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XII

FOUNDATION CHEMISTRY

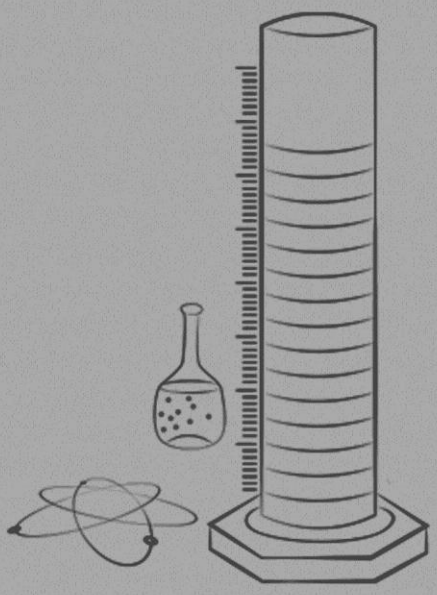
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CONTENTS

1. Alcohols, Phenols & Ethers 4
2. Aldehydes, Ketones & Carboxylic Acids 22
3. Biomolecules Vitamins, Nucleic Acids & Proteins 43
4. Chemical Kinetics 46
5. Chemistry In Everyday Life 59
6. Coordination Compounds 62
7. D & F Block Elements 72
8. Electrochemistry 76
9. Halo Alkanes & Halo Arenes 96
10. Metallurgy 114
11. Compounds Containing Nitrogen 117
12. p – Block Elements 128
13. Polymers 140
14. Solid State 146
15. Solutions 156
16. Surface Chemistry 171

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Alcohols, Phenols & Ethers



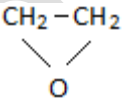
CHEMISTRY

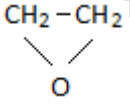
Preparation of alcohols

1. The process of converting alkyl halide into alcohol involves
   (a) addition reaction (b) substitution reaction
   (c) dehydrohalogenation reaction (d) rearrangement reaction

2. When CH_3–CH = CH – CHO is reduced with (1) H_2/Ni and (2) $NaBH_4$, the products formed are in the order
   (a) $CH_3CH_2CH_2CH_2OH$; $CH_3CH_2CH_2CH_2OH$ (b) $CH_3CH_2CH_2CH_2OH$; $CH_3CH = CH – CH_2OH$
   (c) $CH_3CH = CH – CH_2OH$; $CH_3CH_2CH_2CH_2OH$ (d) $CH_3CH = CH – CH_2OH$; $CH_3CH = CH – CH_2OH$

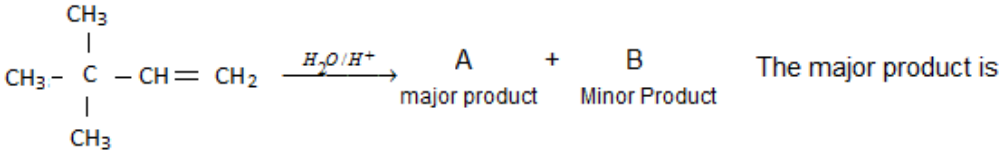
3. The missing reagent 'X' in the reaction CH_3MgI + 'X' $\xrightarrow{H_2O/H^+}$ $CH_3CHOHCH_3$

   (a) CH_2O (b) CH_3CH_2CHO (c) CH_3CHO (d) 

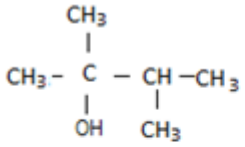
4. The compound which reacts with CH_3MgI Producing a primary alcohol having more then 2 carbon atoms is
   (a) CH_3CHO (b) CH_2O (c)  (d) $CH_3CO\ CH_3$

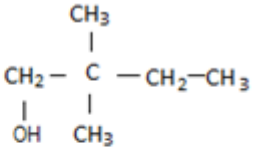
5. Which of the following is not used to convert RCHO to RCH_2OH?
   (a) H_2/Pd (b) $LiAlH_4$ (c) $NaBH_4$ (d) Reaction with RMgX followed by hydrolysis

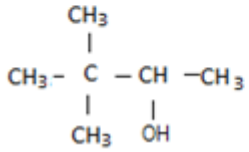
6. In the following reaction,

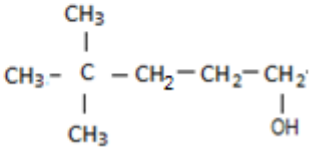


The major product is

(a) 

(b) 

(c) 

(d) 

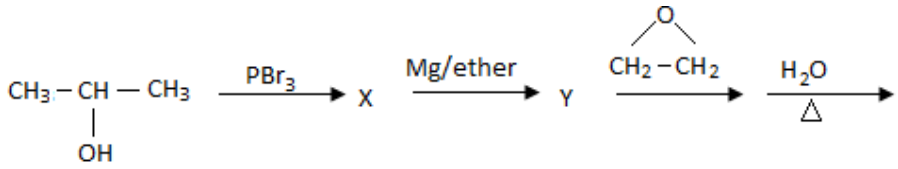
7. The order of reactivity of the alkenes $(CH_3)_2C = CH_2$; $CH_3CH = CH_2$; $CH_2 = CH_2$
   I II III
   When subjected to acid catalysed hydration is
   (a) I > II > III (b) I > III > II (c) III > II > I (d) II > I > III

8. Propene on hydroboration – Oxidation produces
   (a) $CH_3CH_2CH_2OH$ (b) $CH_3CHOH\ CH_3$ (c) $CH_3CHOH\ CH_2OH$ (d) CH_3CH_2CHO

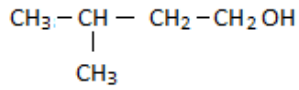
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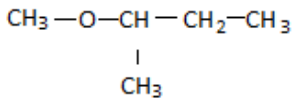
9. Which of the esters shown, after reduction with $LiAlH_4$ and aqueous work up, will yield two molecules of a single alcohol?

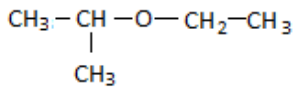
(a) $C_6H_5COO\ C_6H_5$ (b)$CH_3CH_2COO\ CH_2CH_3$ (c) $C_6H_5COO\ CH_2\ C_6H_5$ (d) $CH_3COO\ CH_3$

10. 

The final product is

(a) 

(b) 

(c) 

(d) None of these

ANSWER KEYS

1.b	*2.b*	*3.b*	*4.c*	*5.d*	*6.a*	*7.a*	*8.a*	*9.c*	*10.a*

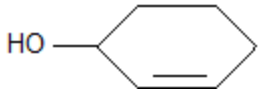
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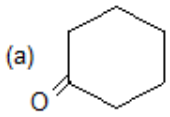
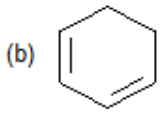
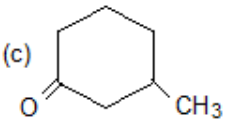
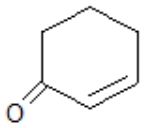
Properties of alcohols

1. The most preferred reagent for the conversion of alcohol to alkyl chloride is
   (a) PCl_3 (b) PCl_5 (c) $SOCl_2$ (d) $HCl/ZnCl_2$

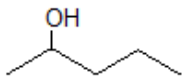
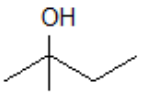
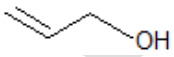
2. $C_5H_{12}O \xrightarrow[330K]{KMnO_4, OH^-} C_5H_{10}O \xrightarrow[400K]{KMnO_4, H^+}$ Ethanoic acid + Propanoic acid

   The starting material $C_5H_{12}O$ is
   (a) 2–Pentanol (b) 3 – Pentanol (c) 3–methylbutan–1–ol (d) 2 – methylbutan-1-ol

3.  $\xrightarrow[\text{Acetone}]{[(CH_3)_3CO]\,Al}$ A, the compound A is

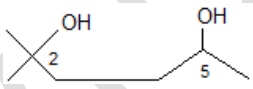
   (a) 
   (b) 
   (c) 
   (d) 

4. The compound which can produce a white turbidity immediately on adding lucas reagent is

   (I) 
   (II) 
   (III) 
   (IV) 

   (a) I (b) II (c) III (d) both II & III

5. The pair that gives iodoform test is
   (a) $CH_3CH_2CH_2OH$, CH_3CH_2OH (b) CH_3OH, CH_3CH_2OH
   (c) CH_3CH_2OH, $CH_3CHOH\ CH_2CH_3$ (d) $CH_3CHOHCH_3$, $(CH_3)_3COH$

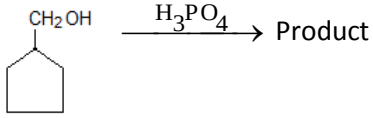
6. In the following diol 

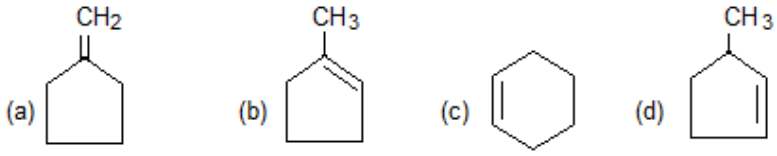
   (a) OH at C_2 is more basic than that at C_5
   (b) OH at C_2 is more acidic than that at C_5
   (c) Both OH groups act as equally strong bases
   (d) Bothe OH groups act as equally strong acids

7. The correct order of basic strength is
   (a) $H_2O < OH^- < CH_3OH < CH_3O^-$ (b) $CH_3OH < H_2O < CH_3O^- < OH^-$
   (c) $H_2O < CH_3OH < OH^- < CH_3O^-$ (d) $OH^- < H_2O < CH_3O^- < CH_3OH$

8. Among the following , the non spontaneous reaction is
   (a) $ROH + R'MgX \longrightarrow R'H + Mg(OR)X$ (b) $RONa + NH_3 \longrightarrow NaNH_2 + ROH$
   (c) $RONa + H_2O \longrightarrow ROH + NaOH$ (d) $ROH + HC \equiv CNa \longrightarrow RONa + HC \equiv CH$

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9. The product of the following reaction is 



10. The best reagent to convert pent – 3- en – 1 - ol into pent-3-en-al

(a) acidified $K_2Cr_2O_7$ (b) alkaline $KMnO_4$

(c) PCC (d) Chromic anhydride in glacial acetic acid

ANSWER KEYS

1.c	*2.b*	*3.d*	*4.d*	*5.c*	*6.a*	*7.c*	*8.b*	*9.c*	*10.c*

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Phenols Preparation & Properties

1. Isopropyl benzene is oxidized in the presence of air to compound 'A'. When A is treacted with dilute mineral acid, the aromatic product formed is

(a) Phenol (b) benzene (c) benzadehyde (d) acetophonone

2. The conversion of m-nitrophenol to resorcinol involves respectively

(a) hydrolysis, diazotization and reduction (b) diazotization, reduction and hydrolysis
(c)hydrolysis, reduction and diazotization (d) reduction, diazotization and hydrolysis.

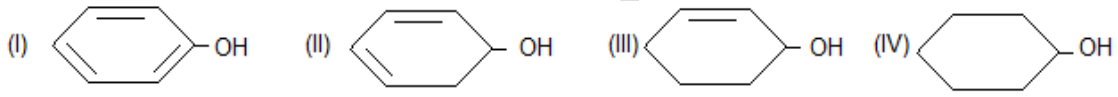
3. The correct order of decreasing acidity of nitro phenol will be

(a) m-nitro phenol > P-nitro Phenol > O – nitro Phenol
(b) O – nitro phenol > m – nitro phenol > P – nitro phenol
(c) P nitro phenol > m– nitro phenol > O– nitro phenol
(d) P – nitro phenol > O – nitro phenol > m – nitro phenol

4. Which of the following will not be soluble in sodium bicarbonate?

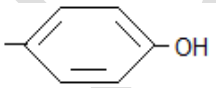
(a) 2,4,6- Trinitrophenol (b) benzoic acid
(c) O – nitro phenol (d) benzene sulphonic acid

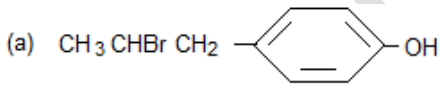
5. The stability towards dehydration of the following compounds

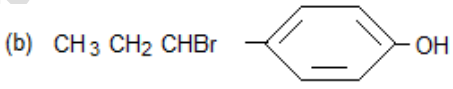


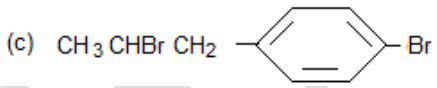
Decreases in the order

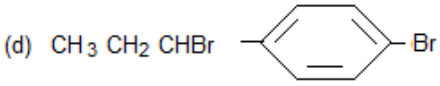
(a) I > II > III > IV (b) I > IV > III > II (c) IV > II > I > III (d) II > III > IV > I

6. The reaction of $CH_3-CH=CH$  with HBr gives

(a) 

(b) 

(c) 

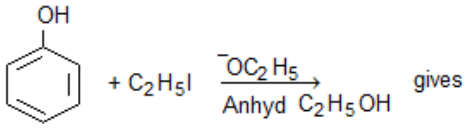
(d) 

7. Phenol, when it reacts with concentrated H_2SO_4 and then with concentrated nitric acid, gives

(a) nitro benzene (b)2,4,6 – tri nitrobenzene
(c) O – nitro phenol (d) P– nitro Phenol

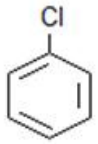
8. The mayor product formed on interaction of phenol with sodium hydroxide and CO_2 is

(a) salicylaldehyde (b) salicylic acid (c) phthalic acid (d) benzoic acid

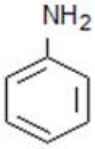
9. 

(a) $C_6H_5OC_2H_5$ (b) $C_2H_5OC_2H_5$ (c) $C_6H_5OC_6H_5$ (d) C_6H_5I

10. Which of the following reaction's will not yield phenol?

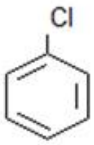
(a) 

fusion with NaOH at 300 atom
(ii) H_2O / H^+

(b) 

(1) $NaNO_2$ /HCl
(2) H_2O warming

(c) 
(1) oleum
(2) NaOH / △
(3) H^+

(d) 

(1) $NaOH_{(aq)}$, 298K/1 atm
(2) HCl

ANSWER KEYS

1.a	*2.d*	*3.d*	*4.c*	*5.b*	*6.b*	*7.c*	*8.b*	*9.b*	*10.d*

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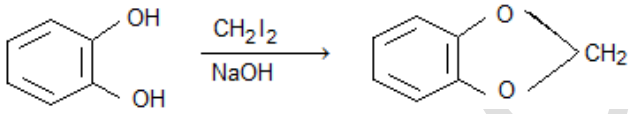
Test of Alcohols, Phenols & Ethers preparation & properties

1. Which of the following isomeric alcohols will produce turbidity first with lucas reagent.
   (a) aliphatic primary (b) secondary (c) tertiary (d) aromatic primary

2. Phenol can be distinguished from ethanol by the reactions with
   (a) Br_2/water (b) Na (c) Neutral $FeCl_3$ (d) both a & c

3. Ortho nitro phenol is less soluble in water than P– and m – nitro phenol because
   (a) O-nitro phenol shows intra molecular H –bonding
   (b) O-nitro phenol shows inter molecular H-bonding
   (c) m.p of O–nitro phenol is lower than those of m and p-nitro phenol
   (d) O-nitro phenol is more volatile in steam than those of m-and P-isomers

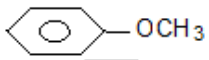
4. The aromatic compounds having formula C_7H_8O which are easily identifiable by $FeCl_3$ solution test (violet coloration) are
   (a) O-cresol and benzyl alcohol (b) m-cresol and P-cresol
   (c) benzyl alcohol and P-cresol (d) methyl phenyl ether & benzyl alcohol

5. The reaction 

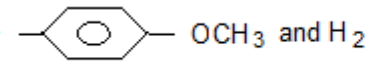
   In an example of
   (a) Wurtz reaction (b) wittig reaction (c) Ullmann reaction (d) Williamson synthesis

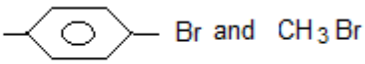
6. Which of the following cannot be made by using Williamson synthesis?
   (a) methoxy benzene (b) benzyl – p – nitro phenyl ether
   (c) tert – butyl methyl ether (d) ditert – butyl ether

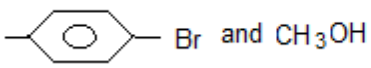
7. $C_2H_5OC_2H_5 + 4[H] \xrightarrow{RedP+HI} 2X + H_2O$; X is
   (a) ethane (b) ethylene (c) butane (d) propane

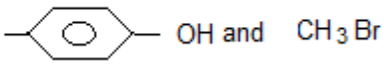
8. In the reaction 

$\xrightarrow{HBr}$ the products are

(a) 

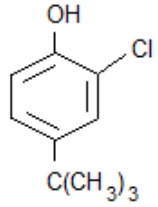
(b) 

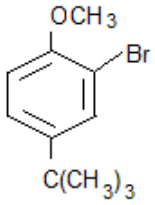
(c) 

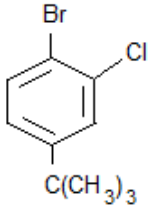
(d) 

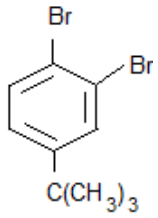
9. Anisole $\xrightarrow[AlCl_3]{(CH_3)_3CCl}$ $\xrightarrow{Cl_2/FeCl_3}$ $\xrightarrow[\Delta]{HBr}$ X

The product X in the above series of reaction is

(a) 

(b) 

(c) 

(d) 

10. Which of the following compounds will give a yellow precipitate with I_2 & alkali?
(a) aceto phenone (b) methyl acetate (c) 2-hydroxypropane (d) both a & c

ANSWER KEYS

1.c	*2.d*	*3.a*	*4.b*	*5.d*	*6.d*	*7.a*	*8.d*	*9.a*	*10.d*

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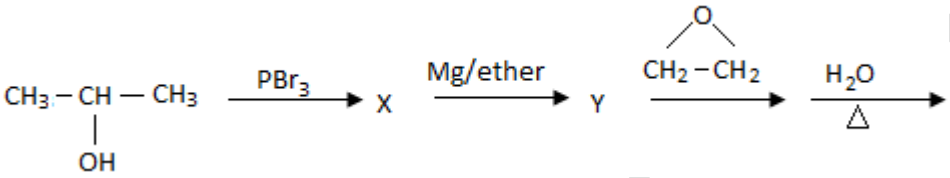
Preparation of alcohols

1. When CH_3–CH = CH – CHO is reduced with (1) H_2/Ni and (2) $NaBH_4$, the products formed are in the order
   (a) $CH_3CH_2CH_2CH_2OH$; $CH_3CH_2CH_2CH_2OH$ (b) $CH_3CH_2CH_2CH_2OH$; $CH_3CH = CH – CH_2OH$
   (c) $CH_3CH = CH – CH_2OH$; $CH_3CH_2CH_2CH_2OH$ (d) $CH_3CH = CH – CH_2OH$; $CH_3CH = CH – CH_2OH$

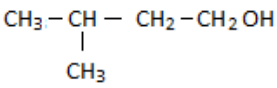
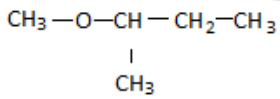
2. Which of the following is not used to convert RCHO to RCH_2OH?
   (a) H_2/Pd (b) $LiAlH_4$ (c) $NaBH_4$ (d) Reaction with RMgX followed by hydrolysis

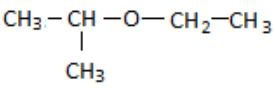
3. The order of reactivity of the alkenes $(CH_3)_2$ C = CH_2; $CH_3CH = CH_2$; $CH_2 = CH_2$
   I II III
   When subjected to acid catalysed hydration is

   (a) I > II > III (b) I > III > II (c) III > II > I (d) II > I > III

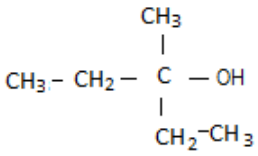
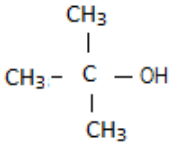
4. 

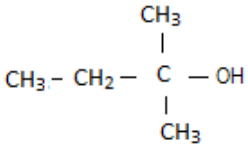
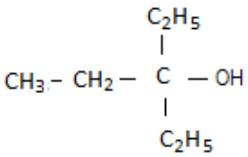
The final product is

(a)  (b) 

(c)  (d) None of these

5. The product formed when ethyl acetate is treated with excess CH_3MgBr followed by hydrolysis is

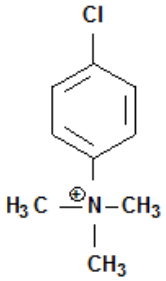
(a)  (b) 

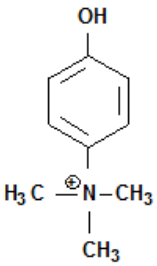
(c)  (d) 

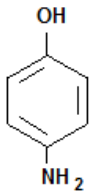
6. t – butyl bromide $\xrightarrow{\text{aq.KOH}}$ X, the main product X is
   (a) tertiary butyl alcohol (b) 1 – butoxy butane (c) isobutylene (d) propene

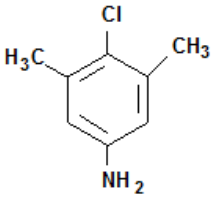
7. But –1 – ene $\xrightarrow[\text{(ii) } NaBH_4/OH^-]{\text{(i) } Hg(OAC)_2/THF - H_2O}$ (A). The product (A) is

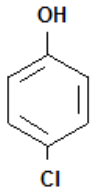
(a) n-butyl alcohol (b) isobutyl alcohol (c) s – butyl alcohol (d) but – 1 – en -3 –ol

8.  $\xrightarrow{OH^{\ominus}}$ A. The product A is

(a) 

(b) 

(c) 

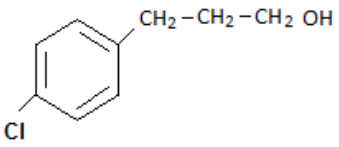
(d) 

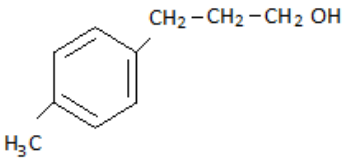
9. [A] $\xrightarrow[\text{(ii) } H_2O_2/OH^-]{\text{(i) } B_2H_6/ether}$ iso butyl alcohol

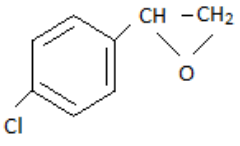
The compound [A] in the above reaction is

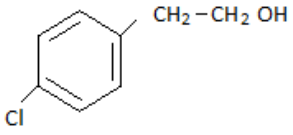
(a) But – 1 – ene (b) But – 2 – ene (c) 2 – methyl propene (d) 2,2-dimethyl but – 1- ene

10. $C_6H_5CH_3 \xrightarrow[Fe]{Cl_2}$ A $\xrightarrow{NBS/CCl_4}$ B $\xrightarrow[(2)\ \triangle O\ (3)\ H_3O^+]{(1)\ Mg/ether}$ C The structure of (C) is

(a) 

(b) 

(c) 

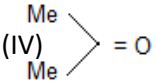
(d) 

ANSWER KEYS

1.b	*2.d*	*3.a*	*4.a*	*5.b*	*6.c*	*7.c*	*8.a*	*9.c*	*10.a*

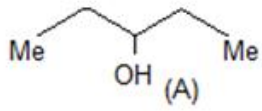
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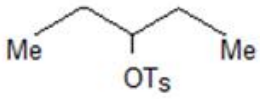
PROPERTIES OF ALCOHOLS

1. The decreasing order of acidic character of the following is
(I) E+OH (II) Me – COOH (III) MeOOC – CH_2 – COOMe (IV) 

(a) II > III > IV > I (b) II > III > I > IV (c) I > IV > III > II (d) IV > I > III > II

2. Which is the best method for the conversion of (A) pentan – 3 – ol to 3 – bromo pentane (B)?

(a)  + PBr ⟶ (B)

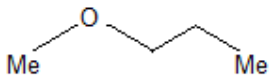
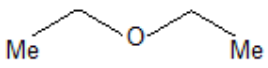
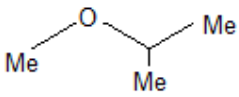
(b) (A) + TsCl ⟶  $\xrightarrow[SN^2]{Br^{\ominus}}$ (B) +  (tosylate ion)

(c) A $\xrightarrow{HBr}$ B

(d) Both a & b

3. (A) ($C_6H_{10}O$) $\xrightarrow{Na}$ No reaction
$\xrightarrow{HI}$ MeI + (B) Alcohol
↓NaOH + I_2
Yellow precipitate

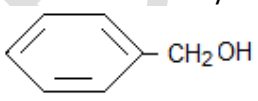
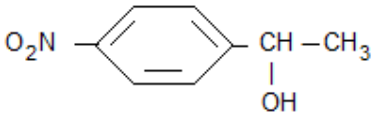
The compound A is

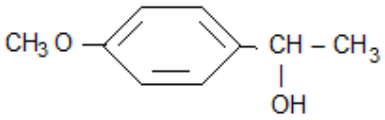
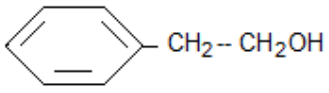
(a)  (b)  (c)  (d) None

4. $CH_3 – CH_2 – \underset{\underset{OH}{|}}{CH} – CH_3 \xrightarrow{conc H_2SO_4} A \xrightarrow{Br_2/CCl_4} C_4H_8Br_2$ If five isomers of final product $C_4H_4Br_2$ are obtained, the number of isomers of (A) formed in the reaction is

(a) 5 (b) 4 (c) 3 (d) 2

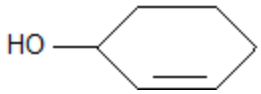
5. The alcohol that is dehydrated most readily with conc. H_2SO_4 is

(a)  (b) 

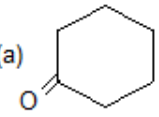
(c)  (d) 

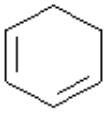
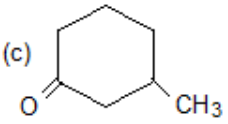
6. $CH_3 – CH = CH_2 \xrightarrow{Cl_2,770K} (A) \xrightarrow{NaOH} (B) \xrightarrow{MnO_2/acetone} (C)$
The major product (C) in the above reaction is

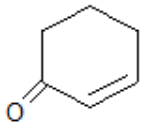
(a) $CH_3 – CO – CHO$ (b) CH_3COOH (c) $CH_2 = CH – COOH$ (d) $CH_2 = CH – CHO$

7. 

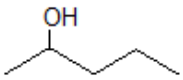
A, the compound A is

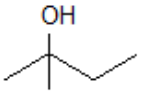
(a) 

(b) 
(c) 

(d) 

8. The compound which can produce a white turbidity immediately on adding lucas reagent is

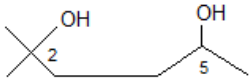
(I) 

(II) 

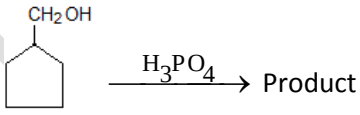
(III) 

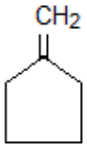
(IV) 

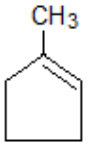
(a) I (b) II (c) III (d) both II & III

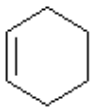
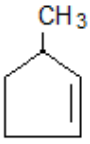
9. In the following diol 

(a) OH at C_2 is more basic than that at C_5
(b) OH at C_2 is more acidic than that at C_5
(c) Both OH groups act as equally strong bases
(d) Bothe OH groups act as equally strong acids

10. The product of the following reaction is 

(a) 

(b) 

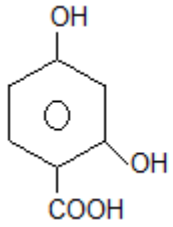
(c) 
(d) 

ANSWER KEY

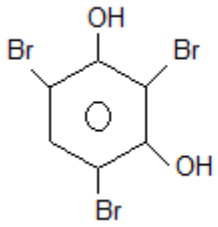
1.b	*2.d*	*3.c*	*4.c*	*5.c*	*6.d*	*7.d*	*8.d*	*9.a*	*10.c*

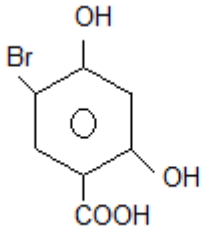
PHENOL PREPARATION AND PROPERTIES

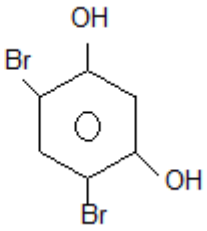
1. Phenol + bromine water ⟶ white precipitate. The product is
   (a) O – bromophenol (b) P – bromophenol (c) a mixture of a & B (d) 2,4,6 – tribromophenol.

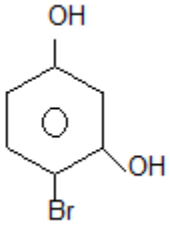
2. 

$\xrightarrow[CH_3COOH]{Br_2}$ Product. The major product obtained is

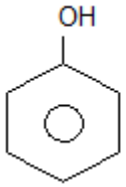
(a) 

(b) 

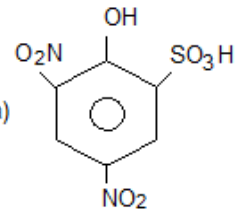
(c) 

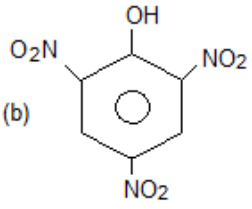
(d) 

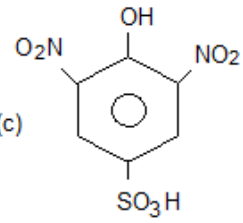
3. Which of the following statements is connect about phenols?
   (a) Electron releasing groups increasing acidic character
   (b) Electron withdrawing groups decrease acidic character
   (c) Phenol is less resonance stabilised than phenoxide ion
   (d) Phenol twins red litmus blue

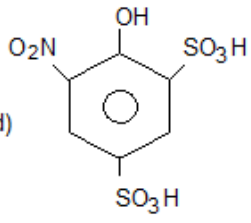
4. 

$\xrightarrow{conc.H_2SO_4}$ A $\xrightarrow[conc.H_2SO_4]{conc.HNO_3}$ B

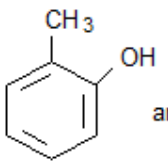
(a) 

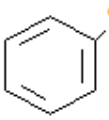
(b) 

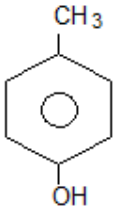
(c) 

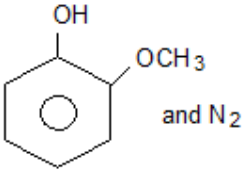
(d) 

5. When phenol reacts with CH_2N_2, the products formed are

(a) 

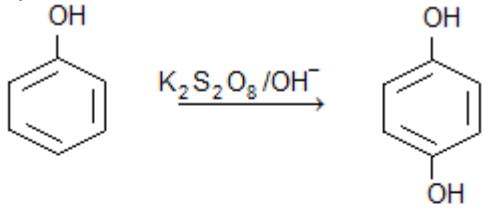
and N_2 (b) 

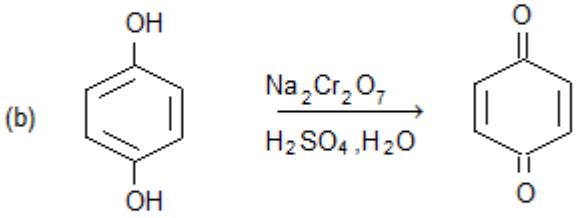
and N_2 (c) 

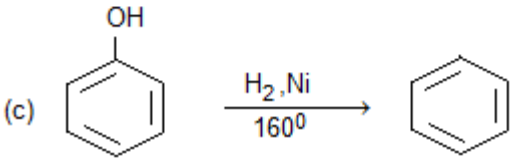
and N_2 (d) 

and N_2

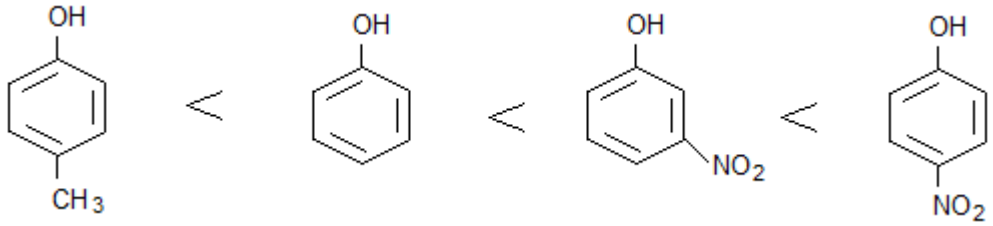
6. Identify the reaction / statement which is not correctly represented.

(a) 

(b) 

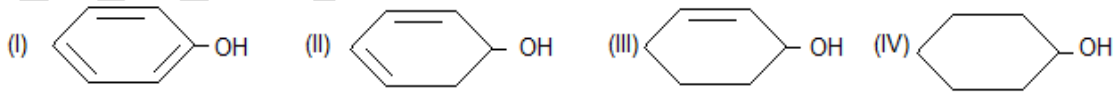
(c) 

(d) The order of acidity of phenols can be represented as



7. The correct order of decreasing acidity of nitro phenol will be
   (a) m-nitro phenol > P-nitro Phenol > O – nitro Phenol
   (b) O – nitro phenol > m – nitro phenol > P – nitro phenol
   (c) P nitro phenol > m– nitro phenol > O– nitro phenol
   (d) P – nitro phenol > O – nitro phenol > m – nitro phenol

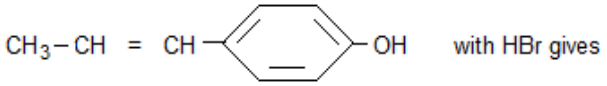
8. The stability towards dehydration of the following compounds



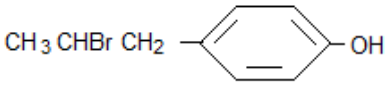
Decreases in the order

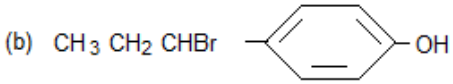
(a) I > II > III > IV (b) I > IV > III > II (c) IV > II > I > III (d) II > III > IV > I

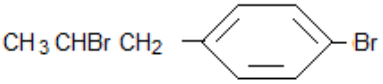
9. The reaction of

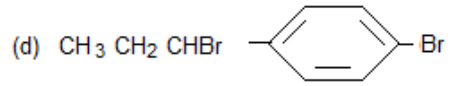


with HBr gives

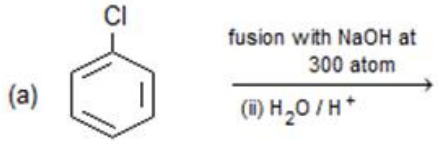
(a) 

(b) 

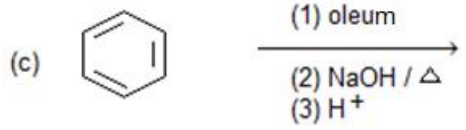
(c) 

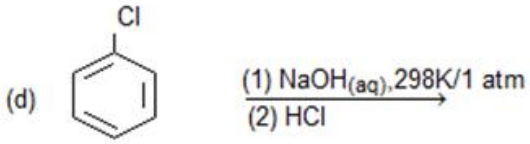
(d) 

10. Which of the following reaction's will not yield phenol?

(a) 

(b) 

(c) 

(d) 

ANSWER KEY

1.d	*2.b*	*3.c*	*4.b*	*5.b*	*6.c*	*3.d*	*5.b*	*6.b*	*10.d*

TESTS OF ALCOHOLS AND PHENOLS, ETHERS-PREPARATION AND PROPERTIES

1. Phenol + phthalic anhydride $\xrightarrow[\Delta]{\text{CONC.}H_2SO_4}$ (X). The product X is used as

(a) an antipyretic (b) a catalyst (c) an indicator (d) a laboratory reagent.

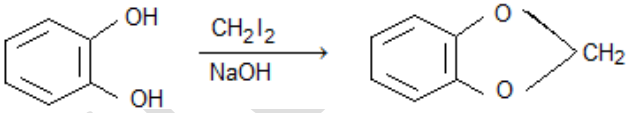
2. Phenol on warming with conc.H_2SO_4 and $NaNO_2$ gives brown colour. On adding NaOH solution, the colour changes from green to blue. This test is called
(a) victor Meyers test (b) Liebermann's test (c) Lucas test (d) Baeyer's test

3. When phenol reacts with dilute neutral $FeCl_3$ solution, a violet colouration is produced. The structure of violet colour species is
(a) $[Fe(OC_6H_5)_6]^{4-}$ (b) $Fe(C_6H_5)_3$ (c) $[Fe(OC_6H_5)_6]^{3-}$ (d) $(FeCl_3)(C_6H_5OH)$

4. In zeisel's method for the determination of methoxyl groups, a sample of 2.68 gm of compound (A) gave 14.08 gm of AgI. If the molecular weight of compound (A) is 134, the number of ($-OCH_3$) groups in the compound (A) is
(a) 1 (b) 2 (c) 3 (d) 4

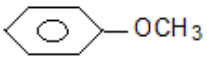
5. The crown ethers are heterocydic polyethers, usually with atleast 4 oxygen atoms. The 12-crown-4ether contains ---------- carbon atoms
(a) 12 (b) 4 (c) 8 (d) 16

6. Which of the following is not used as inhalation anaesthetic
(a) ethoxy ethane (b) Anethole (c) Ethrane (d) Isoflurane

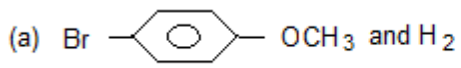
7. The reaction 

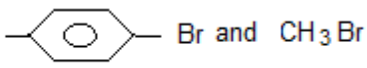
In an example of
(a) Wurtz reaction (b) witting reaction (c) Ullmann reaction (d) Williamson synthesis

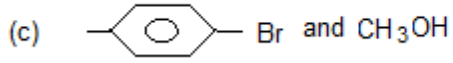
8. $C_2H_5OC_2H_5 + 4[H] \xrightarrow{\text{RedP+HI}} 2X + H_2O$; X is
(a) ethane (b) ethylene (c) butane (d) propane

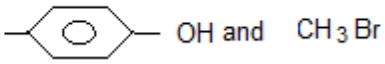
9. In the reaction 

$\xrightarrow{HBr}$ the products are

(a) 

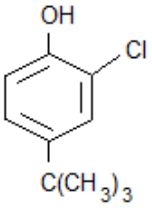
(b) 

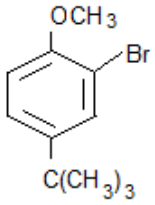
(c) 

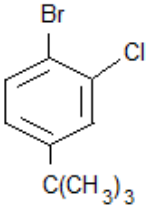
(d) 

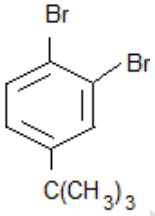
10. Anisole $\xrightarrow[AlCl_3]{(CH_3)_3CCl}$ $\xrightarrow{Cl_2/FeCl_3}$ $\xrightarrow[\Delta]{HBr}$ X

The product X in the above series of reaction is

(a) 

(b) 

(c) 

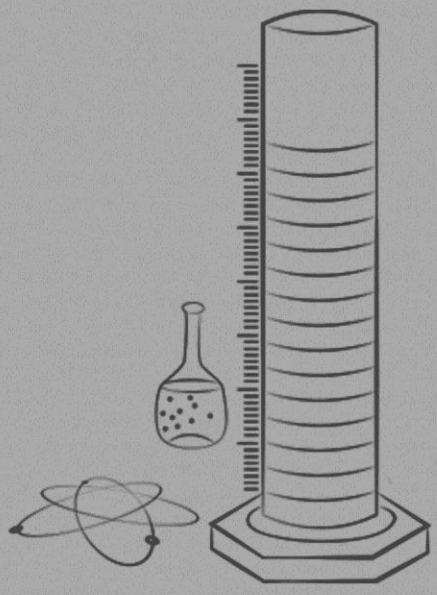
(d) 

ANSWER KEY

1.c	*2.b*	*3.c*	*4.c*	*5.c*	*6.b*	*7.d*	*8.a*	*9.d*	*10.a*

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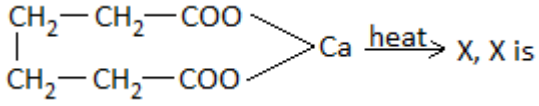
Aldehydes, Ketones & Carboxylic Acids



CHEMISTRY

PREPARATION OF ALDEHYDES AND KETONES

1. Identify the product y in the following reaction sequence.



(a) pentane (b) cyclobutane (c) cyclopentane (d) cyclopentanone

2. Identify the product of the reaction Ph C ≡ CMe $\xrightarrow{H_3O^+, Hg^{+2}}$?

(a) $PhCH_2CH_2CHO$ (b) $PhCOCH_2CH_3$ (c) $PhCH_2COCH_3$ (d) PhCOCOMe

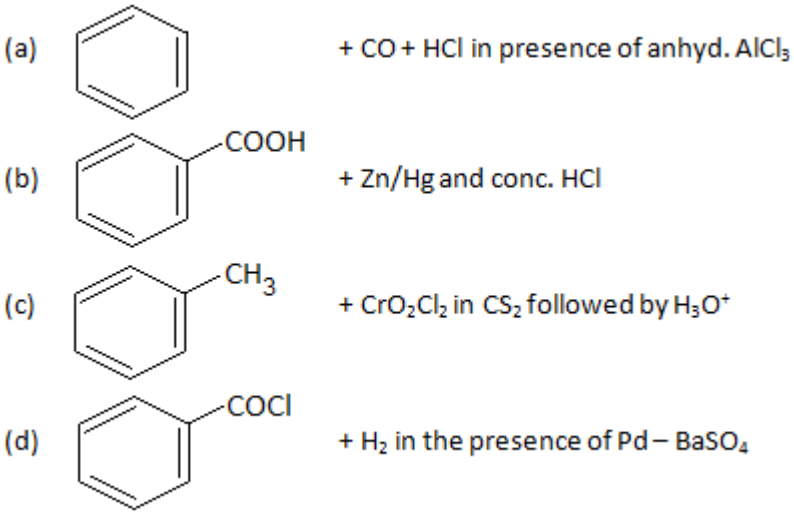
3. One mole of symmetrical alkene on ozonolysis gives two moles of aldehyde having a molecular mass of 44u. The alkane is

(a) 2-butane (b) ethane (c) propene (d) 1-butane

3. $CH_3CH_2C \equiv N \xrightarrow{x} CH_3CH_2CHO$. The reagent/s x is (are)

(a) $SnCl_2$/HCl H_2O/Boil (b) H_2/Pd, $BaSO_4$ (c) $LiAlH_4$/ether (d) $NaBH_4$/ether, H_3O^+

4. Reaction by which Benz aldehyde cannot be prepared is



5. $CH_3 - C \equiv C - C_2H_5 \xrightarrow[② H_2O_2/OH^-]{① B_2H/THF}$ The major product is

(a) pentan-2-one (b) pentan-3-one
(c) pentan-2, 3-dione (d) ethanol + propanal

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6. A $\xrightarrow{SOCl_2}$ B $\xrightarrow[Pd/BaSO_4]{H_2}$ C $\xrightarrow[NaOH]{dil}$ Crotan aldehyde. Then A is

(a) acetaldehyde (b) acetone (c) acetylene (d) acetic acid

7. When propyne is treated with warm dil. H_2SO_4 in the presence of $HgSO_4$, the major product is

(a) propanal (b) Formaldehyde (c) propanol (d) Acetone

8. $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-CH_3 \xrightarrow[573k]{Cu}$ *Product is*

(a) Butanone (b) Formaldehyde + acetone
(c) Formaldehyde + propanal (d) Butanal

9. $C_6H_6 + CO \xrightarrow[HCl_{(g)}]{anhy.Ald_3} C_6H_5CHO$. This reaction is called

(a) Friedel-Crafts reaction (b) Reimer-Tiemann reaction
(c) Gathermann-Koch reaction (d) Bayer's reaction

10. When a mixture of ethylene and O_2 is passed through an aqueous solution of $PdCl_2$ and $CuCl_2$ catalyst under pressure we get

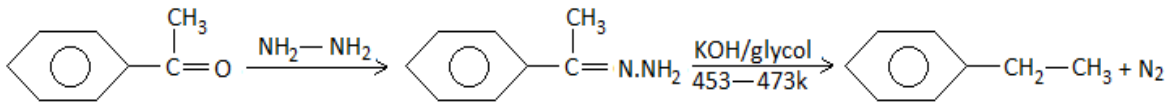
(a) acetaldehyde (b) Ethanol (c) acetic acid (d) ethylene glycol

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
d	b	a, a	b	a	d	a	a	c	a

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PREPARATION OF ALDEHYDES AND KETONES

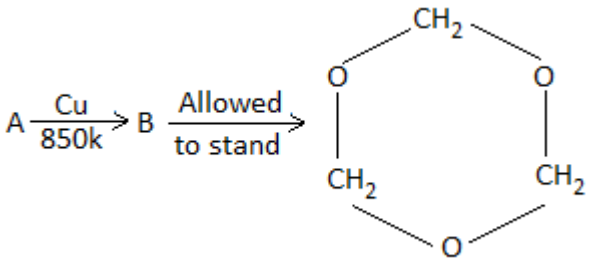
1. 

The reaction is called

(a) Stephen reduction (b) Mendius reduction
(c) Wolff-Kishner reduction (d) Clemmenson reduction

2. An organic compound with formula $C_5H_{10}O$ gives a crystalline precipitate with 2, 4-dinitrophenyl hydrazine. It doesnot give any precipitate with tollen's reagent. It doesnot give precipitate o warming with I_2 and alkali. It is

(a) Et_2CO (b) $CH_3CH_2CH_2CH_2CHO$
(c) $MeCOCH_2CH_2CH_3$ (d) $CH_2 = CH – O – CH_2 – CH_2 – CH_3$

3. 

A is identified as

(a) C_3H_7OH (b) $CH_3 – OH$ (c) $CH_2 = CH – CH_2OH$ (d) $CH_2 = CH – CHO$

4. Which of the following reagents can be used to purify a sample of acetaldehyde containing ethanol as impurity?

(a) NaCN (b) $NaHSO_3$ (c) conc. H_2SO_4 (d) NaOH

5. 2-pentanone and 3-pentanone can be distinguished by

(a) Reaction with NH_3 (b) Reaction with HCN
(c) Reaction with I_2 and Na_2CO_3 solution (d) 50% NaOH solution

6. An organic compound A with molecular formula $C_3H_6Cl_2$ on treating with aqueous NaOH gave B which gave orange precipitate with Borche's reagent and did not reduce tollen's reagent. A and B are

(a) 1, 1-dichloropropane and propanol (b) 1, 2-dichloro propane and propanone
(c) 2, 2-dichloro propane and propanone (d) 1, 3-dichloro propane

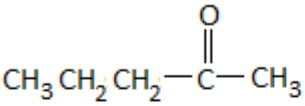
7. A $\xrightarrow{HCN}$ B $\xrightarrow{H^+/H_2O}$ C $\xrightarrow{conc.H_2SO_4}$ Acrylic acid. The starting material A is

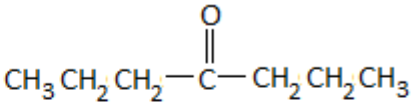
(a) Acrolein (b) Acetone (c) Acelaldehyde (d) Allylalcohol

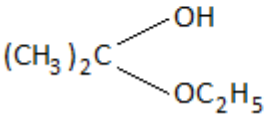
8. Order of reactivity of formaldehyde, acetaldehyde, acetone and benzophenone towards are as follows.

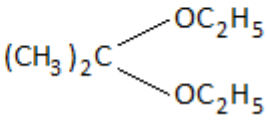
(a) HCHO < MeCHO < MeCOMe < PhCOPh (b) HCHO > MeCHO > MeCOMe > PhCOPh
(c) MeCOMe < PhCOPh < HCHO < MeCHO (d) MeCOMe < PhCOPh > HCHO > MeCHO

9. Acetone is treated with excess of ethanol in the presence of hydrochloric acid. The product obtained is

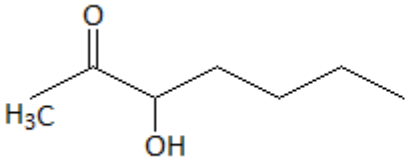
(a) 

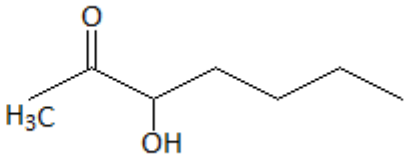
(b) 

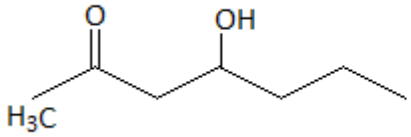
(c) 

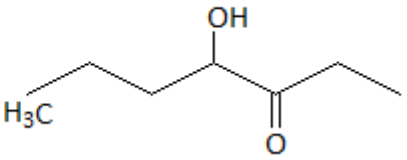
(d) 

10. Which one of the following compounds will be most readily de-hydrated.

(a) 

(b) 

(c) 

(d) 

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
c	a	b	b	c	c	c	b	d	c

CONDENSATION REACTION

1. *Acetone* $\xrightarrow[\text{② heat}]{\text{① } Ba(OH)_2}$ *the product is called*

(a) Crotanal dehyde (b) isovaleraldehyde (c) acrolein (d) mesityl oxide

2. Cannizaro reaction is not given by

(a) $(CH_3)_3C.CHO$ (b) acetaldehyde (c) benzaldehyde (d) formaldehyde

3. A mixture of benzaldehyde and formaldehyde on heating with conc. NaOH solution gives

(a) Benzyl alcohol and sodium formate
(b) Sodium benzoate acid methyl alcohol
(c) Sodium benzoate acid sodium formate
(d) Benzyl alcohol and methyl alcohol

4. $CH_3CH_2CHO \xrightarrow[200^\circ C]{Al(OEt)_3} CH_3CH_2COOCH_2CH_2CH_3$. *This reaction is called*

(a) Cannizaro reaction (b) aldol condensation
(c) Tischenko reaction (d) Koch reaction

5. The compound that undergoes reaction with 50% NaOH solution to give the corresponding alcohol and sodium salt of the corresponding acid is

(a) butanal (b) benzaldehyde (c) phenol (d) benzoic acid

6. Cannizaro reaction is an example of

(a) condensation reaction (b) substitution reaction
(c) disproportion reaction (d) Elimination reaction

7. If dry hydrogen chloride is passed through pure acetone, it condenses to form

(a) mesitylene (b) mesityl oxide (c) phorone (d) both b & c

8. Acetal dehyde reacts with malonic acid in the presence of sodium ethoxide at high temperature gives

(a) acetic acid (b) propanoic acid (c) tartaric acid (d) crotonic acid

9. Claisen condensation is a reaction between

(a) HCOOH + HCOOH (b) HCOOH + HCHO
(c) $CH_3COOC_2H_5 + CH_3COOC_2H_5$ (d) $(CH_3)_3C - COOC_2H_5 + (CH_3)_3C\ COOC_2H_5$

10. *The reaction* $\begin{matrix}CHO\\|\\CHO\end{matrix} \xrightarrow{NaOH} \begin{matrix}CH_2OH\\|\\COONa\end{matrix}$ *is an example of*

(a) intramolecular aldol condensation (b) mixed cannizzaro reaction
(c) intramolecular cannizaro reaction (d) crossed cannizzaro reaction

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
d	b	a	c	b	c	d	d	c	c

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PREPARATION OF ALDEHYDES AND KETONES

1. Methanoic acid and ethanoic acid may be distinguished by the reaction with
   (a) Na_2CO_3 reaction (b) Neutral $FeCl_3$ solution
   (c) Sodium ethoxide (d) Dilute acidified $KMnO_4$ solution

2. Saponification of ethyl-benzoate with caustic soda solution gives
   (a) benzyl alcohol and ethanoic acid (b) sodium benzoate & ethanol
   (c) benzoic acid & sodium ethoxide (d) phenol & ethanoic acid

3. Reaction of ethyl magnesium bromide with CO_2 followed by hydrolysis gives
   (a) ethanoic acid (b) propanoic acid (c) methanoic acid (d) dimethyl acetic acid

4. Which of the following compounds does not give benzoic acid as the product on oxidation with alkaline $KMnO_4$
   (a) methyl benzene (b) ethyl benzene (c) n-propyl benzene (d) tertiary butyl benzene

5. $CH_3COOC_2H_5 + CH_3OH \longrightarrow CH_3COOCH_3 + C_2H_5OH$ this reaction is called
   (a) Hofmann's rearrangement (b) Beckmann's rearrangement
   (c) trans esterification (d) saponification

6. Which of the following acid does not form anhydride
   (a) formic acid (b) acetic acid (c) propionic acid (d) n-butyric acid

7. Which of the following is the most susceptible to nucleophilic attack at the carbonyl carbon.
   (a) CH_3CHO (b) CH_3COCH_3 (c) CH_3COCl (d) CH_3CONH_2

8. Hydrolysis of an ester gives acid "A" and alcohol "B" A reduces febling's solution and oxidation of B gives A. The ester is
   (a) methyl formate (b) ethyl formate (c) methyl acetate (d) ethyl acetate

9. Which of the following compounds would have the smallest value for pka?
   (a) $CHF_2CH_2CH_2COOH$ (b) $CH_3CF_2CH_2COOH$
   (c) $CH_2FCHFCH_2COOH$ (d) $CH_3CH_2CF_2COOH$

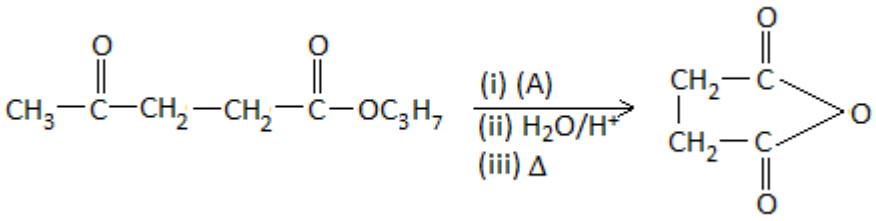
10. RCOOH is successively treated with PCl_5 and kCN. It is then subjected to hydrolysis followed by clemmanson's reduction. The final product obtained is
    (a) RCH_2COCl (b) RCH_2COOH (c) RCOCN (d) RCN

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
d	b	b	d	c	a	c	a	d	b

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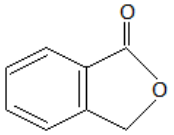
PREPARATION OF ALDEHYDES AND KETONES EXCEPT CONDENSATION

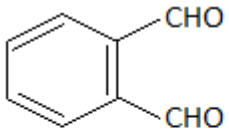
1. 

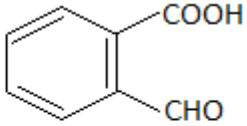
The reagent A is

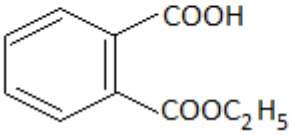
(a) NaOH (b) alcoholic KOH (c) NaOI (d) NaOH

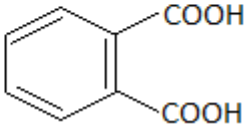
2. $C_6H_5CH_2CN \xrightarrow{R} C_6H_5CH_2 - CHO$. The reagent R used for the above conversion is
(a) $NaBH_4$ (b) $H_2/Pd\text{-}BaSO_4$ (c) $Na/liq.NH_3$ (d) $SnCl_2/HCl$

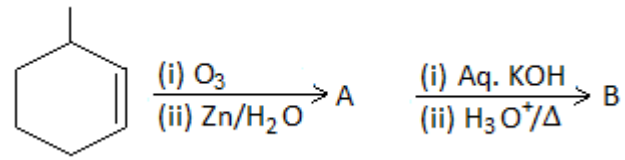
3. An organic compound(X) when heated with concentrated NaOH solution followed by acidification gave the following lactone as the only organic product  The compound X is

(a) 

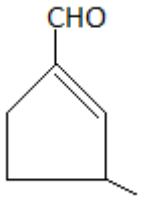
(b) 

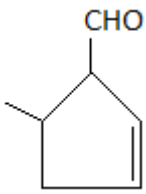
(c) 

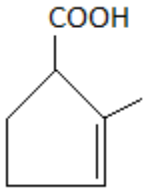
(d) 

4. 

The compound B is the above reaction is

(a) 

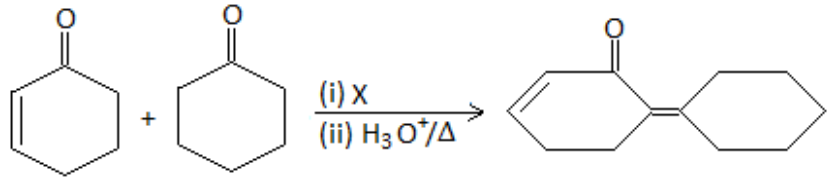
(b) 

(c) 

(d) *$COOH - (CH_2)_4$ - COOH*

5. An acid on treating with calcium hydroxide followed by dry distillation gives 2, 4-dimethyl-3-pentanone. The acid is

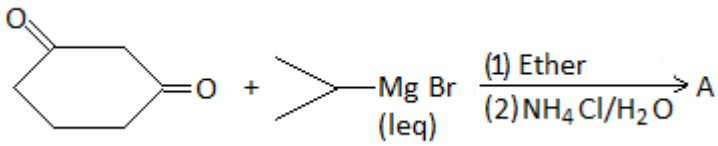
(a) 2, 4-dimethyl pentanoic acid (b) 2, 2-dimethyl proponoic acid
(c) 2-methyl propanoic acid (d) butanoic acid

6. 

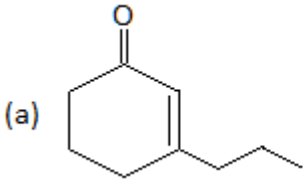
The reagent (X) required is

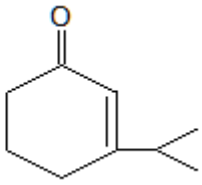
(a) NaOH (b) I_2/NaOH (c) KCN (d) Cl_3CO_3H

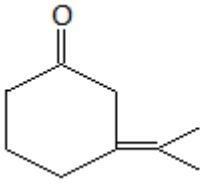
7. Which of the following reaction/s will not give acetophenone as a product?
(a) Acid catalyzed hydration of stysene followed by oxidation with hot alkaline $KMnO_4$
(b) Phenyl acetylene $\xrightarrow{dil.H_2SO_4/Hg^{+2}}$
(c) Reaction of benzoyl chloride with dimethyl cadmium
(d) dry distillation of mixture of calcium acetate and calcium benzoate

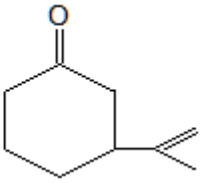
8. 

A is

(a) 

(b) 

(c) 

(d) 

9. One mole of symmetrical alkene on ozonolysis give two moles of aldehyde having a molecular formula of 44u. The alkane is
(a) 2-butane (b) ethane (c) propene (d) 1-butane

10. When a mixture of ethylene and O_2 is passed through an aqueous solution of $PdCl_2$ and $CuCl_2$ catalyst under pressure we get
(a) acetaldehyde (b) Ethanol (c) acetic acid (d) ethylene glycol

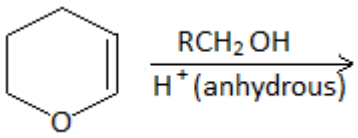
ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
c	d	a	a	c	a	a	b	a	a

FOR MORE JOIN ~ MISSION SSC / BANKING / UPSC

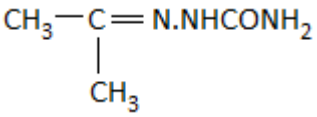
PREPARATION OF ALDEHYDES AND KETONES EXCEPT CONDENSATION

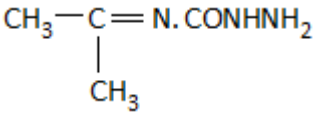
1. The major product of the following reaction is



(a) a hemi acetal (b) acetal (c) an ether (d) an ester

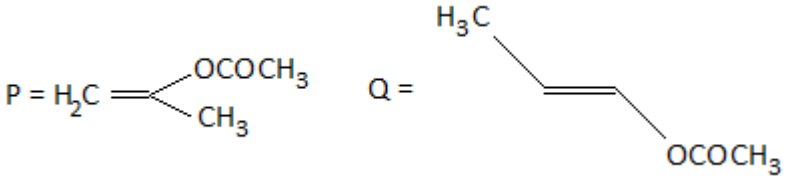
2. Compound A (molecular formula C_3H_8O) is treated with acidified $K_2Cr_2O_7$ to form product B(molecular formula C_3H_6O). B forms a shining mirror on warming with ammonical $AgNO_3$. B when treated with aqueous solution of $H_2NCONHNH_2$.HCl and sodium acetate gives a product 'C' Identify the structure of 'C'

(a) $CH_3CH_2CH = N.NHCONH_2$ *(b)* 

(c) 

(d) $CH_3CH_2CH = NCONHNH_2$

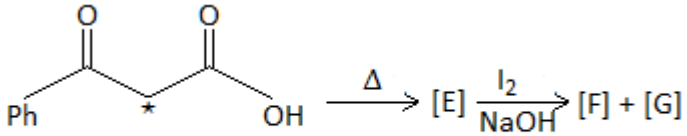
3. The product of acid hydrolysis of P and Q can be distinguished



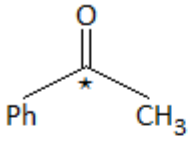
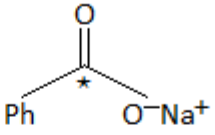
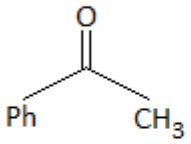
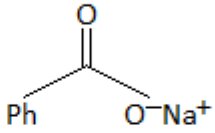
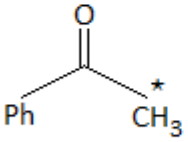
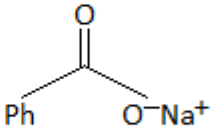
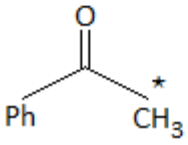
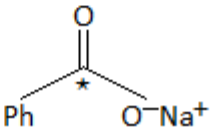
(a) Lucas reagent (b) 2, 4-DNP (c) Feblings solution (d) NaHSO3

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4. In the following reaction sequence, the correct structures of E, F and G are

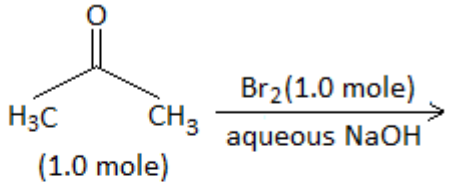


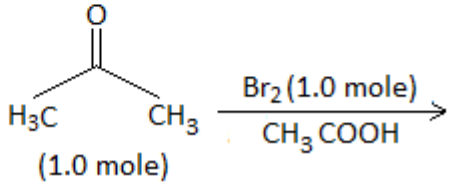
(⋆ Implies ^{13}C labelled carbon)

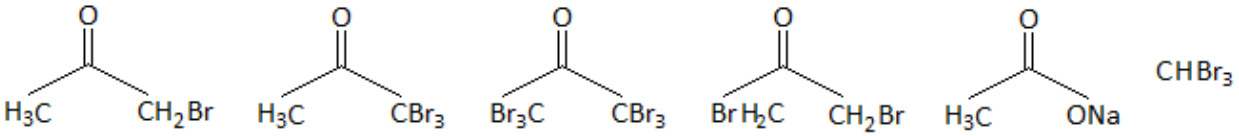
	E	F	G
(a)			CHI_3
(b)			CHI_3
(c)			$\overset{\star}{C}HI_3$
(d)			CH_3I

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5. After completion of reactions (I and II), the organic compound(s) in the reaction mixture is (are)

Reaction I : 

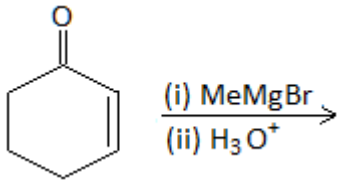
Reaction II : 

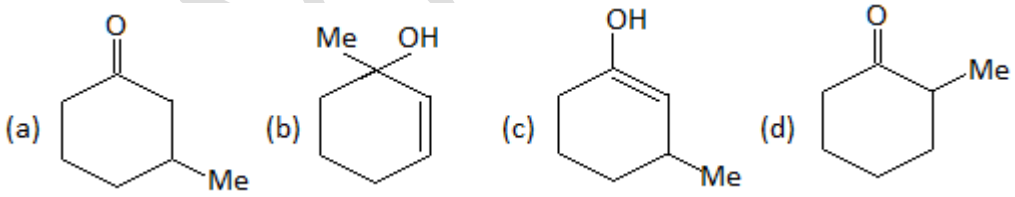


(a) Reaction I:P and Reaction II:P
(b) Reaction I:U, acetone and Reaction II:Q, acetone
(c) Reaction I:T, U, acetone and Reaction II: P
(d) Reaction I:R, acetone and Reaction II:S

6. Acetone on distillation with conc.H_2SO_4 forms
(a) phorone (b) acrolein (c) mesitylene (d) mesityl oxide

7. Predict the product





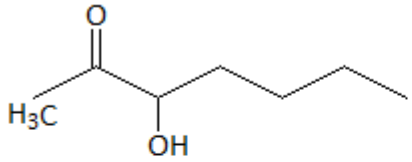
8. Consider the reaction RCHO + $NH_2 – NH_2 \longrightarrow RCH = N – NH_2$ What sort of reaction is it?

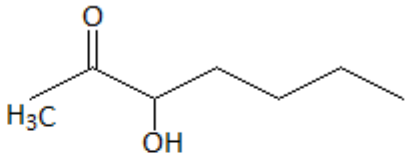
(a) Electrophilic addition – elimination reaction
(b) Free radical addition – elimination reaction
(c) Electrophilic substitution – elimination reaction
(d) Nucleophilic addition – elimination reaction

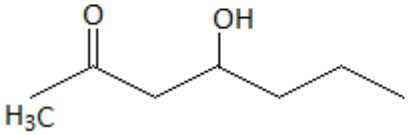
9. A $\xrightarrow{HCN}$ B $\xrightarrow{H^+/H_2O}$ C $\xrightarrow{conc.H_2SO_4}$ Acrylic acid. The starting material A is

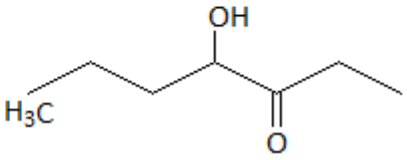
(a) Acrolein (b) Acetone (c) Acelaldehyde (d) Allylalcohol

10. Which one of the following compounds will be most readily de-hydrated.

(a) 

(b) 

(c) 

(d) 

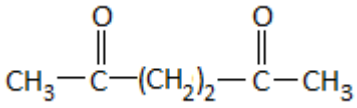
ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
b	a	c	c	c	c	a	d	c	c

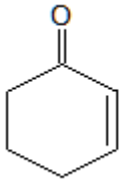
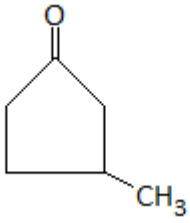
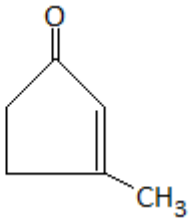
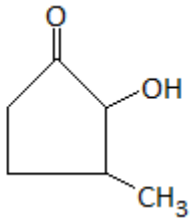
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CONDENSATION REACTION

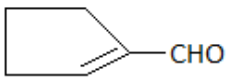
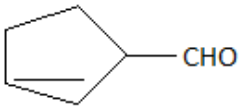
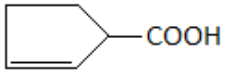
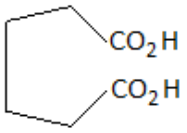
1. The cross aldol product formed when proponal acts as the electrophile and butanal as nucleophile is
   (a) 3-hydroxy-2-methyl pentanal (b) 3-hydroxy-2-methyl hoxanal
   (c) 2-ethyl-3-hydroxy pentanal (d) 2-ethyl-3-hydroxy hexanal

2. *The diketone*  *on intra-molecular aldol condensation gives the*

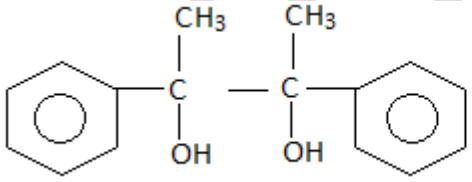
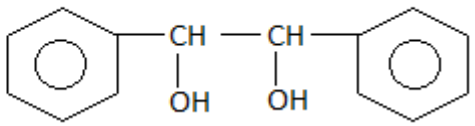
final product

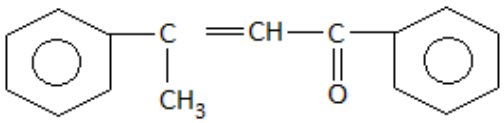
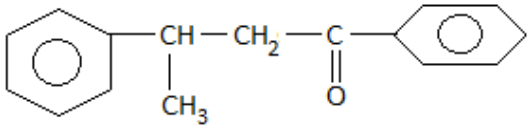
(a)  (b)  (c)  (d) 

3. Cyclohexene on ozonolysis followed by reaction with Zn dust and water gives compound E. compound E on further treatment with aqueous KOH yield compound F. Compound F is

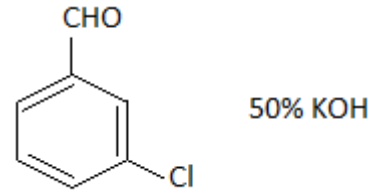
(a)  (b)  (c)  (d) 

4. Acetophenone when reacted with a base C_2H_5ONa yields a stable compound which has the structure

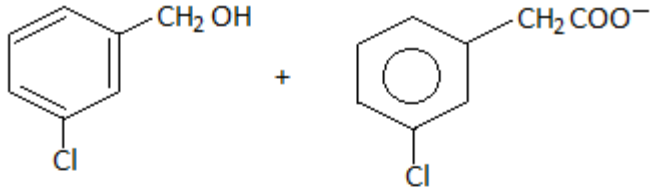
(a)  (b) 

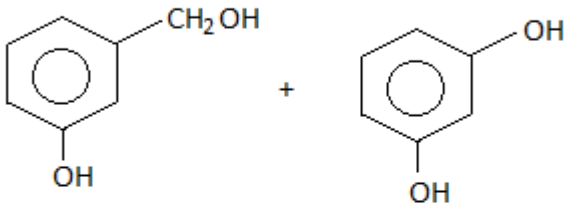
(c)  (d) 

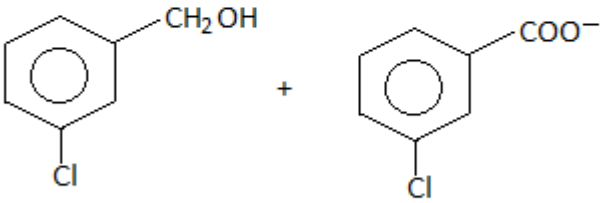
5. Predict the product in the given reaction

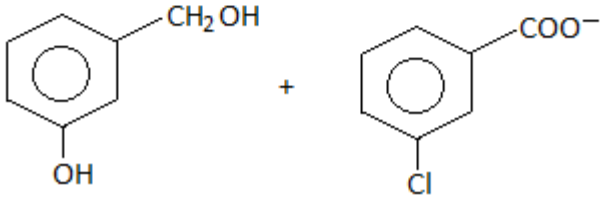


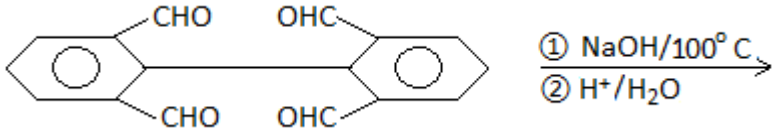
50% KOH

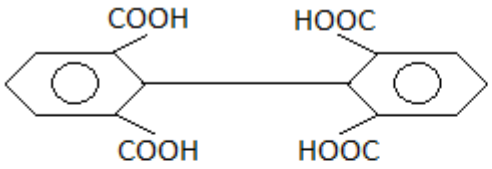
(a) 

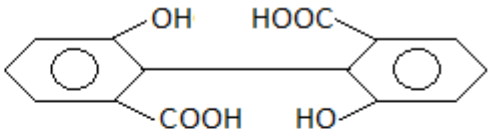
(b) 

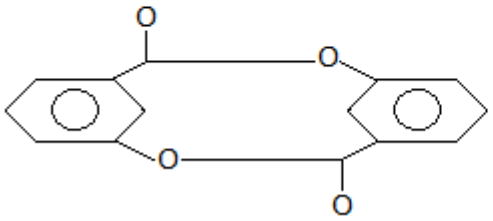
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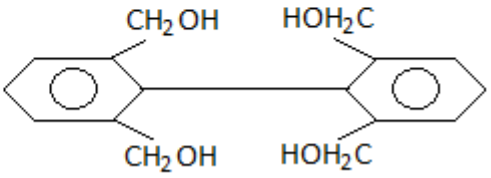
(d) 

6. 

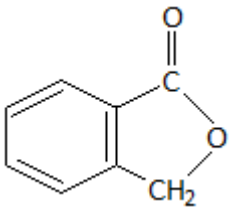
(a) 

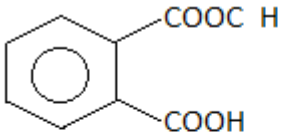
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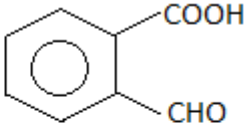
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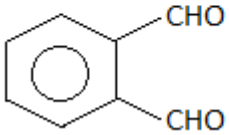
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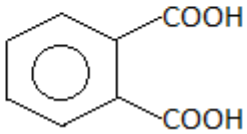
7. Which of the following reactants on reaction with concentrated NaOH followed by acidijication gives the following lactone as the product?



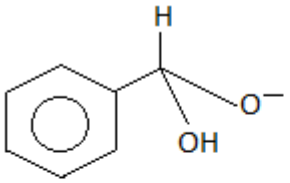
(a) 

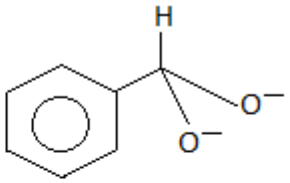
(b) 

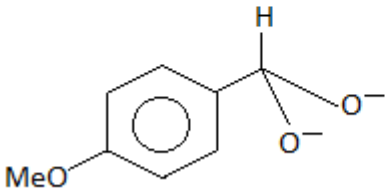
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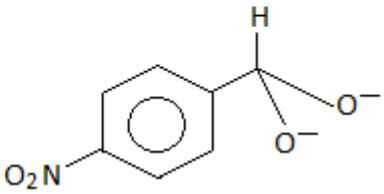
(d) 

8. In cannizaro reaction, the intermediates that will be best hydride donor is

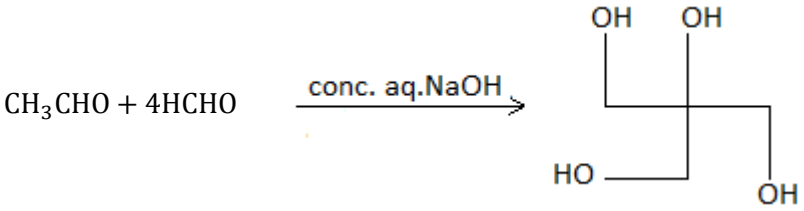
(a) 

(b) 

(c) 

(d) 

9. The number of aldol reaction(s) that occur in the given transformation is



(a) 1 (b) 2 (c) 3 (d) 4

10. Acetal dehyde reacts with malonic acid in the presence of sodium ethoxide at high temperature gives

(a) acetic acid (b) propanoic acid (c) tartaric acid (d) crotonic acid

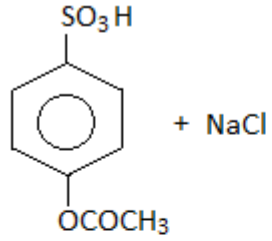
ANSWER KEYS

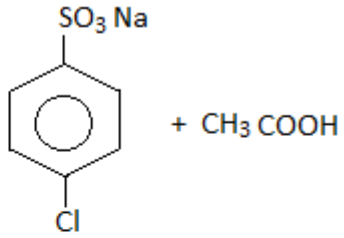
1	2	3	4	5	6	7	8	9	10
c	c	a	c	c	b	c	d	c	d

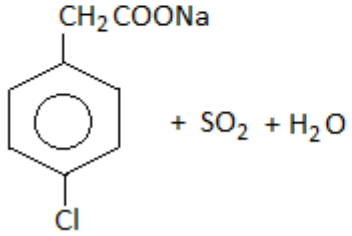
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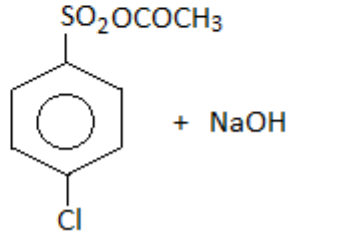
CARBOXYLIC ACIDS AND THEIR DERIVATIVES

1. Which of the following is obtained when 4 chloro benzene sulphonic acid is treated with excess sodium acetate?

(a) 

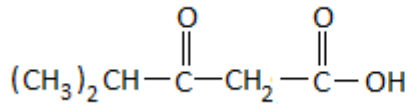
(b) 

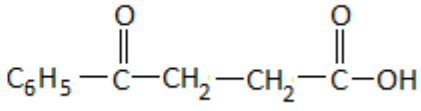
(c) 

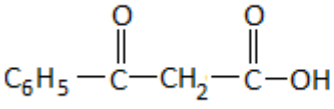
(d) 

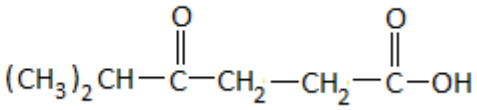
2. When acetic acid is treated with aqueous sodium bicarbonate, CO_2 gas is evolved. The "Carbon" of CO_2 comes from
   (a) carboxyl group (b) methyl group
   (c) bicarbonate (d) both carbonyl group and bicarbonate

3. A carboxylic acid gives a ketone on heating through formation of a cyclic transition state. The ketone formed gives yellow precipitate with I_2 and NaOH and does not give addition product with $NaHSO_3$. The acid is

(a) 

(b) 

(c) 

(d) 

4. Arrange the following in the increasing rate of hydrolysis

$CH_3CH_2CONH_2$	$CH_3CH_2COOC_3H_7$	$(C_2H_5CO)_2O$	C_2H_5COCl
A	*B*	*C*	*D*

(a) A < C < B < D (b) C < D < A < B (c) A < B < C < D (d) C < A < D < B

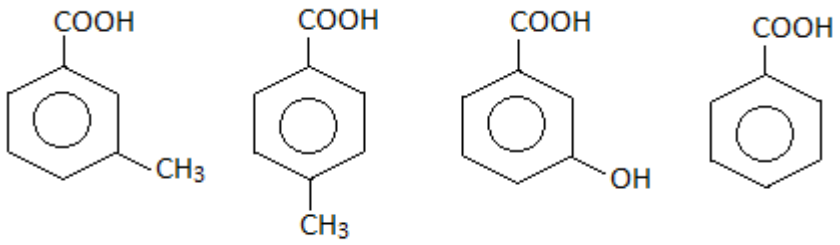
5. $C_2H_5CH = CHCHO \longrightarrow C_2H_5CH = CHCOOH$. The best oxidizing agent that can be used for the above conversion is

(a) acidified $KMnO_4$ solution (b) Tollen's reagent
(c) SeO_2 in ACOH (d) all the above

6. Even though a carboxylic acid contains diagram group, it does not form oxime with hydroxyl amine because

(a) NH_2OH is less reactive to carboxylic acids
(b) in this case NH_2OH acts as reducing agent and oxidized to HNO_2
(c) the >C = 0 group enters into resonance with lone pair of –OH group
(d) the –OH group of carboxylic acid reacts with NH_2OH

7. Arrange the following in the increasing acidity



A B C D

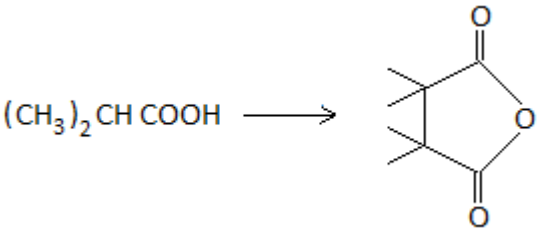
(a) A < D < B < C (b) A < C < B < D (c) C < D < A < B (d) B < A < D < C

8. $CH_3COOH \xrightarrow{LiAlH_4} A$

$A + CH_3COOH \xrightarrow{H_3O^+} B + H_2O$ 'A' and 'B' respectively are

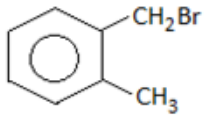
(a) $CH_3COOC_2H_5$, C_2H_5OH (b) CH_3CHO, C_2H_5OH
(c) C_2H_5OH, CH_3CHO (d) C_2H_5OH, $CH_3COOC_2H_5$

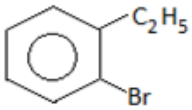
9. The correct set of reagents for the following conversion is

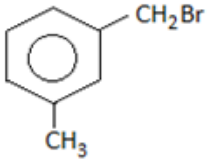


(a) P_4/I_2, Na, conc. H_2SO_4 (b) P_2O_5, $LiAlH_4$
(c) P_2O_5/Δ, H_2O, P_4/I_2, Na (d) P_4/I_2, P_2O_5/Δ

10. Compound (A) C_8H_9Br, gives light yellow precipitate when warmed with alcoholic $AgNO_3$. Oxidation of A gives an acid B. $C_8H_6O_4$(B) easily forms anhydride on heating Identify the compound A.

(a) 

(b) 

(c) 

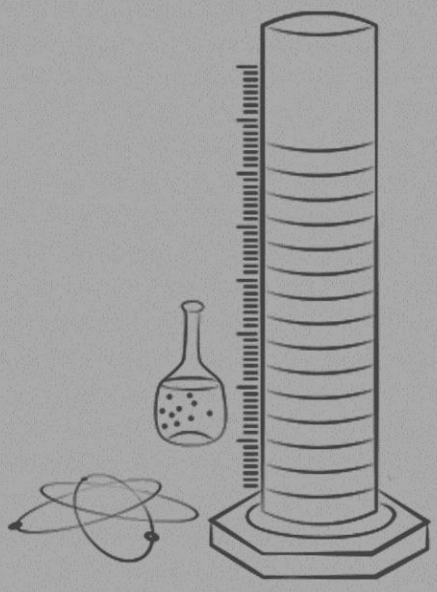
(d) None of the above

ANSWER KEYS

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
b	c	c	c	b	c	d	d	d	a

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Biomolecules Vitamins, Nucleic Acids & Proteins



CHEMISTRY

1. Which of the following is a ketohexose?
   (a) Fructose (b) Glucose (c) Ribose (d) Starch

2. Which of the following forms osazone with phenylhyrazine ?
   (a) Glucose (b) Fructose (c) Maltose (d) All the three above.

3. To covert glucose to saccharic acid the reagent used is
   (a) Bromine water (b) Fehling's solution
   (c) Nitric acid (d) Alkaline solution of Iodine.

4. Glucose reacts with CH_3OH is presence of dry HCl gas to form
   (a) ∝-methyl glucoside (b) β-methyl glucoside (c) Both 1 and 2 (d) none of the these

5. Equilibrium mixture of glucose consists
   (a) 50% ∝ and 50% β (b) 36% ∝ and 64% β
   (c) 64% ∝ and 36% β (d) 20% ∝ and 85% β

6. Which of the following molecules is capable of forming zwitter ion ?
   (a) NH_2 CH_2COOH (b) CH_3COOH (c) $CH_3CH_2NH_2$ (d) $CC1_3NO_2$

7. A sulphur containing amino acid is
   (a) Glycine (b) Alanine (c) Phenylalanine (d) valine

8. The most common reagent for qualitative and quantitative analysis of amino acids is
   (a) Ninhydrin reagent (b) Million's reagent
   (c) Sangar's reagent (d) Edmann's reagent

9. The number of amino acids in insulin is
   (a) 21 (b) 574 (c) 51 (d) 5733

10. Which of the following amino acids does not correspond to the general formula given below
    R-CH(NH_2)-COOH
    (a) Cysteine (b) Proline (c) Argenine (d) Isoleucine

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	d	c	c	b	a	b	a	c	b

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1. Which one of the following is synthesized is our body by sun rays ?
   (a) Vitamin D (b) Vitamin B (c) Vitamin K (d) Vitamin A

2. The disease pernicious anaemia is caused by the deficiency of vitamin
   (a) A (b) D (c) B_1 (d) B_{12}

3. The vitamin essential for synthesis of lipids is
   (a) Pantothenic acid (b) Pyridoxine (c) Retrinol (d) Biotin

4. No. Of hydrogen bonds present between G and C
   (a) 2 (b) 3 (c) 1 (d) 0

5. The RNA A/s which take part in the synthesis of proteins
   (a) m-RNS (b) r-RNA (c) t – RNA (d) All the three above

6. GC / AT ratio in E. coli is
   (a) Parallel (b) Anti parallel (c) Perpendicular (d) Any direction

7. The deficiency of vitamin K cause
   (a) Haemorrhage (b) Lengthening time of blood clotting
   (c) Inflammation of tunge (d) both (a) & (b)

8. The vitamin which is water soluble and antioxidant is
   (a) Vitamin B_6 (b) Vitamin B_{12} (c) Vitmin C (d) Vitamin E

9. The secondary structure of a protein refers to
   (a) $\propto$ - helical back bone (b) hydrophobic integrations
   (c) Sequence of $\propto$ - amino acids (d) fixed configuration of the polypeptide back

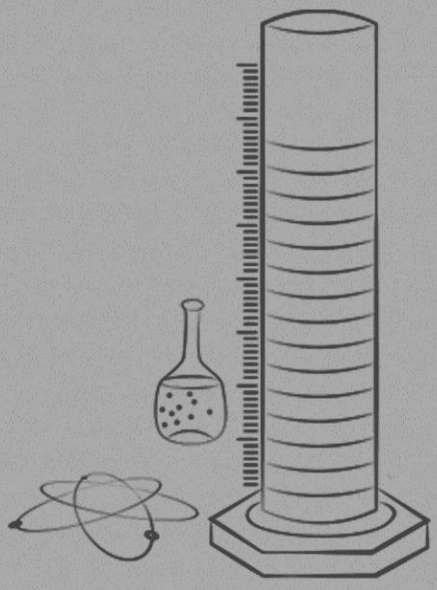
10. The relationship between the nucleotide triplets and the amino acids is called
    (a) Translation (b) Transcription (c) Replication (d) A genetic code

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	d	d	b	d	b	d	c	a	d

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Chemical Kinetics

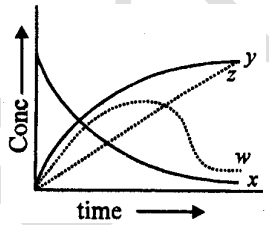


CHEMISTRY

1. For the reaction $A \rightarrow B + 2C$
   (a) Rate of formation of B = Rate of formation of C
   (b) Rate of formation of C = Double the rate of disappearance of A
   (c) Rate of formation of C = Half the rate of disappearance of A
   (d) Rate of formation of C = Rate of disappearance of A

2. For the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ under certain conditions of temperature and partial pressure of the reactants, the rate of formation of NH_3 is 0.001 kg h^{-1}. The rate of conversion of H_2 under same conditions is:
   (a) 0.0015 kg h^{-1} (b) 1.76 x 10^{-4} kg h^{-1} (c) 0.002 kg h^{-1} (d) 0.003 kg h^{-1}

3. For the reaction, $A + B \rightarrow C + D$. The variation of the concentration of the products with time is given by the curve:
   (a) X (b) Y (c) Z (d) W



4. For the reaction,
   $N_2O_5 \rightarrow 2NO_2 + O_2$; Given
   $$-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$$
   $$\frac{d[NO_2]}{dt} = K_2[N_2O_5] \text{ and } \frac{d[O_2]}{dt} = K_3[N_2O_5]$$
   The relation in between K_1, K_2 and K_3 is:
   (a) $2K_1 = K_2 = 4K_3$ (b) $K_1 = K_2 = K_3$ (c) $2K_1 = 4K_2 = K_3$ (d) None of these

5. In a gaseous phase reaction,
   $A_2(g) \rightarrow B(g) + (1/2)\, C(g)$, the increase in pressure from 100 mm to 120 mm is noticed in 5 minute.
   The rate of disappearance of A_2 in mm min^{-1} is:
   (a) 4 (b) 8 (c) 16 (d) 2

6. The differential rate law for the reaction:
   $H_2 + I_2 \rightleftharpoons 2HI$ is:
   (a) $\frac{-d[H_2]}{dt} = \frac{-d[I_2]}{dt} = \frac{-d[HI]}{dt}$
   (b) $\frac{dH_2}{dt} = \frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$
   (c) $\frac{1}{2}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[I_2]}{dt} = \frac{-d[HI]}{dt}$
   (d) $-2\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$

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7. The rate constant for the reaction:

$2N_2O_5 \rightarrow 4NO_2 + O_2$ is 3.0×10^{-5} sec^{-1}. If the rate is 2.40×10^{-5} M sec^{-1}, then the concentration of N_2O_5 (in M) is:

(a) 1.4 (b) 1.2 (c) 0.04 (d) 0.8

8. Consider the chemical reaction:

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$. The rate of this reaction can be expressed in terms of $N_{2(g)}$, $H_{2(g)}$ and $NH_{3(g)}$ as:

(a) Rate = $\frac{-d[N_2]}{dt} = \frac{-1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(b) Rate = $\frac{-d[N_2]}{dt} = \frac{3d[H_2]}{dt} = \frac{2d[NH_3]}{dt}$

(c) Rate = $\frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(d) Rate = $\frac{-d[N_2]}{dt} = \frac{-d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

9. In a reaction of nth order, the half life period is related to initial concentration C_0 by

(a) $t_{1/2} \propto \frac{1}{C_o^n}$ (b) $t_{1/2} \propto \frac{1}{C_0^{n-1}}$ (c) $t_{1/2} \propto C_0^{n-1}$ (d) $\frac{0.693}{C_o^n}$

10. The value of activation energy can be evaluated from the plot of

(a) k vs T (b) 1/k vs T (c) log k vs 1/T (d)logkvs

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	b	b	a	b	d	d	a	d	b

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1. For an endothermic reaction, where ΔH represents the enthalpy of the reaction in kJ/mol the minimum value of the activation energy would be
   (a) Less than ΔH (b) zero
   (c) greater than ΔH (d) equal to ΔH

2. If the initial concentration is doubled, the time for half of the reaction is also doubled. The order of reaction is
   (a) Zero (b) first (c) second (d) third

3. The statement which is wrong for a first order reaction
   (a) Plot of log(a/(a - x) vs 't' is straight line passing through origin
   (b) Plot of log(a - x) vs 't' is a straight line with decreasing slope
   (c) Plot of (a - x) vs 't' is a straight line
   (d) The half life is independent of the initial concentration of the reactant

4. The rate constant for a zero order reaction is 2×10^{-2} mol L^{-1} sec^{-1}. If the concentration of the reactant after 25 sec is 0.5 M, the initial concentration must have been:
   (a) 0.5 M (b) 1.25 M (c) 12.5 M (d) 1.0 M

5. Two first order reactions have half lives in the ratio 3 : 2. Calculate the ratio of time intervals t_1 : t_2. The time t_1 and t_2 are the time period for 25% and 75% completion for the first and second reaction respectively.
   (a) 0.311 : 1 (b) 0.420 : 1 (c) 0.273 : 1 (d) 0.119 : 1

6. For the reaction:
   $[Cu(NH_3)_4]^{2+} + H_2O \rightleftharpoons [Cu(NH_3)_3H_2O]^{2+} + NH_3$
   The net rate of reaction at any time is given by : net rate
   $= 2.0 \times 10^{-4} [[Cu(NH_3)_4]^{2+}] [H_2O] - 3.0 \times 10^5$
   $[[Cu(NH_3)_3 H_2O]^{2+}] [NH_3]$. Then correct statement is (are):
   (a) Rate constant for forward reaction = 2×10^{-4}
   (b) Rate constant for backward reaction = 3×10^5
   (c) Equilibrium constant for the reaction = 6.6×10^{-10}
   (d) All of these

7. Two reactions, A $\rightarrow$ products and B $\rightarrow$ products have rate constant K_A and K_B at temperature T and activation energies E_A and E_B respectively. If $K_A > K_B$ and $E_A < E_B$ and assuming that A for both the reactions is same then:
   (a) At higher temperatures K_A will be greater than K_B
   (b) At lower temperature K_A and K_B will differ more and $K_A > K_B$
   (c) As temperature rises K_A and K_B will be close to each other in magnitude
   (d) All of these

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8. A reaction, $A_2 + B_2 \rightarrow 2AB$ occurs by the following mechanism:

$A_2 \rightarrow A + A$ ..... (slow)

$A + B_2 \rightarrow AB + B$ ..... (fast)

$A + B \rightarrow AB$ ..... (fast)

Its order would be:

(a) 3/2 (b) 1 (c) zero (d) 2

9. When ethyl acetate was hydrolysed in presence of 0.1 N HCl, the rate constant was found to be 5.40×10^{-5} sec^{-1}. But when 0.1 N H_2SO_4 was used for hydrolysis, the rate constant was found to be 6.25×10^{-5} sec^{-1}. Thus it may be concluded that:

(a) H_2SO_4 is stronger than HCl

(b) H_2SO_4 is weaker than HCl

(c) H_2SO_4 and HCl both have the same strength

(d) The data are not sufficient to compare the strength of H_2SO_4 and HCl

10. The activation energy for a reaction is 9.0 kcal/mol. The increase in the rate constant when its temperature is increased from 298 K to 308 K is:

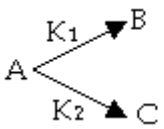
(a) 10% (b) 100% (c) 50% (d) 63%

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	a	d	d	a	d	d	b	a	d

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1. A substance undergoes first order decomposition. The decomposition follows two parallel first order reaction as:



and $K_1 = 1.26 \times 10^{-4}$ sec^{-1}

$K_2 = 3.80 \times 10^{-5}$ sec^{-1}

The percentage distribution of B and C are:

(a) 80% B and 20% C (b) 76.83% B and 23.17% C

(c) 90% B and 10% C (d) 60% B and 40% C

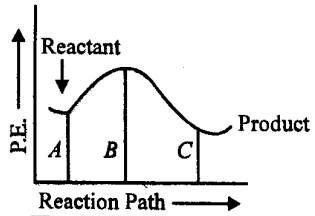
2. With respect to the figure given below which of the following statement is correct:

(a) E_a for the forward reaction is C – B

(b) E_a for the forward reaction is B – A

(c) E_a (forward) > E_a (backward)

(d) E_a (for reverse reaction) = C – A



3. For the reaction,

$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$ the rate expression can be written in the following ways:

$$\frac{d[N_2]}{dt} = k_1[NO][H_2]; \frac{d[H_2O]}{dt} = k[NO][H_2]$$

$$-\frac{d[NO]}{dt} = k'_1[NO][H_2]; -\frac{d[H_2]}{dt} = k''_1[NO][H_2]$$

The relationship between k, k_1, k'_1 and k''_1 is:

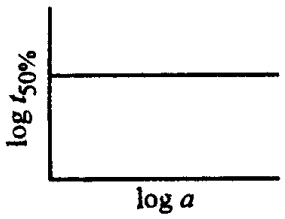
(a) $k = k_1 = k'_1 = k''_1$ (b) $k = 2k_1 = k'_1 = k''_1$

(c) $k = 2k'_1 = k_1 = k''_1$ (d) $k = k_1 = k'_1 = 2k''_1$

4. A graph plotted between log $t_{50\%}$ *vs.* log concentration is a straight line. What conclusion can you draw from this graph:

(a) n = 1 : $t_{1/2} = \frac{1}{x \times a}$ (b) n = 2: $t_{1/2} = \frac{1}{a}$

(c) n = 1 : $t_{1/2} = \frac{0.693}{k}$ (d) None of these



5. In a first order reaction, the concentration of the reactant decreases from 0.8 M to 0.4 M minute. The time taken for the concentration to change from 0.1 M to 0.0125 M is:

(a) 60 minute (b) 45 minute (c) 7.5 minute (d) 30 minute

(e) Rate of formation of C is twice the rate of disappearance of A

6. A reaction involving two different reactants can never be:
   (a) Unimolecular reaction (b) I order reaction
   (c) II order reaction (d) Bi molecular reaction

7. The rate constant, the energy of activation and the Arrhenius parameter of a chemical reactions at 25^0C are 3.0×10^{-4} sec^{-1}, 104.4 kJ mol^{-1} and 6.0×10^{14} sec^{-1} respectively. The value of rate constant as $T \rightarrow \infty$ is:
   (a) 2.0×10^{18} sec^{-1} (b) 6.0×10^{14} sec^{-1} (c) Infinity (d) 3.6×10^{30} sec^{-1}

8. The reaction: $X \rightarrow$ Product follows first order kinetic. In 40 minutes, the concentration of X changes from 0.1 M to 0.025 M, then rate of reaction when concentration of X is 0.01 M is:
   (a) 1.73×10^{-4} M/min (b) 3.47×10^{-5} M/min
   (c) 3.47×10^{-4} M/min (d) 1.73×10^{-5} M/min

9. The rate law of a reaction, $A + B \rightarrow$ Product is rate = $K[A]^n[B]^m$. On doubling the concentration of A and halving the concentration of B, the ratio of new rate to the earlier rate of reaction will be:
   (a) n – m (b) 2^{n-m} (c) $\frac{1}{2^{m+n}}$ (d) m + n

10. In a first order reaction, the concentration of the reactant decreases from 0.8 M to 0.4 M in 15 minute. The time taken for the concentration to change from 0.1 M to 0.025 M is:
   (a) 60 minute (b) 15 minute (c) 7.5 minute (d)30 minute

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
b	b	b	c	b	a	b	c	b	d

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1. The half-life of a first order reaction A → B + C is 10 minutes. The concentration of A would be reduced to 10% of the original concentration in
(a) 10 minutes (b) 90 minutes (c) 33 minutes (d) 70 minutes

2. What will be amount of X($t_{1/2}$ = 25 minutes) left after 50 minutes in the reaction X → Y
(a) 1/2 (b) 1/3 (c) 1/4 (d) 1/10

3. The rate equation for a hypothetical reaction is rate = $k[A]^2[B]^3$. How many times the rate of the reaction is increased if the concentrations of both A and B are doubled
(a) 4 (b) 9 (c) 32 (d) 13

4. The rate constant for a first order reaction is 1×10^{-2} s^{-1}. The concentration of the reactants would be reduced from 1 mole to 0.25 mole in
(a) 10^2 s (b) 69.3 s (c) 0.5×10^2 s (d) 138.6 s

5. The rate of the reaction A + B + C → P is given by $r = -\frac{d[A]}{dt} = k[A]^{1/2}[B]^{1/2}[C]^{1/2}$. The order of reaction is
(a) 1 (b) 2½ (c) 1/2 (d) 1½

6. For the exothermic reaction A + B → C + D; ΔH is the heat of reaction and E_a is the activation energy. The activation energy for the formation of A + B will be
(a) E_a (b) ΔH (c) E_a + ΔH (d) ΔH – E_a

7. The reaction A + 2B → 2C has the rate law, rate = k[A] [B]. Which of the following is an appropriate rate determining step?
(a) A + 2B → C (b) A + C → D (c) A + B → E (d) 2A → C + D

8. The half life of a first order reaction is 2 hours. The time required for the completion of 99.9% of the reaction is
(a) 5 hours (b) 10 hours (c) 20 hours (d) 40 hours

9. **Assertion (A):** Rate of chemical reaction depends on the nature of reactants.
Reason (R) : Different reactants involve different types of bond rearrangements.
(a) both **A** and **R** are true and **R** is the correct explanation of **A**
(b) both **A** and **R** are true but **R** is not the correct explanation of **A**
(c) **A** is true but **R** is false
(d) **A** is false but **R** is true

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10. In the formation of NH_3 by Haber's process $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of appearance of NH_3 was measured as 2.50^{-4} mol litre^{-1} s^{-1}. The rate of disappearance of H_2 will be

(a) 2.5×10^{-4} mol litre^{-1} s^{-1} (b) 3.75×10^{-4} mol litre^{-1} s^{-1}

(c) 1.25×10^{-4} mol litre^{-1} s^{-1} (d) 5×10^{-4} mol litre^{-1} s^{-1}

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
c	c	c	d	d	c	c	c	a	b

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1. The correct statements from the following are
   i) The units of rate and rate constant are same for zero order reactions
   ii) Rate of zero order reaction is independent of concentration of reactants
   iii) Catalyst affects the value of first order rate constant
   iv) Rate of reaction is independent of concentration of reactant if present in excess
   (a) i, ii, iii (b) ii, iii, iv (c) i, ii, iv (d) i, ii, iii, iv

2. If the rate of the reaction is equal to the rate constant, the order of the reaction is
   (a) 1 (b) 2 (c) 3 (d) 0

3. For a first order reaction, frequency factor A in the equation $K = Ae^{-Ea/RT}$ will have units of
   (a) mol litre^{-1}second^{-1} (b) second^{-1} (c) mol^{-1} litre second^{-1} (d) mole^{-2} litre^{2} second^{-1}

4. The time needed for the disintegration of 50% of a radioactive nuclide is 5 minutes. What is the time (in seconds) needed for 99.9% disintegration of that radioactive nuclide?
   (a) 50 (b) 0.5 (c) 3000 (d) 3.33

5. In the reaction A $\rightarrow$ B, average energy of reactants is 10 kcal/mole and average energy of products is 5 kcal/mole. Then which of the following is true for that reaction ?
   (a) it is endothermic (b) its threshold energy is 20 cal
   (c) its ΔH is -5 kcal (d) its threshold energy is 15 kcal

6. The rate constant is equal to rate of reaction when molar concentration of reactants is equal to
   (a) unity (b) may have any value (c) zero (d) two

7. The rate of following chemical reactions increases with increase of temperature
   (a) exothermic reaction only (b) endothermic reaction only
   (c) first order reaction only (d) for any type of chemical reaction

8. The units of rate of reaction are
   (a) mol litre^{-1} (b) litre mol^{-1} s^{-1} (c) mol litre s^{-1} (d) mol litre^{-1} s^{-1}

9. For the reaction $A \rightarrow 2B + \frac{1}{2}C$, $\frac{-d[A]}{dt} = K_1(A); \frac{d[B]}{dt} = K_2(A); \frac{d][C]}{dt} = K_3[A)$. Then
   (a) $2K_1 = K_2 = 4K_3$ (b) $K_1 = K_2 = K_3$ (c) $2K_1 = 4K_2 = K_3$ (d) $K_1 = 2K_2 = 3K_3$

10. The minimum amount of energy that the reacting molecules must posses at the time of collisions in order to produce effective collisions is called
    (a) activation energy (b) threshold energy (c) internal energy (d) free energy

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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	d	b	c	c	a	d	d	a	b

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1. In the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of the reaction with respect to hydrogen is 2.4×10^{-2} moles/litre.sec. The rate of the reaction with respect to ammonia is
   (a) 2.4×10^{-2} moles/litre.sec (b) 1.6×10^{-2} moles/litre.sec
   (c) 4.8×10^{-3} moles/litre.sec (d) 3.2×10^{-2} moles/litre.sec

2. In a catalytic conversion of N_2 to NH_3 by Haber's process, the rate of reaction was expressed as change in the concentration of ammonia per unit time is 40×10^{-3} mol litre^{-1} s^{-1}. If there are no side reactions, the rate of disappearance of hydrogen is
   (a) 60×10^{-3} mol litre^{-1} s^{-1} (b) 20×10^{-3} mol litre^{-1} s^{-1}
   (c) 1200 mol litre^{-1} s^{-1} (d) 10.3×10^{-3} mol litre^{-1} s^{-1}

3. If reaction obeys the equation $k = \frac{2.303}{t}\log\frac{a}{a-x}$, the order of the reaction will be
   (a) zero (b) first (c) second (d) third

4. If the unit of velocity constant is litre mol^{-1} s^{-1}, the order of the reaction will be
   (a) 3 (b) 2 (c) 1 (d) 0

5. The units of a rate of reaction of second order is
   (a) mole^{-1} litre second^{-1} (b) mole^{2} litre^{-2} second^{-1}
   (c) mole^{-2} litre^{2} second^{-1} (d) mole litre^{-1} second^{-1}

6. How will the rate of reaction, $2SO_2 + O_2 \rightleftharpoons 2SO_3$ change if the volume of the reaction vessel is doubled. It will be
   (a) one fourth of its initial value (b) one eighth of its initial value
   (c) four times of its initial value (d) eight times of its initial value

7. Choose the correct statement from the following
   (a) order and molecularity is the same for $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$
   (b) molecularity of a reaction may be zero
   (c) order of reaction never be zero
   (d) molecularity of a reaction can't be negative but it may be fractional

8. The rate of a reaction is doubled for every 10°C rise in temperature. The increase in reaction rate as a result of temperature rise from 30°C to 80°C is
   (a) 112 (b) 32 (c) 400 (d) 614

9. The rate constants at 27°C and 127°C are 10^{-4} and 10^{-2} respectively. Then the activation energy of the reaction is approximately.
   (a) 110 kcal (b) 11 kcal (c) 1.1 kcal (d) 0.11 kcal

10. The half life for a given reaction was doubled as the initial concentration of the reactant was doubled. The order of the reaction is
    (a) 0 (b) 1 (c) 2 (d)

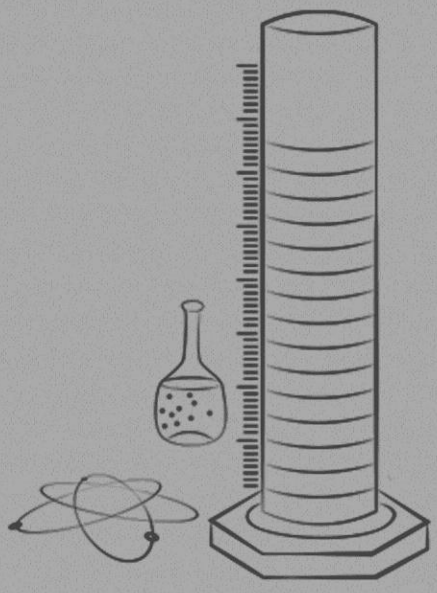
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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	a	b	b	d	b	a	b	b	a

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Chemistry In Everyday Life



CHEMISTRY

1. Which of the following is not used as an antacid ?
   (a) Magnesium hydroxide (b) Sodium carbonate
   (c) Sodium bicarbonate (d) Aluminium phosphate

2. Which of the following is not a tranquilizer ?
   (a) Luminal (b) Seconal (c) valium (d) alitame

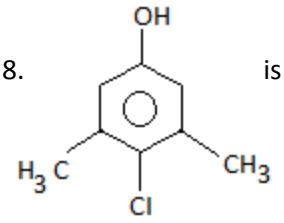
3. Paracetamol is
   (a) Both antipyretic and analgesic (b) Analgesic (c) Antipyretic (d) Antimalarial

4. Dilute solution of boric acid used as
   (a) Antiseptic (b) Disinfectant (c) Antipyretic (d) Analgesic

5. In the following which is 550 times sweeter than cane sugar
   (a) Saccharin (b) Aspartam (c) Alitame (d) Sucrose

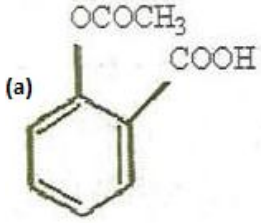
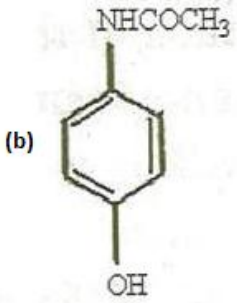
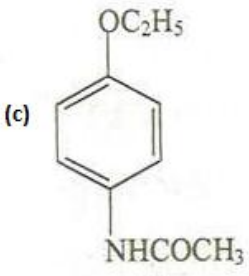
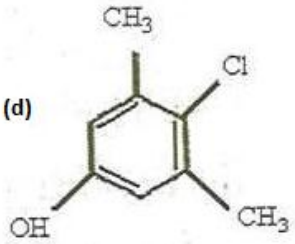
6. Chloramphenicol is used as an
   (a) analgesic (b) antibiotic (c) anaesthetic (d) antiseptic

7. The most commonly used food preservative is
   (a) sodium cyclamate (b) sodium benzoate (c) sodium acetate (d) vanillin

8.  is present in

(a) Dettol (b) Pencillin (c) Dyes (d) Antifertility drugs

9. The structure of phenacetin is

(a) 
(b) 
(c) 
(d) 

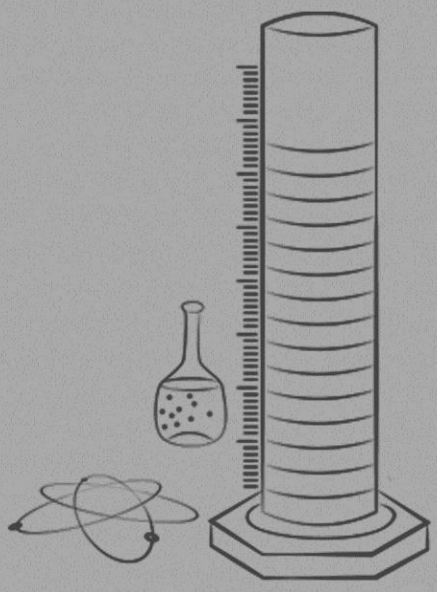
10. An example for anionic detergent is
   (a) NaLS (b) CTAB (c) Trimethyl phosphate (d) All

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
b	d	a	a	a	b	b	a	c	a

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Coordination Compounds



CHEMISTRY

1. The common features among the species CN^-, CO and NO^+ are:
   (a) Bond order three and diamagnetic (b) Bond order three and weak field ligands
   (c) Paramagnetic and strong field ligands (d) Paramagnetic and π – acceptor ligands

2. $[PdCl_2(PMe_3)_2]$ is a diamagnetic complex of Pd (II). How many unpaired electrons are present in analogous complex of Ni (II)?
   (a) Zero (b) 1 (c) 2 (d) 3

3. If EAN of central metal cation M^{2+} in a non – chelating complex is 36 and atomic no. Of metal M is 26, then the number of monodentate ligand in this complex are:
   (a) 5 (b) 4 (c) 6 (d) none of these

4. Magnetic moment (spin only) of octahedron complex having CFSE= $-0.8\Delta_0$ and surrounded by weak field ligands can be:
   (a) $\sqrt{15}$ BM (b) $\sqrt{8}$ BM (c) (a) & (b) both (d) None of these

5. Which of the following is an oxidizing agent?
   (a) $Mn(CO)_5$ (b) $Fe(CO)_5$ (c) $Mn_2(CO)_{10}$ (d) $Fe_2(CO)_9$

6. An effective atomic number of $Co(CO)_4$ is 35 and hence is less stable. It attanins stability by:
   (a) Oxidation of Co (b) Reduction of Co
   (c) Dimerisation (d) Both (b) and (c)

7. Which of the following pairs of complexes are isomeric with each other but their aqueous solutions exhibit different molar conductivities?
   (a) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$
   (b) $[CoCl_2(NH_3)_4]NO_2$ and $[CoCl(NO_2)(NH_3)_4]Cl$
   (c) $[Co(NO_2)(NH_3)_5]Cl_2$ and $[Co(ONO)(NH_3)_5]Cl_2$
   (d) $[CoBr(NH_3)_5]SO_4$ and $[Co(SO_4)(NH_3)_5]Br$

8. A six coordinate complex of formula $CrCl_3.6H_2O$ has green colour. A 0.1 M solution of the complex when treated with excess of $AgNO_3$ gave 28.7g of white precipitate. The formula of the complex would be:
   (a) $[Cr(H_2O)_6)]Cl_3$ (b) $[CrCl(H_2O)_5]Cl_2\ H_2O$
   (c) $[CrCl_2(H_2O)_4]Cl\ 2H_2O$ (d) $[Cr(H_2O)_3Cl_3]$

9. The coordination number of a central metal atom in a complex is determined by:
   (a) the number of only anionic ligands bonded to the metal ion
   (b) the number of monodentate ligands around a metal ion bonded by pi-bonds
   (c) The coordination number is determined solely by the tendency to surround the metal atom with the same number of electrons as one of the rare gases
   (d) the number of monodentate ligands around a metal ion bonded by sigma-bonds

10. Which of the following pair the EAN of central metal atom is not same?
   (a) $[Fe(CN)_6]^{3-}$ and $[Fe(NH_3)_6]^{3+}$ (b) $[Cr(CN_3)_6]^{3+}$ and $[Cr(CN)_6]^{3-}$
   (c) $[FeF_6]^{3-}$ and $[Fe(CN_6)]^{3-}$ (d) $[Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$

ANSWER KEY

1.a	***2.c***	***3.c***	***4.c***	***5.a***	***6.d***	***7.d***	***8.b***	***9.d***	***10.d***

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1. Consider the following complex: $]Co(NH_3)_5CO_3]ClO_4$
The coordination number, oxidation number, no. of d-electrons and number of unpaired d-electrons on the metal are respectively:
(a) 6,2,7,3 (b) 7,2,7,1 (c) 5,3,6,4 (d) 6,3,6,0

2. The correct name for the complex ion $[CoCl(ONO)(en)_2]^+$ is:
(a) chlorobis(ethylenediamine)nitrito - O - cobaltate (III) ion
(b) Chlorodiethyldiaminenitrito - O - cobalt (III) ion
(c) chloronitrito - O – diethyldiamine cobaltate (III) ion
(d) chlorobis(ethylenediamine) nitrito-O-cobalt (III) ion

3. Consider the following complex: $[Co(CO_3)(NH_3)_5]ClO_4$
Mark the correct option:

	Coordination No.	***Oxidation No.***	***No. Of d-electrons***	***Unpaired d-electrons***
(a)	*6*	*3*	*6*	*0*
(b)	*7*	*2*	*7*	*1*
(c)	*7*	*1*	*6*	*4*
(d)	*6*	*2*	*7*	*3*

4. In the isoelectronic series of metal carbonyl, the CO bond strength is expected to increase in the order:
(a) $[Mn(CO)_6]^+ < [Cr(CO)_6] < [V(CO)_6]^-$ (b) $[V(CO)_6]^- < [Cr(CO)_6] < [Mn(CO)_6]^+$
(c) $[V(CO)_6]^- < [Mn(CO)_6]^+ < [Cr(CO)_6]$ (d) $[Cr(CO)_6] < [Mn(CO)_6]^+ < [V(CO)_6]^-$

5. Which is not true about metal carbonyls?
(a) Here CO acts as a Lewis base as well as Lewis acid
(b) Here metal acts as Lewis base as well as Lewis acid
(c) Here dπ-pπ back bonding takes place
(d) Here pπ-pπ back bonding takes place

6. Which of the following pair the EAN of central metal atom is not same?
(a) $[Fe(CN)_6]^{3-}$ and $[Fe(NH_3)_6]^{3+}$ (b) $[Cr(NH_3)_6]^{3+}$ and $[Cr(CN)_6]^{3-}$
(c) $[FeF_6]^{3-}$ and $[Fe(CN_6)]^{3-}$ (d) $[Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$

7. IUPAC name of $[Fe(O_2)(CN)_4Cl]^{4-}$ is :
(a) Chlorotetracyano dioxoferrate (II) ion (b) Chlorotetracyano peroxoferrate (II)ion
(c) Chlorotetracyano superoxoferrate (II)ion (d) Tetracyanochloro superoxoferrate (II)ion

8. The IUPAC name of the Wilkinson's catalyst $[RhCl(P\ Ph_3)_3]$ is
(a) Chlorotris (triphenylphosphine) rhodium (I)
(b) Chlorotris (triphenylphosphine) rhodium (IV)
(c) Chlorotris (triphenylphosphine) rhodium(0)
(d) Chlorotris (triphenylphosphine) rhodium(VI)

9. The correct formula of diammine dichlorodicyano chromate (III) is:
(a) $[CrCl_2(CN)_2(NH_3)_2]^{3+}$ (b) $[CrCl_2(CN)_2(NH_3)_2]^{3-}$ (c) $[CrCl_2(CN)_2(NH_3)_2]$ (d) $[CrCl_2(CN)_2(NH_3)_2]^-$

10. The IUPAC name for $K_2[Cr(CN)_2O_2(O_2)NH_3]$ is:
    (a) Potassium amminedicyanotetraoxo chromium (III)
    (b) Potassium amminedicyanodioxygendioxo chromate(IV)
    (c) Potassium amminedicyanosuperoxoperoxo chromate (III)
    (d) Potassium amminedicyanodioxoperoxo chromate (VI)

ANSWER KEY

1.d	***2.d***	***3.a***	***4.b***	***5.d***	***6.d***	***7.c***	***8.a***	***9.d***	***10.d***

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1. IUPAC name of $H_2[PtCl_6]$ is:
   (a) hydrogen hexachloroplatinate (IV) (b) dihydrogen hexachloroplatinate (IV)
   (c) hydrogen hexachloroplatinic (IV) acid (d) hexachloroplatinic (IV) acid.

2. The IUPAC name for $[PtCl(NH_2CH_3)(NH_3)_2]Cl$ is:
   (a) diamminechloro (methylamine) platinum (II) chloride
   (b) (dimethylamine) chlorodiamminoplatinum (II) chloride
   (c) bis(ammine) chloro (methylamine) palatinate (II) chloride
   (d) diaminechloro(methylamine) platinum (II) chloride

3. The IUPAC nomenclature for the complex $Na[PtBrCl(NO_2)(NH_3)]$ is :
   (a) Sodium amminechlorobromonitro-N-platinum(II)
   (b) Sodium nitrochlorobromoammine-N-platinate(II)
   (c) Sodium amminebromochloronitro-N-platinate(II)
   (d) Sodium amminebromochloronitro-N-Platinum(II)

4. The IUPAC name of $Xe[Pt\ F_6]$ is:
   (a) Hexafluoroplatinate (VI) xenon (b) Xenonhexafluoroplatinate (V)
   (c) Xenonhexafluoroplatinate (VI) (d) Xenoniumhexafluoroplatinum(V)

5. There are four complexes of Ni. Select the complex (es) which will be attracted by magnetic field:
   (I) $[Ni(CN)_4]^{2-}$ (II) $[NICl_4]^{2-}$ (III) $Ni(CO_4)$ (IV) $[Ni(H_2O)_6]^{2+}$
   (a) I only (b) IV only (c) II, III and IV (d) II and IV

6. The magnetic moments of complexes given below are in the order:
   (I)$[Ni(CO)_4]$ (II) $[Mn(CN)_6]^{4-}$ (III) $[Cr(NH_3)_6]^{3+}$ (IV) $[CoF_6]^{3-}$
   (a) I > II > III > IV (b) I < II < III < IV (c) IV > II > I > III (d) IV < II < I < III

7. Which is low spin complex?
   (a) $[Fe(CN_6)]^{3-}$ (b) $[Co(NO_2)_6]^{3-}$ (c) $[Mn(CN)_6]^{3-}$ (d) All of these

8. Which of the following are diamagnetic?
   (I) $K_4[Fe(CN)_6]$ (II) $K_3[Fe(CN)_6]$ (III) $K_3[Co(CN)_6]$ (IV) $K_2[Ni(CN)_4]$
   Select the correct answer using the codes given below:
   (a)I, II and IV (b) I, III and IV (c) II and III (d) I and IV

9. The spin magnetic moment of cobalt in $Hg(Co(SCN)_4]$ is:
   (a) $\sqrt{3}$ (b) $\sqrt{8}$ (c) $\sqrt{15}$ (d) $\sqrt{24}$

10. The species having tetrahedral shape is:
   (a) $[PdCl_4]^{2-}$ (b)$[Ni(CN)_4]^2$ (c) $[Pd(CN)_4]^{2-}$ (d)$[NiCl_4]^{2-}$

ANSWER KEY

1.d	***2.a***	***3.c***	***4.b***	***5.d***	***6.b***	***7.d***	***8.b***	***9.c***	***10.d***

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1. If E.A.N.of central metal cation M^{2+} in a non-chelating complex is 36 and atomic no. Of metal M is 26, then the number of monodentate ligand is in this complex are:
(a) 5 (b) 4 (c) 6 (d) None of these

2. Complex compound(s) having even number of space (stereo) isomers is/are:
(where AA-symmetrical bidentate ligand and a,b,c,d, e-monodentate ligands)
(a) $[M(AA)_2b_2]^{n\pm}$ (b) $[Ma_3b_3]^{n\pm}$ (c) $[Ma_3bcd]^{n\pm}$ (d) $[Ma_2bcde]^{n\pm}$

3. Select correct statement (s) regarding $[Ni(DMG)_2]$ complex compound:
(a) It acts as oxidising agent because Ni^{2+} cation is having E.A.N. 34.
(b) It is extra stabilized by hydrogen bonding
(c) It's IUPAC name is Bis (dimethylglyoximato) nickelate (II)
(d) It's ligand contains two different donar sites

4. The π-acid ligand which uses its d-orbital during synergic bonding in its complex compound.
(a) CN^- (b) PR_3 (c) NO (d) N_2

5. Consider the complex $[Co(NH_3)_4\ CO_3]ClO_4$, in which coordination number, oxidation number and number of d-electrons on the metal are respectively.
(a) 6,3,6 (b) 6,2,7 (c) 5,3,6 (d) 5,3,7

6. Select the correct code of TRUE and False for given statement:
(a) Peroxide ion as well as dioxygen molecule both are paramagnetic species
(b) In set of isomers, $[Cr(H_2O)_6]Cl_3$ and $[CrCl(H_2O)_5]Cl_2{\cdot}H_2O$, both compounds can easily loose water molecule on treatment with conc. H_2SO_4
(c) During transformation NO → NO^+ , bond length and magnetic lkbehaviour decreases
(d) An ether is more volatile than alcohol both having same molecular formula
(a) FFTT (b) FTFT (c) FTTT (d) TFFT

7. In which of the following complex ion the value of magnetic moment (spin only) is $\sqrt{3}$ BM and outer d-orbitals is used in hybridization.
(a) $[Mn(CN)_6]^{4-}$ (b) $[Fe(NH_3)_6]^{3+}$ (c) $[Co(CO)_4]$ (d) $[Cu(H_2O)_6]^{2+}$

8. The IR stretchin frequencies of free CO, and CO in $[V(CO)_6]^-$, $[Cr(CO)_6]^-$ and $[Mn(CO)_6]^-$ are 2143 cm^{-1}, 1860 cm^{-1} and 2000 cm^{-1} and 2090 cm^{-1}, respectively. Then correct statement about metal carbonyls is:
(a) 'C–O' bond is strongest in the cation and weakest in the anion.
(b) 'C–O' bond is weakest in the cation and strongest in the anion.
(c) 'C–O' bond is longer in the cation than in the anion.
(d) 'M–O' pi bonding is higher in the cation.

9. $[Mn(CO)_4NO]$ is diamagnetic because:
(a) Mn metal is diamagnetic in free state (b) Mn is in +1 oxidation state in this complex
(c) NO is present as positive ligand (d) All of these

10. The inner orbital complex which exhibits both geometrical as well as optical isomerism.
(a) $[Cr(en)_3]^{3+}$ (b) $[IrF_3(H_2O)_2(NH_3)]$ (c) $[NiCl_2(en)_2]$ (d) $[Co(CN)_2(ox)_2]^{3-}$

Solution Key:

1.c	***2.b***	***3.b***	***4.b***	***5.a***	***6.a***	***7.d***	***8.a***	***9.c***	***10.d***

1. The π – acid ligand which uses its d-orbital during synergic bonding in its complex compound:
   (a) NO^+ (b) PR_3 (c) C_6H_6 (d) CO

2. Select incorrect statement labout complex $[Cr(NO_2)(NH_3)_5][Zn(SCN)_4]$:
   (a) It shows co-ordination isomerism
   (b) It shows optical activity
   (c) It shows linkage isomerism
   (d) IUPAC name of the compound is pentaaminenitrito-N-chromium (III) tetrathiocyanato-S-zincate(II)

3. Find out correct IUPAC name of complex compound
   (a) Triamminetricyanidochromium (III) hexanitrito-N-irridate(III)
   (b) Pentaamminecyanidochromium (III) hexanitrito-N-irridium(III)
   (c) Hexanitrito-N-irridium(III) pentaamminecyanidochromate (II)
   (d) Pentaamminecyanidochromium (III) hexanitrito-n-irridate (III)

4. Correct sequence of CO bond order in given compounds is:
   (P) $Fe(CO)_5$ (Q) CO (R) $H_3B \leftarrow CO$ (S) $[Mn(CO)_5]^-$
   (a) P > R > S > Q (b) S > P > R > Q (c) q V S > P > R (d) R > Q > P > S

5. Which of the following species can act as reducing agent?
   (a) $[Co(CO)_4]^-$ (b) $Mn(CO)_6$ (c) $Mn(CO)_5$ (D) $Cr(CO)_6$

6. In which of the following complex ion the value of magnetic moment (spin only) is $\sqrt{3}$ B.M and outer d-orbitals is used in hybridization:
   (a) $[Fe(NH_3)_6]^{3+}$ (b) $[Mn(CN)_6]^{4-}$ (c) $[CuCl_5]^{2-}$ (d) $[Co(NH_3)_6]^{2+}$

7. Which of the following match is incorrect?

Complex compounds		Type of hybridization
(a) $[V(NH_3)_6]^{3+}$	:	d^2sp^3
(b) $[CrCl_3](NMe_3)_3]$	:	d^2sp^3
(c) $[Cu(CN)(NO_2)(NH_3)(py)]$	:	dsp^2
(d) $K_3[Co(ox)_3]$	:	sp^3d^2

8. Which of the following order of CFSE is incorrect?
   (a) $[Co(en)_3]^{3+} > [Co(NH_3)_6]^{3+} > [Co(H_2O)_6]^{3+}$ (b) $[PtCl_4]^{2-} > [PdCl_4]^{2-} > [NiCl_4]^{2-}$
   (c) $[Ni(DMG)_2] < [Ni(en)_2]^{2+}$ (d) $[Co(ox)_3]^{3-} < [Co(en)_3]^{3+}$

9. For which of the following d^n configuration of octahedral complexes, can not exist in both high spin and low spin forms:
   (I) d^3 (II) d^5 (III) d^6 (IV) d^8
   (a) I, II, & III (b) II, III & IV (c) I & IV (d) None of these

10. Which of the following complex compound exhibits geometrical isomerism?
    (a) $[Fe(DMG)_2]$ (b) $[Be(gly)_2]$ (c) [PdClBr(gly)] (d) $[Cd(NH_3)\ Cl(gly)]$

Solution Key:

1.b	***2.b***	***3.d***	***4.d***	***5.b***	***6.c***	***7.d***	***8.c***	***9.c***	***10.c***

1. Consider the following two reaction:

$Cd^{2+}(aq.) + 4CH_3NH_2 \xrightarrow{K_1}$ 'A', ΔG_1°

$Cd^{2+}(aq.) + 2H_2NCH_2CH_2NH_2 \xrightarrow{K_2}$ 'B', ΔG_2°

According to given information the correct statement (s) is/are:

(a) ΔG_2° is more negative than ΔG_1° (b) Compound 'A' is optically inactive

(c) Compound 'B' is optically active (d) Formation constant K_2 is greater than formation constant K_1

2. Complex compound $[Co(SCN)_2(NH_3)_4]Cl$ exhibits:

(a) Ionization isomerism (b) Geometrical isomerism (c) Optical isomerism (d) Linkage isomerism

3. Which of the following compound has/have effective atomic number equal to the atomic number of a noble gas?

(a) $K[Co(CO)_4]$ (b) $K_2[Fe(CO)_4]$ (c) $[Co(NH_3)_6]Cl_2$ (d) $[CoCl_3(H_2O)_3]$

4. Select correct statement (s) regarding octahedron complex having CFSE = $-1.2\Delta_0$.

(a) Compound is neither low spin nor high spin complex

(b) Type of hybridisation complex does not depend upon nature of ligands

(c) Magnetic moment of complex compounds is either $\sqrt{15}$ B.M. or $\sqrt{8}$ B.M.

(d) All are incorrect statements

5. Consider the following two carbonyl compounds

(i) $[Tc(CO)_6]^+$ and (ii) $[Nb(CO)_6]^-$

Select incorrect statement (s) for given carbonyl compounds.

(a) $[Tc(CO)_6]^+$ acts as reducing agent and $[Nb(CO)_6]^-$ acts as oxidizing agent

(b) $[Nb(Cl)_6]^-$ acts as reducing agent and $[Tc(CO)_6]^+$ acts as oxidizing agent

(c) "Nb—C" bond order in $[Nb(CO)_6]^-$ is greater than "Tc—C" bond order in $[Tc(CO)_6]^+$

(d) "CO" bond order is greater in $[Nb(CO)_6]^-$ than in $[Tc(CO)_6]^+$

6. Which of the following ligand (s) can act as π-acid ligand.?

(a) σ-cyclopentadienyl (b) π-Allyl (c) $B_3N_3H_6$ (d) π-cyclopentadienyl

7. Find out correct I.U. P. A. C name of complex compound.

(a) Pentaamminecyanidochromium (II) hexanitrito-N-irridate (III)

(b) Triamminetricyanidochromium (III) hexanitrito-N-irridate(III)

(c) Hexanitrito-N-irridium (III) pentaamminecyanidochromate (II)

(d) pentaamminecyanidochromium (III) hexanitrito-N-irridate (III)

8. Consider the following reactions of complex compounds A, B and C

(i) $CoCl_2Br \cdot 5NH_3$ + excess $Ag^+(aq.) \rightarrow 1AgCl(s)$

(Compound A)

(ii) $CoCl_2Br \cdot 5NH_3$ + excess $Ag^+(aq.) \rightarrow 2AgCl(s)$

(Compound B)

(iii) $CoCl_2Br \cdot 4NH_3$ + excess $Ag^+(aq.) \rightarrow 1AgCl(s)$

(Compound C)

Then according to the given information the correct statement (s) is/are:

(a) Compounds (A) and (B) are ionisation isomers

(b) Molar conductivity of compounds (A) and (B) are almost same

(c) Compounds (A), (B) and (C) do not exhibit geometrical isomerism

(d) Order of CFSE values : $\Delta_0(A) > \Delta_0(B) > \Delta_0(C) >$

9. Which complex species does/do not exhibit geometrical isomerism and only have two stereoisomers.
(a) $[Co(EDTA)]^{-}$ (b) $[PtBrCl(gly)]^{-}$ (c)$[Co(acac)_2(en)]^{+}$ (d) $[Pd(NO_2)(ox)(gly)]$

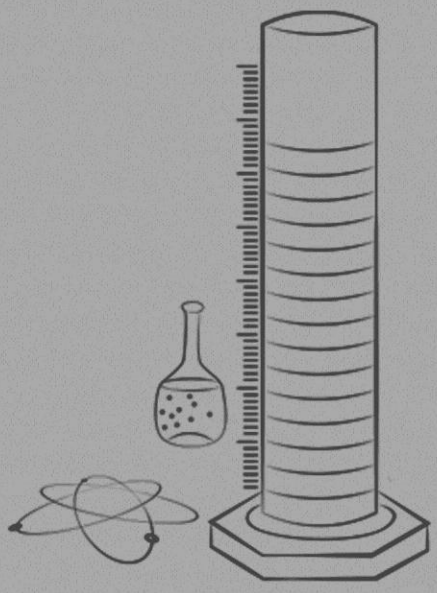
10. Which of the following complex (s) can not exhibit both geometrical and optical isomerism?
(a) $[Ru(en)_3]^{+3}$ (b) $[Co(H_2O)Cl_3]$ (c) $[PtBrCl(H_2O)NH_3]$ (d) $[FeBr_2(en)_2]^{+}$

Solution Key:

1.a,b,d	***2.a,b,d***	***3.a,b,d***	***4.a,b,c***	***5.a,b,d***	***6.a,b,c,d***	***7.ad***	***8.a,b,d***	***9.a,c***	***10.b***

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d & f Block Elements



CHEMISTRY

1. CrO_4^{2-} (yellow) changes to $Cr_2O_7^{2-}$ (orange in pH = x and vice – versa in pH = y. Hence, x and y are:
   (a) 6, 8 (b) 6, 5 (c) 8, 6 (d) 7, 7

2. Manganese ions (Mn^{2+}) can be Oxidised by Persulphate ions $S_2O_8^{2-}$ according to the following half – equaltions,
   $S_2o_8^{2-} + 2e^- \rightarrow 2SO_4^{2-}$
   $Mn^{2+} + 4H_2O \rightarrow MnO_4^- + 8H^+ + 5e^-$
   How many moles of $S_2O_8^{2-}$ are required to oxidise 1 mole of Mn^{2+}?
   (a) 2.5 (b) 2. (c) 11.0 (d) 0.4

3. AgCl on fusion with Na_2CO_3 forms:
   (a) Ag_2 CO_3 (b) Ag_2O (c) Ag (d) Ag_2C_2

4. Formula of Rust is:
   (a) Fe_2CO_3 (b) $FeO.xH_2O$ (c) $Fe_2O_3.xH_2o$ (d) $Fe_3O_4.xH_2o$

5. CrO_3 dissoloves in aqueous NaOH to give :
   (a) $Cr_2O_7^{2-}$ (b) CrO_4^{2-} (c) $Cr(OH)_3$ (d) $Cr(OH)_2$

6. Chemically philosopher of wool is:
   (a) ZnO (b) BaO (c) HgCl (d) Hg_2Cl_2

7. Boiling $CuCl_2$ with Cu in conc. HCl gives:
   (a) CuCl (b) $CuCl_2$ (c) $H[CuCl_2]$ (d) Cu_2Cl

8. Thermal decomposition of zinc nitrate give:
   (a) Zn (b) SnO (c) $Zn(NO_3)_2$ (d) NO

9. Malachite and azurite are used respectively are:
   (a) Blue and green pigment (b) Red and green pigment
   (c) Green and blue pigment (d) Green and red pigment

10. Mercury is transported in the containers made of:
    (a) Ag (b) Pb (c) Al (d) Fe

Solution Key:

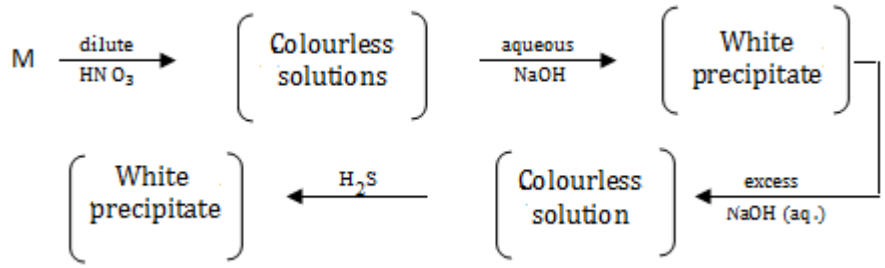
1.a	***2.a***	***3.c***	***4.c***	***5.b***	***6.a***	***7.a***	***8.b***	***9.c***	***10.d***

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1. Which of the following is called Wilkinson's catalyst?
   (a) $[Ph_3P)_3$ RhCl] (b) $TiCl_4+(C_2H_5)_3Al$
   (c) $(C_2H_5)_4$ Pb (d) $[PtCl_2(NH_3)_2]$

2. Which of the following is not a consequence of the Lanthanoid contraction?
   (a) 5d series elements have a higher IE_1 THAN 3D OR 4D SERIES
   (b) Zr and Hf have a comparable size
   (c) Zr and Hf occurs together in the earth crust in their minerals
   (d) High density of the sixth period elements

3. A metal M and its compound can give the following observable changes in a consequence ofreactions



   (a) Mg (b) Pb (c) Zn (d) Sn

4. Sodium thiosulphate is used to remove the unexposed AgBr from photographic films by forming a complex. In this complex of silver, the coordination number of silver is:
   (a) 2 (b) 4 (c) 6 (d) 8

5. Each of the following ion contains vanadium the +V oxidation state except:
   (a) VO_2^+ (b) $V(OH)_4^+$ (c) VO^{2+} (d) $[VO_3{\cdot}OH]^{2-}$

6. Mercury (II) chloride solution on reaction with gaseous ammonia forms:
   (a) $Hg(NH_2)Cl{\cdot}HgO$ (b) $Hg(NH_3)_2Cl_2$ (c) $[Hg(NH_3)_4]Cl_2$ (d) $[Hg(NH_3)_2]Cl$

7. Copper sulphate is prepared by blowing a current of air through copper scrap and dilute H_2SO_4. Dilute HNO_3 is also added:
   (a) to oxidise copper to Cu^{2+} which then form $CuSO_4$ with dilute H_2SO_4
   (b) to oxidise Fe^{2+} to iron (III) sulphate, which remains in solution after crystallisation of $CuSO_4$
   (c) to speed up the ionisation of H_2SO_4 to give SO_4^{2-} ions
   (d) which combines with H_2SO_4 to give a very strong oxidising mixture and oxidise Cu to Cu^{2+}

8. Which two sets of reactants best represent the amphoteric character of Zn $(OH)_2$?
   Set 1: $Zn(OH)_2$ (S) and OH^- (aq)
   Set 2: $Zn(OH)_2$ (S) and H_2O(l)
   Set 3: $Zn(OH)_2$ (S) and H^+ (aq)
   Set 4: $Zn(OH)_2$ (S) and NH_3(aq)
   (a) 1 and 2 (b) 1 and 3 (c) 2 and 4 (d) 3 and 4

9. The false statement about iron (III) hydroxide is that :
   (a) it is a weaker base than $Fe(OH)_2$
   (b) with concentrated KOH, it forms a complex $K_3=[Fe(OH)_6]$
   (c) it gradually loses water and transforms into Fe_2O_3
   (d) it exhibits amphoteric properties with its predominating acidic nature

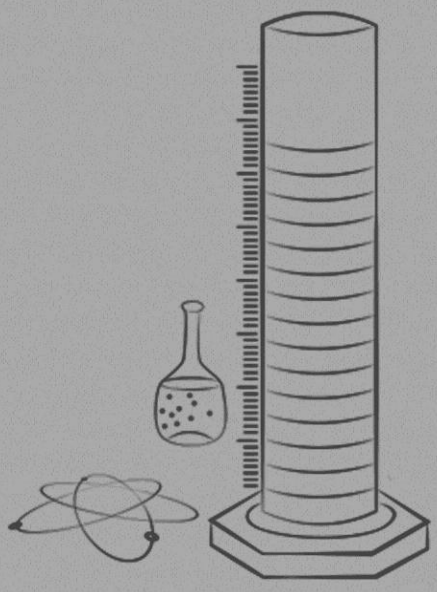
10. $AgNO_3 \xrightarrow{\Delta} (W) + (X)+O_2$
   $(X) + H_2O \longrightarrow HNO_2 + HNO_3$
   $(W) + HNO_3 \longrightarrow Y + NO + H_2O$
   $(Y) + Na_2S_2O_3(excess) \longrightarrow (Z) + NaNO_3$
   Identify (W) to (Z).
   (a) W = Ag X = N_2O Y = $AgNO_3$ Z = $Na_2[Ag(S_2O_3)_2]$
   (b) W = Ag_2O X = NO Y = $AgNO_3$ Z = $Na_3[Ag(S_2O_3)_2]$
   (c) W = Ag X = NO_2 Y = $AgNO_3$ Z = $Na_3[Ag(S_2O_3)_2]$
   (d) W = Ag_2O X = N_2 Y = $AgNO_3$ Z = $Na[Ag(S_2O_3)_2]$

Solution Key:

1.a	***2.d***	***3.c***	***4.b***	***5.c***	***6.a***	***7.a***	***8.b***	***9.b,d***	***10.c***

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Electrochemistry



CHEMISTRY

Electrolytes and Electrolysis

1. Which of the following does not conduct electricity
   (a) Fused NaCl (b) Solid NaCl (c) Brine Solution (d) Copper

2. When the sample of copper with zinc impurity is to be purified by electrolysis, the appropriate electrodes are

	Cathode	Anode
(a)	Pure zinc	Pure copper
(b)	Impure sample	Pure copper
(c)	Impure zinc	Impure sample
(d)	Pure copper	Impure sample

3. The electric conduction of a salt solution in water depends on the
   (a) Shape of its molecules (b) Size of its molecules
   (c) Size of solvent molecules (d) Extent of its ionization

4. Which of the following liberate hydrogen on reaction with dilute H_2SO_4
   (a) Fe (b) Cu (c) Al (d) Hg

5. On the electrolysis of aqueous solution of sodium sulphate, on cathode we get
   (a) Na (b) H_2 (c) SO_4 (d) SO_3

6. During the electrolysis of an electrolyte, the number of ions produced, is directly proportional to the
(a) Time consumed (b) Electro chemical equivalent of electrolysis
(c) Quantity of electricity passed (d) Mass of electrons

7. Which of the following compounds will not undergo decomposition on passing electricity through aqueous solution
   (a) Sugar (b) Sodium Chloride (c) Sodium Bromide (d) Sodium Acetate

8. Which of the following metal can be obtained by the electrolysis of the aqueous solutions of their salts
   (a) Cu (b) Na (c) Mg (d) K

9. Electrolytes when dissolved in water dissociates into ions because
   (a) They are unstable
   (b) The water dissolves it
   (c) The force is repulsion increases
   (d) The forces of electrostatic attraction are broken down by water

10. In a galvanic cell, the electrons flow from
   (a) Anode to cathode through the solution
   (b) Cathode to anode through the solution
   (c) Anode to cathode through the external circuit
   (d) Cathode to anode through the external circuit

1. B	***2. D***	***3. D***	***4. C***	***5. B***	***6. C***	***7. A***	***8. A***	***9. D***	***10. C***

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Electrolytes and Electrolysis
Keys and Solutions

1.**(b)** Solid NaCl does not conduct electricity due to absence of free ions.

2.**(d)** Impure metal made anode while pure metal made cathode.

3.**(d)** Extent of its ionization

4.**(c)** $2Al + dil, H_2SO_4 \rightarrow Al_2SO_4 + H_2\uparrow$

5.**(b)** Water is reduce at the cathode and oxidized at the anode instead of Na^+ and SO_4^{2-}

Cathode : $2H_2O + 2e^- \rightarrow H_2 + OH^-$ Anode : $H_2O \rightarrow 2H^+ + \frac{1}{2}O_2 + 2e^-$

6.**(c)** According to Faraday's law

7.**(a)** Because in it covalent bonding is present.

8.**(a)** Na, K and Mg are placed above hydrogen in the electrochemical series. When the aqueous solutions of these salts are electrolyzed, hydrogen is released at the cathode instead of the respective metals. Cu is placed below hydrogen in the electrochemical series, when aqueous solution of copper is electrolyzed, copper is deposited at the cathode.

9.**(d)** The forces of electrostatic attraction are broken down by water

10.**(c)** In a galvanic cell, the electrons flow from anode to cathode through the external circuit. At cathode (– ve pole) oxidation and at cathode (+ve pole) reduction takes place.

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Faraday's Law of Electrolysis

1. The electro chemical equivalent of an element is 0.0006735 g/c. Its wt. is
   (a) 65 gm (b) 75 gm (c) 85 gm (d) 95 gm

2. One Faraday charge was passed through the electrolyte cell placed in series containing solutions of Ag^{+2} , Ni^{+2} , Cr^{+3} . Then the masses of Ag, Ni, Cr deposited will be
   (a) 108 gm, 29.5 gm, 17.3 gm (b) 1.08 gm, 2.95 gm, 1.73 gm
   (c) 17.3 gm, 108 gm, 2.95 gm (d) 17.3 gm, 10.8 gm, 2.95 gm

3. 965 amp current is passed through molten metal chloride for 1 minute and 40 seconds during electrolysis. The mass of metal deposited is 9 gm at the cathode. The valency of metal atom is (At. Wt. of metal atom = 27)
   (a) 3 (b) 6 (c) 9 (d) 12

4. In the electrolysis of water, one Faraday of electrical energy would evolve
   (a) One mole of oxygen (b) One g atom of oxygen
   (c) 8g of oxygen (d) 22.4 litres of oxygen

5. Two electrolyte cells, one containing acidified $FeSO_4$ and another acidified $Fe_2(SO_4)_3$ in the series. The ratio of mass of iron deposited at the cathode in the two cells will be
   (a) 3 : 2 (b) 1 : 2 (c) 4 : 2 (d) 5 : 2

6. How many coulombs of electricity are required for the reduction of 1 mole of MnO_4^- to Mn^{+2} ?
   (a) 4.825×10^5 C (b) 48.25×10^5 C (c) 482.5×10^5 C (d) 4825×10^5 C

7. What is the time required (in sec.) for depositing all the silver present in 125 ml of 1M $AgNO_3$ solution by passing a current of 241.25 amperes
   (a) 40 sec (b) 55 sec (c) 50 sec (d) 65 sec

8. The number if coulombs required to reduce 12.3 g of nitrobenzene to aniline
(a) 115800 C (b) 5790 C (c) 28950 C (d) 57900 C

9. Three faradays electricity was passed through an aqueous solution of iron (II) bromide. The weight of iron metal (at. wt. = 56) deposited at the cathode (in gm) is
   (a) 56 (b) 84 (c) 112 (d) 168

10. When a quantity of electricity is passed through $CuSO_4$ solution. 0.16 g of copper gets deposited. If the same quantity of electricity is passed through acidulated water, then the volume of H_2 liberated at STP will be
    (a) 4.0 cm^3 (b) 56 cm^3 (c) 604 cm^3 (d) 8.0 cm^3

KEY

1. A	2. A	3. A	4. C	5. A	6. A	7. C	8. D	9. B	10. B

Faraday's Law of Electrolysis
Keys and Solutions

1.**(a)** w = eQ
m = e . Q e = 0.0006735 g/c
= 67.35×10^{-5} g/c
m = $67.5 \times 10^{-5} \times 96500$
= $67.35 \times 10^{-5} \times 965 \times 10^{2}$
= $64{,}992 \cdot 75 \times 10^{-3}$
= 64.992
= 65 gm

2.**(a)** Wt. of Ag deposited = Eq. wt. of Ag = 108 gm
Wt. of Ni deposited = Eq. wt. of Ni = 29.5 gm
Wt. of Cr deposited = Eq. wt. of Cr = 17.3 gm

3.**(a)** $W = \frac{Mct}{ZF}$ $Z = \frac{Mct}{WF}$ $Z = \frac{27 \times 965 \times 100}{9 \times 96500} = 3$

4.**(c)** 4F charge will produce = 1 mole O_2 = 32 gm O_2
$\Rightarrow$ 1F charge will produce = $\frac{32}{4}$ = 8 gm O_2.

5.**(a)** $\frac{W_1}{W_2} = \frac{E_1}{E_2} \frac{W_1}{W_2} = \frac{56}{2} \times \frac{3}{56} = 3 : 2$

6.**(a)** MnO_4^- + $5e^-$ → Mn^{+2}
96500 C = 1 e^-
$5 \times 96500 = 4.825 \times 10^5$ C

7.**(c)** $W = \frac{Mct}{ZF}$

$t = \frac{1 \times 96500 \times 13.5}{108 \times 241.25}$

t = 50 sec.

8.**(d)** $C_6H_5NO_2 + 6H^+ + 6e^- \rightarrow C_6H_5NH_2 + 2H_2O$
1 mole = 123 gm Nitrogen requires 6 mole electron = 6 × 96500 coulomb charge.
∴ 12.3 gm Nitrobenzene will require = $\frac{6 \times 96500 \times 12.3}{123}$ = 6 × 9650 = 57900C.

9.**(b)** $Fe^{2+} + 2e^- \rightarrow Fe$; $E_{Fe} = \frac{56}{2} = 28$

$W_{Fe} = E_{Fe}$ × Number of faraday = 28 × 3 = 84 gm

10.**(b)** $\frac{\text{wt. of Cu deposited}}{\text{wt. of } H_2 \text{ produced}} = \frac{\text{eq. wt. of Cu}}{\text{eq. wt. of H}} \Rightarrow \frac{0.16}{\text{wt. of } H_1} = \frac{32}{1}$

$$\text{wt. of } H_2 = \frac{0.16}{32} = 5 \times 10^{-3} \text{ g}$$

∴ Volume of H_2 liberated at STP = $\frac{22400}{2} \times 5 \times 10^{-3}$ cc = 56 cc.

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Conductor and Conductance

1. In infinite dilutions, the equivalent conductances of Ba^{2+} and Cl^- are 127 and 76 ohm^{-1} cm^{-1} $eqvt^{-1}$. The equivalent conductivity of $BaCl_2$ at indefinite dilutions is
   (a) 101.5 (b) 139.5 (c) 203.5 (d) 279.5

2. Specific conductance of 0.1M nitric acid is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conductance of solution is
   (a) 630 ohm^{-1} cm^2 $mole^{-1}$ (b) 315 ohm^{-1} cm^2 $mole^{-1}$
   (c) 100 ohm^{-1} cm^2 $mole^{-1}$ (d) 6300 ohm^{-1} cm^2 $mole^{-1}$

3. The values of equivalent conductivity at infinite dilution for NH_4Cl, NaOH and NaCl are 149.74, 248.1 and 126.4 ohm^{-1} cm^2 $eqvt^{-1}$. The value Λ_{eq}^{∞} of NH_4OH is
   (a) 371.44 (b) 271.44 (c) 71.44 (d) None

4. The molar conductivities of KCl, NaCl and KNO_3 are 152, 128 and 111 S cm^{-1} mol^{-1} respectively. What is the molar conductivity of $NaNO_3$
   (a) 101 S cm^2 mol^{-1} (b) 87 S cm^2 mol^{-1}
   (c) – 101 S cm^2 mol^{-1} (d) – 391 S cm^2 mol^{-1}

5. The molar conductivity is maximum for the solution of concentration
   (a) 0.001 M (b) 0.005 M (c) 0.002 M (d) 0.004 M

6. If equivalent conductance of 1M benzoic acid is 12.8 ohm^{-1} cm^2 and if the conductance of benzoate ion and H^+ ion are 42 and 288.42 ohm^{-1} cm^2 respectively its degree of dissocaiton is
   (a) 39% (b) 3.9% (c) 0.35% (d) 0.039%

7. The unit ohm^{-1} is used for
   (a) Molar conductivity (b) Equivalent conductivity
   (c) Specific conductivity (d) Conductivity

8. At 25°C, the molar conductance at infinite dilution for the strong electrolytes NaOH, NaCl and $BaCl_2$ are 248×10^{-4}, 126×10^{-4} and 280×10^{-4} Sm^2 mol^{-1} respectively. $\lambda_m^0 Ba(OH)_2$ in Sm^2 mol^{-1} is
   (a) 52.4×10^{-4} (b) 524×10^{-4} (c) 402×10^{-4} (d) 262×10^{-4}

9. The electrolytic conductance is direct measure of
   (a) Resistance (b) Potential (c) Concentration (d) Dissociation

10. What is the effect of dilution on the equivalent conductance of strong electrolyte
    (a) Decrease of dilution (b) Remains unchanged
    (c) Increase on dilution (d) None of the above

1. B	***2. A***	***3. B***	***4. B***	***5. A***	***6. B***	***7. D***	***8. B***	***9. C***	***10. C***

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Conductor and Conductance
Key and Solutions

1.**(b)** λ^{∞} $BaCl_2$ = $\frac{1}{2}$ λ^{∞} Ba^{2+} + λ^{∞} Cl^- = $\frac{127}{2}$ + 76 = 139.5 ohm^- cm^{-1} eq^{-1}

2.**(a)** $\Lambda_m = \frac{1000 \times K}{\text{molarity}} = \frac{1000 \times 6.3 \times 10^{-2}}{0.1}$ = 630 ohm^{-1} cm^2

3.**(b)** $NH_4Cl + NaOH \rightarrow NaCl + NH_4OH$
$\Lambda^{\infty}_{eq_{NH_4OH}} = \Lambda^{\infty}_{NH_4Cl} + \Lambda^{\infty}_{NaOH} - \Lambda^{\infty}_{NaCl}$
= (149.74 + 248.1) – 126.4
= 271.44

4.**(b)** Now,
$\Lambda_{NaNO_3} = \Lambda_{NaCl} + \Lambda_{KNO_3} - \Lambda_{KCl} \Rightarrow \Lambda^0_{NaNO_3}$ = 128 + 111 – 152 = 87 S cm^{-1} mol^{-1}

5.**(a)** Since molar conductance $\propto = \frac{1}{\text{Molarity}}$

6.**(b)** $\Lambda^0_{m(C_6H_5COOH)} = \Lambda^0_{(C_6H_5COO^-)} + \Lambda^0_{(H^+)}$

= 42 + 288.42 = 330.42

$\alpha = \frac{\Lambda^c_m}{\Lambda^0_m} = \frac{12.8}{330.42}$ = 3.9%

7.**(d)** Conductance = $\frac{1}{\text{resistance}} = \frac{1}{\text{ohm}}$ = ohm^- or mho

8. **(b)** $\lambda^0_{Na^+} + \lambda^0_{OH^-}$ = 248 × 10^{-4} Sm^2 mol^{-1}
$\lambda^0_{Na^+} + \lambda^0_{Cl^-}$ = 126 × 10^{-4} Sm^2 mol^{-1}
$\lambda^0_{Ba^{2+}} + \lambda^0_{2Cl^-}$ = 280 × 10^{-4}
Now, $\lambda^0_{Ba(OH_2)} = \lambda^0_{BaCl_2} + 2\lambda^0_{NaOH} + 2\lambda^0_{NaCl}$
$\lambda^0_{Ba(OH_2)}$ = 280 × 10^{-4} + 2 × 248 × 10^{-4} + 2 × 126 × 10^{-4}
$\lambda^0_{Ba(OH_2)}$ = 524 × 10^{-4} Sm^2 mol^{-1}

9.**(c)** Because conductance increase when the dissociation is more.

10.**(c)** The equivalent conductance of strong electrolyte is increased by dilution, because its value is equal to the multiple of K_v and the volume of solution. By making dilution the volume of solution increases which also increase the value of equivalent conductivity.

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Cell constant and Electrochemical cells
Electrode potential, E_{cells} Nernst equation and ECS

1. In galvanic cell, the salt bridge is used to
   (a) Complete the circuit (b) Reduce the electric resistance in the cell
   (c) Separate cathode from anode (d) Carry salts for the chemical reaction.

2. If a strip of Cu metal is placed in solution of ferrous sulphate
   (a) Copper will precipitate out (b) Iron will precipitate out
   (c) Copper will dissolve (d) No reaction will take place

3. If hydrogen electrode dipped in 2 solution of pH = 3 and pH = 6 and salt bridge is connected the e.m.f. of resulting cell is
   (a) 0.177 V (b) 0.3 V (c) 0.252 V (d) 0.104 V

4. What is the cell reaction occurring in Daniel cell (Galvanic cell)
   (a) $Cu_{(s)} + ZnSO_{4(aq)} \rightarrow CuSO_{4(aq)} + Zn_{(s)}$ (b) $Zn_{(s)} + CuSO_{4(aq)} \rightarrow Cu_{(s)} + ZnSO_{4(aq)}$
   (c) $Ni(s) + ZnSO_{4(aq)} \rightarrow NiSO_{4(aq)} + Zn_{(s)}$ (d) $2Na_{(s)} + CdSO_{4(aq)} \rightarrow NaSO4(a) + cd_{(s)}$

5. The specific conductance of a 0.1 N KCl solution at 23°C is 0.012 ohm^{-1} cm^{-1}. The resistance of cell containing the solution at the same temperature was found to be 55 ohm. The cell constant will be
   (a) 0.142 cm^{-1} (b) 0.66 cm^{-1} (c) 0.918 cm^{-1} (d) 1.12 cm^{-1}

6. In an electrochemical cell
   (a) Potential energy changes into kinetic energy
   (b) Kinetic energy changes into potential energy
   (c) Chemical energy changes into electrical energy
   (d) Electrical energy changes into chemical energy

7. The standard reduction potential for Li^+/Li; Zn^{2+}/Zn; H^+/H_2 and Ag^+/Ag is –3.05, – 0.762, 0.00 and +0.80 V. Which of the following has highest reducing capacity
   (a) Ag (b) H_2 (c) Zn (d) Li

8. The standard reduction potential for Fe^{2+}/Fe and Sn^{2+}/Sn electrodes are – 0.44 and – 0.14 volt respectively. For the given cell reaction $Fe^{2+} + Sn \rightarrow Fe + Sn^{2+}$, the standard EMF is
   (a) + 0.0 V (b) – 0.58 V (c) + 0.58 V (d) – 0.30 V

9. Calculate standard free energy change for the reaction $\frac{1}{2}$ Cu(s) + $\frac{1}{2}$ $Cl_2(g)$ = $\frac{1}{2}$ $Cu^{2+} + Cl^-$ taking place at 25°C in a cell whose standard e.m.f. is 1.02 volts
   (a) – 98430 J (b) 98430 J (c) 96500 J (d) – 49215 J

10. E° for the cell $Zn/Zn^{2+}(aq) \parallel Cu^{2+}(aq)/Cu$ is 1.10 V at 25°C, the equilibrium constant for the reaction $Zn + Cu^{2+}(aq)$ is of the order of
    (a) 10^{-28} (b) 10^{-37} (c) 10^{+18} (d) 10^{+1}

1. A	***2. D***	***3. C***	***4. B***	***5. B***	***6. C***	***7. D***	***8. D***	***9. A***	***10. B***

Cell constant and Electrochemical cells
Electrode potential, Ecells Nernst equation and ECS
Key and Solutions

1.**(a)** In galvanic cell, the salt bridge used to complete the circuit.

2.**(d)** $Cu + FeSO_4 \rightarrow$ No reaction. ∵ Cu has $E^0 = 0.34$ volt and Fe has $E^0 = -44$ volt.

3.**(c)** $E_{cell} = -0.059 \log \frac{10^{-6}}{10^{-3}} = -0.059 \log 10^{-3}$
$= 0.059 \times (-3) = 0.177$ V

4.**(b)** In Daniel cell (copper/zinc galvanic cell), the spontaneous chemical reaction between zinc metal and aqueous copper (II)sulphate is conducted so as to obtain the available chemical energy released in the form of electrical energy.

5.**(b)** $K = \frac{1}{R} \times$ Cell constant
Cell constant = $K \times R$; $0.012 \times 55 = 0.66\ cm^{-1}$

6.**(c)** In the electrochemical cell chemical energy changes into electrical energy.

7.**(d)** $E° = -3.05$ Li^+ / Li is most negative (minimum) and hence Li has maximum tendency to lose electrons or it is the strongest reducing agent.

8.**(d)** For the cell reaction, Fe acts as cathode and Sn as anode. Hence,
$E^0_{cell} = E^0_{cathode} - E^0_{anode} = -0.44 - (-0.14) = -0.30$ V
The negative EMF suggests that the reaction goes spontaneously in reverse direction.

9.**(a)** $\Delta G = -nFE°$
$\Delta G = -1 \times 96500 \times 1.02$; $\Delta G = -98430$

10.**(b)** $E^0_{cell} = \frac{0.059}{n} \log K$

$\log K = \frac{1.10 \times 2}{0.059} = 37.2881$ or $K = 10^{-37}$

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Electrolytes and Electrolysis

1. Which one of the following metals could not be obtained on electrolysis of aqueous solution of its salts
   (a) Ag (b) Mg (c) Cu (d) Cr

2. In the electrolytic cell, flow of electrons is from
(a) Cathode to anode in solution
(b) Cathode to anode through external supply
(c) Cathode to anode through internal supply
(d) Anode to cathode through internal supply

3. A solution of sodium sulphate in water is electrolysed using inert electrodes. The products at the cathode and anode are respectively.
   (a) H_2, O_2 (b) O_2, H_2 (c) O_2, Na (d) O_2, SO_2

4. The products formed when an aqueous solution of NaBr is electrolysed in a cell having inert electrodes are
   (a) Na and Br_2 (b) Na and O_2 (c) H_2, Br and NaOH (d) H_2 and O_2

5. Which of the following metal can be obtained by the electrolysis of the aqueous solution of their salts
   (a) Cu (b) Na (c) Mg (d) K

6. In a galvanic cell, the electrons flow from
   (a) Anode to cathode through the solution
   (b) Cathode to anode through the solution
   (c) Anode to cathode through the external circuit
   (d) Cathode to anode through the external circuit

7. Electrolyte can conduct electricity because
   (a) Their molecules contain unpaired electrons, which are mobile
   (b) Their molecules contain loosely held electrons which get free under the influence of voltage
   (c) The molecules break up into ions when a voltage is applied
   (d) The molecules are broken up into ions when the electrolyte is fused or is dissolved in the solvent

8. The aqueous solution of which of the following decomposes on passing electric current
   (a) Canesugar (b) Urea (c) Methanol (d) Potassium iodide

9. Electrolysis involves oxidation and reduction respectively at
   (a) Anode and cathode (b) Cathode and anode
   (c) At both the electrodes (d) None of the above

10. The passage of current liberates H_2 at cathode and Cl_2 at anode. The solution is
    (a) Copper chloride in water (b) NaCl in water (c) H_2SO_4 (d) Water

KEY

1. B	*2. D*	*3. A*	*4. C*	*5. D*	*6. C*	*7. D*	*8. D*	*9. A*	*10. B*

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Electrolytes and Electrolysis
Key and Solutions

1.**(b)** The reduction potential of Mg is less than that of water (E° = – 0.83V). Hence their ions in the aqueous solution cannot be reduced instead water will be reduced.
$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$

2.**(d)** In electrolytic cell, cathode acts as source of electrons.

3.**(a)** At cathode : $2H^+ + 2e^- \rightarrow H_2$
At anode : $2OH^- \rightarrow H_2O + \frac{1}{2} O_2 + 2e^-$

4.**(c)** At cathode H^+ reduces to H_2 and at anode Br^- oxidises to Br_2, leaving NaOH in the solution.

5.**(d)** Na, K and Mg are placed above hydrogen in the electrochemical series. When the aqueous solutions of these salts are electrolysed, hydrogen is released at the cathode instead of the respective metals. Cu is placed below hydrogen in the electrochemical series, when aqueous solution of copper is electrolysed, copper is deposited at the cathode

6.**(c)** In a galvanic cell, the electrons flow from anode to cathode through the external circuit. At anode (– ve pole) oxidation and at cathode (+ ve pole) reduction takes place.

7.**(d)**

8.**(d)** KI is an electrolyte

9.**(a)** In electrolysis process oxidation occurs at anode and reduction occurs at cathode.

10.**(b)** Since discharge potential of water is greater than that of sodium so water is reduced at cathode instead of Na^+
Cathode : $H_2O + e^- \rightarrow \frac{1}{2} H_2 + OH^-$
Anode : $Cl \rightarrow \frac{1}{2} Cl_2 + e^-$

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Faraday's Law of Electrolysis

1. Cadmium amalgam is prepared by electrolysis of a solution of $CdCl_2$ using a mercury cathode. How long should a current of 4 A be passed in order to prepare 10% by wt. Cd in Cd—Hg amlagam on cathode of 4.5 g Hg? (atomic wt. of Cd = 112)
   (a) 400 sec (b) 215.40 sec (c) 861.6 sec (d) 430.8 sec

2. How much chlorine will be liberated on passing one ampere current for 30 minutes through NaCl solution.
   (a) 0.66 mole (b) 0.33 mole (c) 0.66 gm (d) 0.33 gm

3. Al_2O_3 is reduced by electrolysis at low potential and high currents. If 4.0×10^4 amperes of current is passed through molten H_2O for 6 hours, what mass of aluminium is produced (Assume 100% current efficiency. At mass of Al = 27 g mol^{-1})
   (a) 9.0×10^3 g (b) 8.1×10^4 g (c) 2.4×10^5 g (d) 1.3×10^4 g

4. Electrolysis rules of Faraday's states that mass deposited on electrode is proportional to
   (a) $m \propto I^2$ (b) $m \propto Q$ (c) $m \propto Q^2$ (d) None of these

5. Then during electrolysis of a solution of $AgNO_3$, 9650 coulombs of charge pass through the electroplating bath, the mass of silver deposited in the cathode will be
   (a) 1.08 g (b) 10.8 g (c) 21.6 g (d) 108 g

6. 4 g of copper was dissolved in concentrated nitric acid. The copper nitrate solution on strong heating gave 5 g of its oxide. The equivalent weight of copper is
   (a) 23 (b) 32 (c) 12 (d) 20

7. The number of electrons passing per second through a cross-section of copper wire carrying 10^{-6} amperes of current per second is found to be
   (a) 1.6×10^{-19} (b) 6×10^{-35} (c) 6×10^{-16} (d) 6×10^{-12}

8. A certain quantity of electricity is passed through an aqueous solution of $AgNO_3$ and cupric salt solution connected in series. The amount of Ag deposited is 1.08 gm, the amount of copper deposited is (atomic weight of Cu= 63.5; Ag = 108)
   (a) 0.6454 g (b) 6.354 g (c) 0.3177 g (d) 3.177 g

9. When electricity is passed through the solution of $AlCl_3$, 13.5 gm of Al are deposited. The number of Faraday must be
   (a) 0.50 (b) 1.00 (c) 1.50 (d) 2.00

10. When molten lithium chloride (LiCl) is electrolyzed, lithium metal is formed at the cathode. If current efficiency is 75% then how many grams of lithium are liberated when 1930 C of charge pass through the cell? (Atomic weight : Li = 7)
    (a) 0.105 (b) 0.120 (c) 0.28 (d) 0.240

KEY

1. B	***2. C***	***3. B***	***4. B***	***5. B***	***6. B***	***7. D***	***8.C***	***9. C***	***10. A***

Faraday's Law of Electrolysis
Key and Solutions

1.**(b)** 10 g Cd should present with 90 g Hg.
Wt. of Cd required with 4.5 g of Hg at cathode
$= \frac{10}{90} \times 4.5 \Rightarrow 0.5$; $(Cd^2 + 2e^- \rightarrow Cd)$

$\therefore \frac{0.5}{112} \times 2 = \frac{4 \times t}{96500}$

$\Rightarrow$ t = 215.40 sec

2.**(c)** $W = \frac{Mct}{ZF}$

$W = \frac{35.5 \times 1 \times 30 \times 60}{1 \times 96500}$ = 0.66 gm

3.**(b)** Total current $4.0 \times 10^4 \times 6 \times 60 \times 60C$
96500 C liberates 9g of Al (1g.eq)
$(4 \times 10^4 \times 6 \times 60 \times 60C)$ liberates $\frac{(4 \times 10^4 \times 6 \times 60 \times 60)}{96500} = 8.1 \times 10^4$ g of Al.

4.**(b)** It is Faraday's law.

5.**(b)** $Ag^+ \xrightarrow{+e^-} Ag.$ $\Rightarrow$ 96500 C will liberate silver = 108 gm
9650 C will liberate silver = 10.8 gm

6.**(b)** Empirical formula = CuO of oxide
In this oxide, oxidation no. of Cu = +2
Equivalent weight $= \frac{\text{Molecular weight}}{\text{Oxidation no.}} = \frac{63.5}{2} \approx 31.75$
But Equivalent weight should be an integral no. = 32
Given, current = 241.25 columb

7.**(d)** Charge (Coulombs) pass per second $= 10^{-6}$
number of electrons passed per second
$= \frac{10^{-6}}{1.602 \times 10^{-19}} = 6 \times 10^{12}$

8.**(c)** $\frac{\text{Wt.of Cu}}{\text{Wt.of Ag}} = \frac{\text{Eq.wt.of Cu}}{\text{Eq.wt.of Ag}}$; $\frac{\text{Wt.of Cu}}{1.08} = \frac{63.5/2}{108}$

Wt. of Cu = 0.31777 gm

9.**(c)** Eq. of Al $= \frac{13.5}{27/3} = 1.5$
Thus 1.5 Faraday is needed.

10.**(a)** $\frac{W}{7} = \frac{1930 \times 0.75}{96500}$; W = 0.105 gm

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Conductor and Conductance

1. Specific conductance of 0.1 M nitric acid is 6.3×10^{-2} ohm^{-1} cm^{-1}. the molar conductance of solution is
   (a) 630 ohm^{-1} cm^2 mole^{-1} (b) 315 ohm^{-1} cm^2 mole^{-1}
   (c) 100 ohm^{-1} cm^2 mole^{-1} (d) 6300 ohm^{-1} cm^2 mole^{-1}

2. Electrolytic conduction differs from metallic conduction in that in the case of electrolytic conduction
   (a) The resistance increases with increasing temperature
   (b) The resistance decrease with increasing temperature
   (c) The flow of current does not generate heat
   (d) The resistance is independent of the length of the conductor

3. The molar conductivity is maximum for the solution of concentration
   (a) 0.001 M (b) 0.005 M (c) 0.002 M (d) 0.004 M

4. The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25°C are 93.0 and 426.2 S cm^2/mol respectively. To calculate Λ^0_{HOAc}, the additional value required is
   (a) $\Lambda^0_{H_2O}$ (b) Λ^0_{KCl} (c) Λ^0_{NaOH} (d) Λ^0_{NaCl}

5. The conductivity of strong electrolyte is
   (a) Increase of dilution slightly
   (b) Decrease on dilution
   (c) Does not change with dilution
   (d) Depend upon density of electrolytes itself

6. Resistance of 0.1 M KCl solution in a conductance cell is 300 ohm and conductivity is 0.013 Scm^{-1}. The value of cell constant is :
   (a) 3.9 cm^{-1} (b) 39 m^{-1} (c) 3.9 m^{-1} (d) None of these

7. The resistance of 0.1 N solution of formic acid is 200 ohm and cell constant is 2.0 cm^{-1}. The equivalent conductivity (in Scm^2 eq^{-1}) of 0.1 N formic acid is :
   (a) 100 (b) 10 (c) 1 (d) none of these

8. The conductance of a salt solution (AB) measured by two parallel electrodes of area 100 cm^2 separated by 10 cm was found to be 0.0001 Ω^{-1}. If volume enclosed between two electrode contain 0.1 mole of salt, what is the molar conductivity (Scm^2 mol^{-1}) of salt at same concentration:
   (a) 10 (b) 0.1 (c) 1 (d) none of these

9. At 25°C, the molar conductance at infinite dilution for the strong electrolytes NaOH, NaCl and $BaCl_2$ are 248×10^{-4}, 126×10^{-4} and 280×10^{-4} Sm^2 mol^{-1} respectively. λ^0_m Ba $(OH)_2$ in Sm^2 mol^{-1} is
   (a) 52.4×10^{-4} (b) 524×10^{-4} (c) 402×10^{-4} (d) 262×10^{-4}

10. The equivalent conductance of $\frac{M}{32}$ solution of a weak monobasic acid is 8.0 mhos cm^2 and at infinite dilution is 400 mhos cm^2. The dissociation constant of this acid is
    (a) 1.25×10^{-5} (b) 1.25×10^{-6} (c) 6.25×10^{-4} (d) 1.25×10^{-4}

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KEY

1. A	***2. B***	***3. A***	***4. D***	***5. A***	***6. A***	***7. A***	***8. B***	***9. B***	***10. A***

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Conductor and Conductance
Key and Solutions

1.**(a)** $\Lambda_m = \frac{1000 \times K}{\text{molarity}} = \frac{1000 \times 6.3 \times 10^{-2}}{0.1} = 630 \text{ ohm}^{-1} \text{ cm}^2$

2.**(b)** Electrolytic conduction resistance decreases with increasing temperature.

3.**(a)** Since molar conductance $\propto \frac{1}{\text{Molarity}}$

4.**(d)** According to Kohlrausch law the molar conductivity of an electrolyte at infinite dilution is the sum of conductivities of its ions. Therefore to obtain Λ^0_{HOAc} from the conductivity of Λ^0_{NaOAc} and Λ^0_{HCl} the conductivity value of NaCl i.e., Λ^0_{NaCl} is also needed.
$\Lambda^0_{NaOAc} + \Lambda^0_{HCl} - \Lambda^0_{NaCl} = \Lambda^0_{HOAc}$

i.e., $\Lambda^0_{Na} + \Lambda^0_{OAc^-} + \Lambda^0_H + \Lambda^0_{Cl^-} - \left(\Lambda^0_{Na^+} + \Lambda^0_{Cl^-}\right) = \Lambda^0_{OAc^-} + \Lambda^0_H = \Lambda^0_{HOAc}$

Cell constant = $\frac{\text{Conductivity(I)}}{\text{Conductance(II)}} = \frac{\text{Conductivity(II)}}{\text{Conductance(II)}}$

Conductivity(II) = $\frac{129}{520}$ S m^{-1} = 0.2M = 200 mol m^{-3}
Molar conductivity of 0.2 M solution = $\frac{129/520}{200} = 12.4 \times 10^{-4}$ S m^2 mol^{-1}

5.**(a)** Generally strong electrolyte on dilution shows conductivity characters.

6.**(a)** Conductance (G) = $\frac{1}{R} \Rightarrow \frac{1}{300}$;

$\because \quad \kappa = G\left(\frac{l}{A}\right)$
Cell constant $\left(\frac{l}{A}\right) = \frac{0.013}{1} \times 300 = 3.9 \text{ cm}^{-1}$

7.**(a)** $\kappa = G.G^* \Rightarrow \frac{1}{200}\ 2 \Rightarrow 0.01$;

$\Lambda_{eq} = \frac{\kappa}{N} \times 1000$

$\Rightarrow \frac{0.01}{0.1} \times 1000 \Rightarrow 100$

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8.**(b)** $G^* = \frac{l}{a} = \frac{10}{100} = 0.1$; G = 0.0001 S

V = 100 × 10 = 1000 cm^3 = 1 litre

$\kappa = G.G^* = 0.1 \times 0.0001 = 10^{-5}$

$\Lambda_m = \frac{\kappa \times 1000}{M}$

$= \frac{(0.1 \times 0.0001) \times 1000}{0.1}$

= 0.1 $Scm^2\ mol^{-1}$

9.**(b)** Now, $\lambda^0_{Ba(OH)_2} = \lambda^0_{BaCl_2} + 2\lambda^0_{NaOH} + 2\lambda^0_{NaCl}$

$\lambda^0_{Ba(OH)_2} = 280 \times 10^{-4} + 2 \times 248 \times 10^{-4} + 2 \times 126 \times 10^{-4}$

$\lambda^0_{Ba(OH)_2} = 524 \times 10^{-4}\ Sm^2\ mol^{-1}$

10.**(a)** $\alpha = \frac{\Lambda}{\Lambda^0} = \frac{8.0}{400} = 2 \times 10^{-2}$

$K_\alpha = \frac{C\alpha^2}{(1-\alpha)} \approx c\alpha^2 = \frac{1}{32} \times (2 \times 10^{-2})^2 = 1.25 \times 10^{-5}$

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Electrode potential, E_{cells}, Nernst equation and ECS

1. The standard reduction potentials of $Cu^{2+}|Cu$ and $Cu^{2+}|Cu^{\oplus}$ are 0.337 V and 0.153 V, respectively. The standard electrode potential of $Cu^{\oplus}|Cu$ half cell is
   (a) 0.184 V (b) 0.827 V (c) 0.521 V (d) 0.490 V

2. The standard reduction potential values of three metallic cations, X, Y and Z are 0.52, –3.03, and –1.18 V, respectively. The order of reducing power of the corresponding metal is
   (a) Y > Z > X (b) X > Y > Z (c) Z > Y > X (d) Z > X > Y

3. Use the following E° for the electrode potentials, calculate ΔG° in kJ for the indicated reaction :
   $5Ce^{4+}(aq) + Mn^{2+}(aq) + 4H_2O(l) \rightarrow 5Ce^{3+}(aq) + MnO_4^-(aq) + 8H^+(aq)$
   $MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$; E° = + 1.51 V
   $Ce^{4+}(aq) + e^- \rightarrow Ce^{4+}(aq)$ E° = + 1.61 V
   (a) – 9.65 (b) –24.3 (c) –48.25 (d) –35.2

4. A 1.0 M solution of Cd^{2+} is added to excess iron and the system is allowed to reach equilibrium. What is the concentration of Cd^{2+}?
   $Cd^{2+}(aq) + Fe(s) \rightarrow Cd(s) + Fe^{2+}(aq)$; E° = 0.037
   (a) 0.195 (b) 0.097 (c) 0.053 (d) 0.145

5. What is the SRP for $S^{2-}|CuS|Cu$ half-cell?
   Given : $K_{sp}(CuS) = 10^{-35}$ and $E^0_{Cu^{2+}/Cu}$ = 0.34 V
   (a) 1.034 V (b) 1.0 V (c) – 0.694 V (d) 0.694 V

6. The E° at 25°C for the following reaction at the indicated concentrations is 1.50 V. Calculate the ΔG in kJ at 25°C : $Cr(s) + 3Ag^+(aq, 0.1\ M) \rightarrow Ag(s) + Cr^{3+}(aq, 0.1\ M)$
   (a) – 140.94 (b) – 295 (c) –212 (d) –422.83

7. The hydrogen electrode is dipped in a solution of pH = 3 at 25°C. The potential of the cell would be (the value of 2.303RT / F is 0.059 V)
   (a) 0.1777 V (b) – 0.177 V (c) 0.087 V (d) 0.059 V

8. Standard electrode potential of NHE at 298 K is
   (a) 0.05 V (b) 0.1 V (c) 0.00 V (d) 0.11 V

9. For a cell reaction involving a two-electron change, the standard emf of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction at 25°C will be
   (a) 1×10^{-10} (b) 29.5×10^{-2} (c) 10 (d) 1×10^{10}

10. The strongest reducing agent of the alkali metal is
    (a) Li (b) Na (c) K (d) Cs

1. C	***2. A***	***3. C***	***4. C***	***5. C***	***6. D***	***7. B***	***8. C***	***9. D***	***10. A***

Electrode potential, E_{cells}, Nernst equation and ECS
Key and Solutions

1.**(c)** $Cu^{2+} + 2e^- \rightarrow Cu$ .....(i) $E_1^{\ominus}$
$Cu^{2+} + e^- \rightarrow Cu$ .....(ii) $E_2^{\ominus}$
Net equation ($Cu^{\oplus} + e^- \rightarrow Cu$) .....(iii) $E_3^{\ominus}$
is obtained by Eq. (i) – (ii)

$$E_3^{\ominus} = \frac{n_1 E_1^{\ominus} - n_2 E_2^{\ominus}}{n_3} = \frac{2 \times 0.337 - 1 \times 0.153}{1} = 0.521 \text{ V}$$

2.**(a)** The smaller the reduction potential of a substance, the more is its reducing power. (Y > Z > X).

3.**(c)** $E^{\circ}_{cell} = E^{\circ}_{RP(RHS)} - E^{\circ}_{RP(LHS)}$
= 1.61 – 1.51 ⇒ 0.10 V
$\Delta G^{\circ} = -nFE^{\circ} \Rightarrow -5 \times 96500 \times 0.10$ J
$\Delta G^{\circ} = -48.25$ kJ

4.**(c)** Cd^{2+} (aq) + Fe(s) ⇌ Cd(s) + Fe^{2+} (aq)
At eqm. 1 – x – – x
At equilibrium $E^{\circ} = \frac{0.0591}{2} \log \left(\frac{Fe^{2+}}{Cd^{2+}}\right)$

$$0.037 = \frac{0.0591}{2} \log \left(\frac{x}{1-x}\right)$$

$x = [Fe^{2+}] \Rightarrow 0.947$ M
$\therefore [Cd^{2+}] = 0.053$ M

5.**(c)** One design a cell in which the half cell reaction is
CuS(s) + $2e^-$ ⇌ Cu(s) + S^{2-} (aq) occurs
so Cu(s) ⇌ $Cu^{2+} + 2e^-$ ΔG_1°
CuS + $2e^-$ ⇌ Cu(s) + S^{2-} (aq) ΔG_2°
CuS(s) ⇌ Cu^{2+} (aq) + S^{2-} (aq) ΔG_3°
from $\Delta G_3^{\circ} = \Delta G_1^{\circ} + \Delta G_2^{\circ}$
$E^0_{S^{2-}|CuS|Cu} = E^0_{Cu^{2+}Cu} + \frac{0.0591}{2} \log K_{sp}$
$\Rightarrow 0.34 + \frac{0.0591}{2} \log(10^{-35})$

$= -0.694$ V

6.**(d)** $\Delta G = \Delta G^{\circ} + RT \ln Q$
$\Rightarrow -nFE^{\circ} + 2.303\ RT \log \frac{[Cr^{3+}]}{[Ag^+]^3}$
$\Delta G = -3 \times 96500 \times 1.50 + 8.314 \times 298 \times 2.303 \log \frac{(0.1)}{(0.1)^3}$
$\Rightarrow -422838.3$ J or -422.83 kJ

7.**(b)** Reduction potential of hydrogen electrode,
$E_H = \frac{-2.303\ RT}{F} \log \frac{1}{[H^+]}$
$= -0.059$ pH $= -0.059 \times 3 = -0.177$ V

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8.**(c)** At 298 K standard electrode potential of NHE electrode is 0.00V

9.**(d)** $\Delta G = -nFE^\circ$

$\Delta G = -2.303\ RT \log K$; $nFE^\circ = 2.303\ RT \log K$

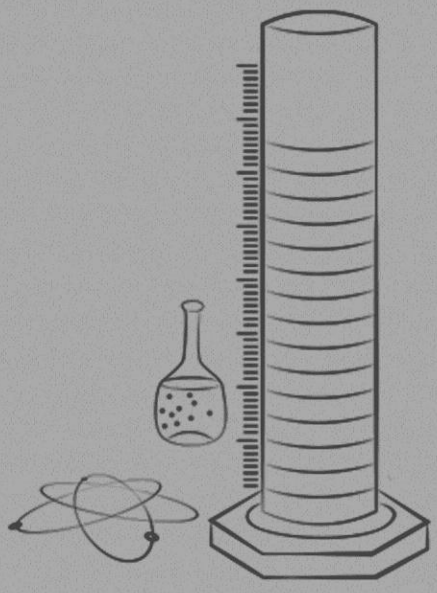
$\log K = \frac{nFE^\circ}{2.303RT} = \frac{2 \times 96500 \times 0.295}{2.303 \times 8.314 \times 298}$

$\log K = 9.97 = K = 1 \times 10^{10}$

10.**(a)** Lithium is the strongest reducing agent of the alkali metals.

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Halo Alkanes & Halo Arenes

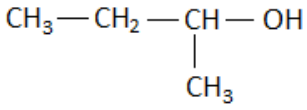


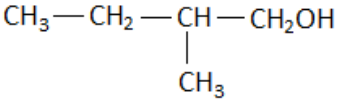
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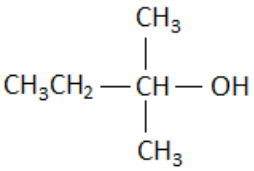
PREPARATION OF HALO ALKANES AND HALO ARENES

1. Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature?

(a) $CH_3 - CH_2 - CH_2 - OH$

(b) 

(c) 

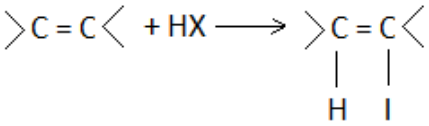
(d) 

2. Toluene reacts with halogen in the presence of iron(III) chloride giving ortho and parahalo compounds. The reaction is

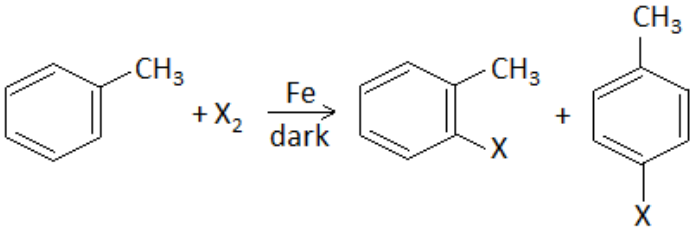
(a) Electrophilic elimination reaction
(b) Electrophilic substitution reaction
(c) Free radical addition
(d) Nucleophilic substitution reaction

3. Which of the following is halogen exchange reaction?

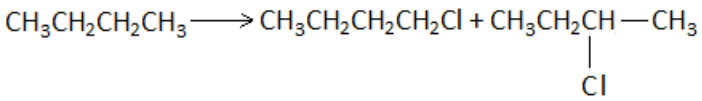
(a) $R - X + NaI \rightarrow RI + NaX$

(b) 

(c) $R - OH + HX \xrightarrow{ZnCl_2} R - X + H_2O$

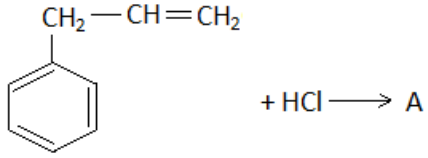
(d) 

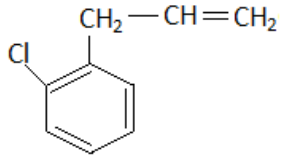
4. Which reagent will you use for the following reaction?

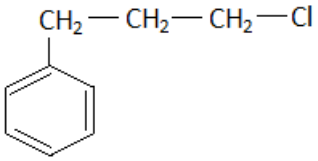


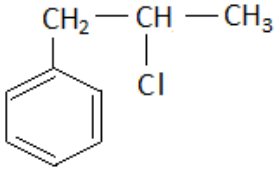
(a) Cl_2/uV light
(b) NaCl + H_2SO_4
(c) Cl_2 gas in dark
(d) Cl_2 gas in the presence of iron in dark

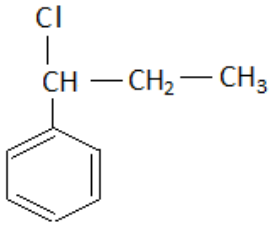
5. What is 'A' in the following reaction?



(a) 

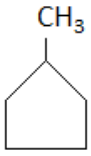
(b) 

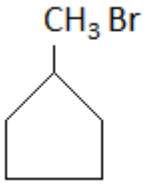
(c) 

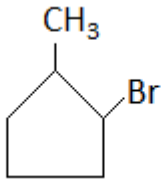
(d) 

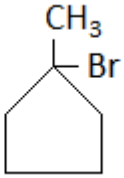
6. The intermediate during the addition of HCl to propene in the presence of peroxide.

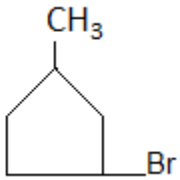
(a) $CH_3\dot{C}HCH_2Cl$ (b) $CH_3\overset{+}{C}HCH_3$ (c) $CH_3CH_2\overset{+}{C}H_2$ (d) $CH_3CH_2\dot{C}H_2$

7. In the following reaction  $\xrightarrow[h\nu]{Br_2}$ *The major product is*

(a) 

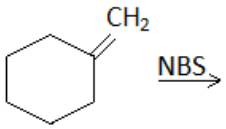
(b) 

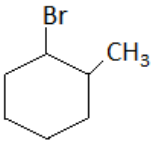
(c) 

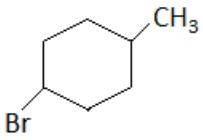
(d) 

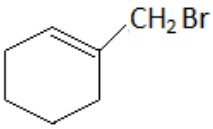
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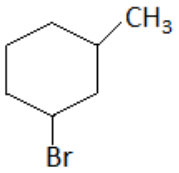
8. What will be the product in the following reaction?



(a) 

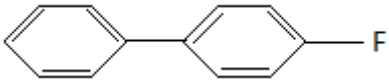
(b) 

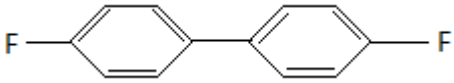
(c) 

(d) 

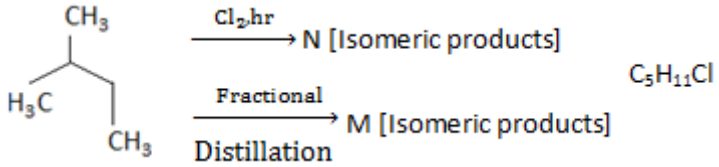
9. $Ph - NH_2 \xrightarrow[0°C]{HNO_2} A \xrightarrow[BF_3]{HF} B \xrightarrow{\Delta} C$, C is

(a) $Ph - \overset{+}{N} \equiv NBF_4^-$

(b) 

(c) 

(d) $Ph - F$

10. 

Give the number of N and M?

(a) 6, 6 (b) 6, 4 (c) 4, 4 (d) 3, 3

ANSWER KEYS

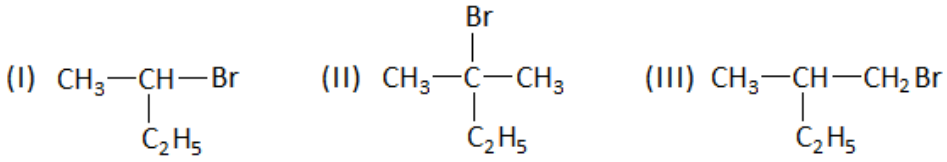
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	b	a	a	c	b	c	c	d	b

SN^1 & SN^2 MECHANISM

1. Which of the following alkyl halide will undergo SN^1 reaction most readily?
   (a) $(CH_3)_3$ C – F (b) $(CH_3)_3$ C – Cl (c) $(CH_3)_3$ C – Br (d) $(CH_3)_3$ C – I

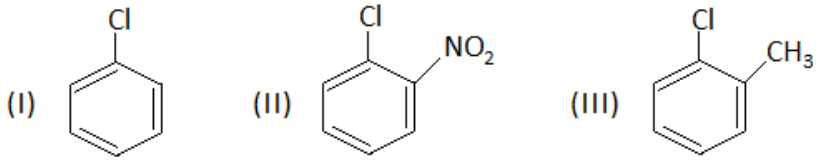
2. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows . . . . .
   (a) SN^1 mechanism
   (b) SN^2 mechanism
   (c) Any of the above two depending on the temperature of reaction
   (d) Saytzeff rule

3. Which of the following compounds will give racemic mixture on nucleophilic substitution by OH^- ion?

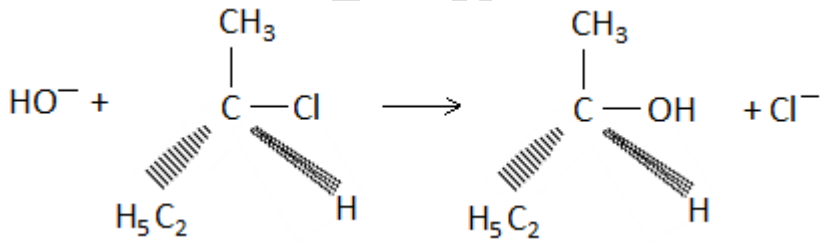


   (a) I (b) I, II, III (c) II, III (d) I, III

4. Arrange the following in the increasing order of rate of reaction towards nucleophilic substitution



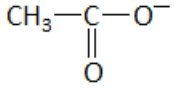
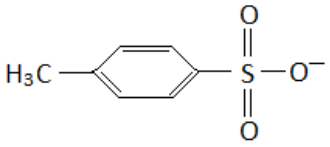
   (a) I < II < III (b) I < III < II (c) III < I < II (d) III < II < I

5. 

   Which of the following statements are correct about the mechanism of this reaction?
   I. A carbocation will be formed as an intermediate in the reaction
   II. OH^- will attach the substrate (II) from one side Cl^- will leave it simultaneously from other side
   III. An unstable intermediate will be formed in which OH^- and Cl^- will be attached by weak bonds.
   IV. Reaction proceeds through SN^1 mechanism
   (a) I & II (b) II & III (c) I & IV (d) I, II & III

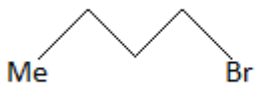
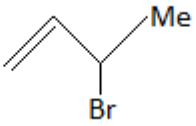
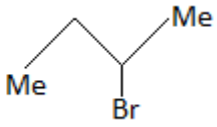
6. For the following (a) I^- (b) Cl^- (c) Br^- the increasing order of nucleophilicity could be
   (a) $Br^- < Cl^- < I^-$ (b) $I^- < Br^- < Cl^-$ (c) $Cl^- < Br^- < I^-$ (d) $I^- < Cl^- < Br^-$

7. The decreasing order of nucleophilicity among the nucleophiles is

(1)  (2) CH_3O^- (3) CN^- (4) 

(a) 1, 2, 3, 4 (b) 4, 3, 2, 1 (c) 2, 3, 1, 4 (d) 3, 2, 1, 4

8. Consider the following bromides

(A)  (B)  (C) 

The correct order of SN^1 reactivity is

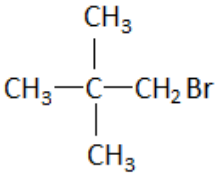
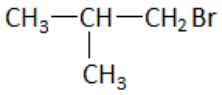
(a) C > B > A (b) A > B > C (c) B > C > A (d) B > A > C

9. The organic chloro compound which shows complete stereo-chemical inversion during a SN^2 reaction is

(a) CH_3Cl (b) $(C_2H_5)_2CHCl$ (c) $(CH_3)_3CCl$ (d) $(CH_3)_2CHCl$

10. In a SN^2 substitution reaction of the type $R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$

Which one of the following has the highest relative rate?

(a)  (b) CH_3CH_2Br (c) $CH_3CH_2CH_2Br$ (d) 

ANSWER KEYS

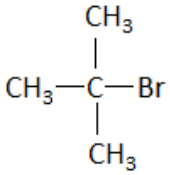
1	2	3	4	5	6	7	8	9	10
d	a	a	c	c	c	d	c	a	b

PROPERTIES OF HALO ALKANES & HALO ARENES

1. Chloromethane on treatment with excess of ammonia yields mainly
   (a) N, N-diethylmethanamine (b) N-methylmethanamine
   (c) Methanamine (d) Mixture containing all these in equal proportions

2. Which is correct increasing order of boiling points of the following compounds?
   1-bromoethane, 1-bromopropane, 1-bromobutane, bromobenzene
   (a) bromobenzene < 1-bromobutane < 1-bromopropane < 1-bromoethane
   (b) bromobenzene < 1-bromoethane < 1-bromopropane < 1-bromobutane
   (c) 1-bromopropane < 1-bromobutane < 1-bromoethane < bromobenzene
   (d) 1-bromoethane < 1-bromopropane < 1-bromobutane < bromobenzene

3. The ease of de-hydro-halogenation of alkyl halides with alcoholic kOH is
   (a) 3° < 2° < 1 (b) 3° > 2° > 1° (c) 3° < 2° > 1° (d) 3° > 2° < 1°

4. *B(Major)* $\xleftarrow[CH_3CH_2OH]{CH_3CH_2O^-Na^+}$  $\xrightarrow{CH_3CH_2OH}$ *A(Major) A and B are*

   (a) Both A and B are $(CH_3)_3C - OCH_2CH_3$
   (b) Both A and B are $(CH_3)_2C = CH_2$
   (c) A is $(CH_3)_3C - OCH_2CH_3$ and B is $(CH_3)_2C = CH_2$
   (d) A is $(CH_3)_2C = CH_2$ and B is $(CH_3)_3C - OCH_2CH_3$

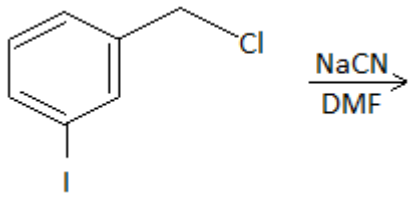
5. The major product formed on treatment of $CH_3CH_2CH(F)CH_3$ with CH_3O^-/CH_3OH is
   (a) $CH_3CH_2CH(OCH_3)CH_3$ (b) $CH_3CH = CHCH_3$
   (c) $CH_3CH_2CH = CH_2$ (d) $CH_3CH_2CH_2OCH_3$

6. An alkyl bromide produces a single alkene when it reacts with sodiumethoxide and ethanol, this alkene on hydrogenation produces 2-methyl butane. What is the alkyl halide?
   (a) 1-bromo-2, 2-dimethyl propane (b) 1-bromo butane
   (c) 1-b room-2-methylbutane (d) 2-bromo-2-methyl butane

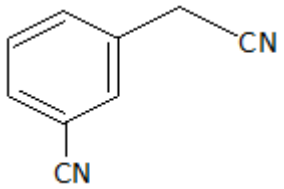
7. Cycloalkane formed when 1, 4-dibromo pentane is heated with sodium is
   (a) methyl cyclobutane (b) cyclopentane
   (c) cyclobutane (d) methyl cyclopentane

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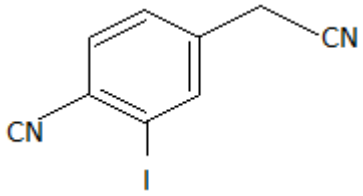
8. The structure of the major product formed in the following reaction is



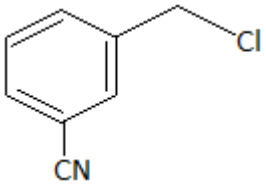
(a)



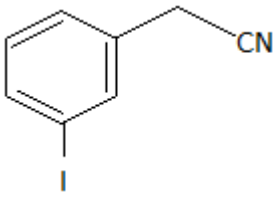
(b)



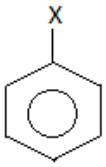
(c)

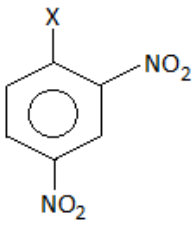


(d)



9. The correct order of increasing reactivity of C – X bond towards nucleophile in the following compound is

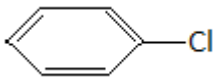
(I) 

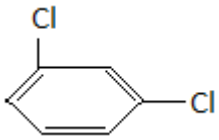
(II) 

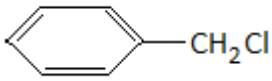
(III) $(CH_3)_3C—X$ (IV) $(CH_3)_2CH—X$

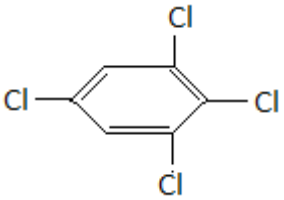
(a) III < II < I < IV (b) I < II < IV < III (c) II < III < I < IV (d) IV < III < I < II

10. Which of the following compound has dipole moment different from rest of the compounds.

(a) 

(b) 

(c) 

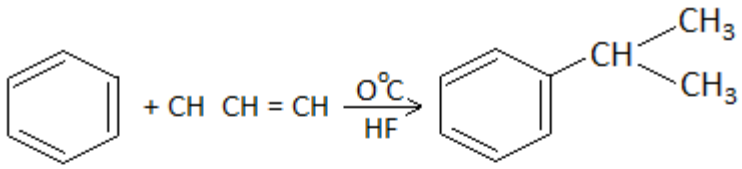
(d) 

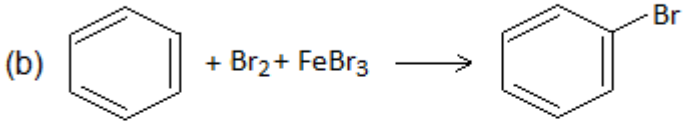
ANSWER KEYS

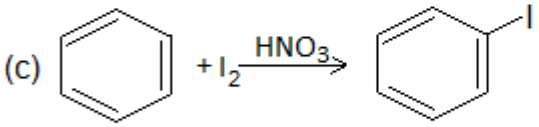
1	2	3	4	5	6	7	8	9	10
c	d	b	c	c	c	a	d	b	c

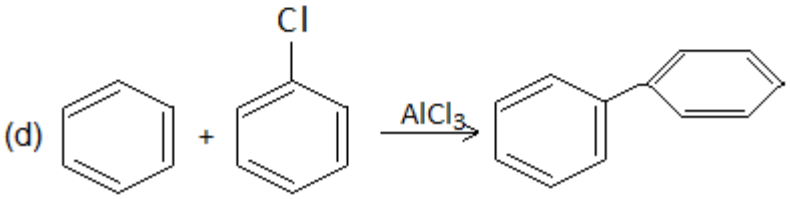
PREPARATION OF HALO ALKANES & HALO ARENES

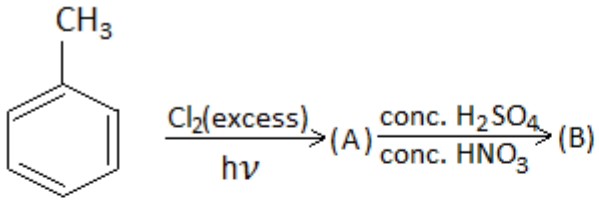
1. A reaction which is not feasible, under the conditions indicated is

(a) 

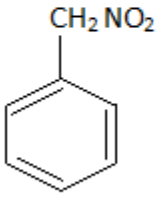
(b) 

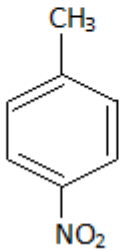
(c) 

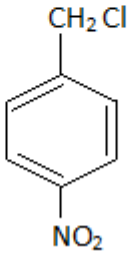
(d) 

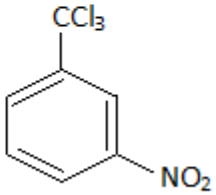
2. 

B is

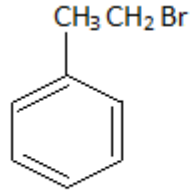
(a) 

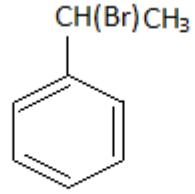
(b) 

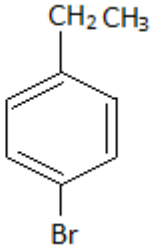
(c) 

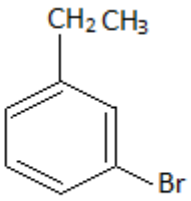
(d) 

3. When ethylbenzene is treated with one equivalent of N-bromosuccinimide in CCl_4, the major product obtained is

(a) 

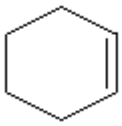
(b) 

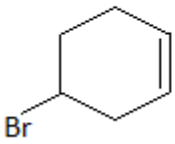
(c) 

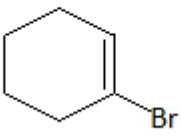
(d) 

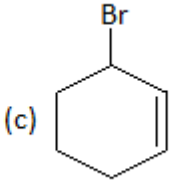
4. Hydrogen chloride gas is passed through an organic compound of a molecular formula $C_4H_{10}O$ at room temperature to obtain the product C_4H_9Cl. The product is

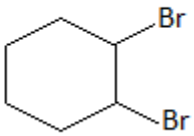
(a) 1-chlorobutane (b) 2-chloro butane
(c) 1-chloro-2-methylpropane (d) 2-chloro-2-methyl propane

5.  $\xrightarrow{NBS/CCl_4}$ *X, X is*

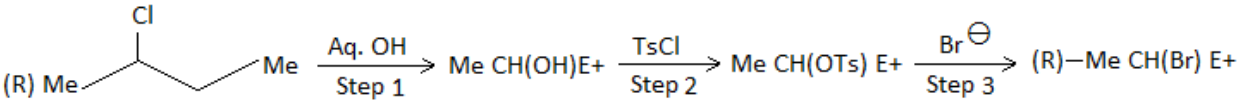
(a) 

(b) 

(c) 

(d) 

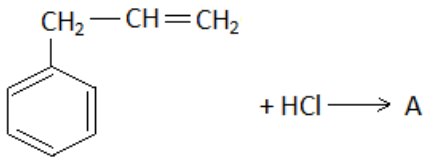
6. In the conversion of optically active (R) form of 2-chlorobutane to (R) form of 2-bromobutane, the following sequence of reaction is carried out

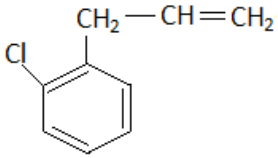


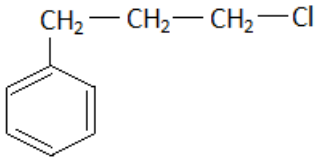
(A) (B) (C) (D)

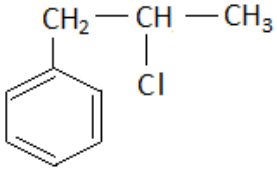
Direct conversion is not feasible since Cl cannot be replaced by Br in one step.
In which of the following steps does the inversion does not occur.
(a) Step-1 (b) Step-2 (c) Step-3 (d) None

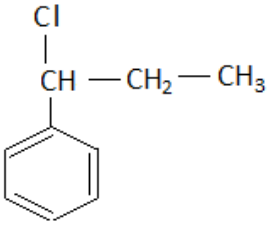
7. What is 'A' in the following reaction?

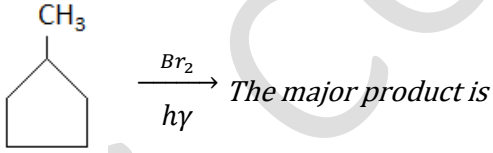


(a) 

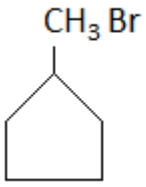
(b) 

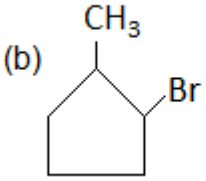
(c) 

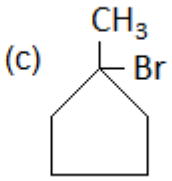
(d) 

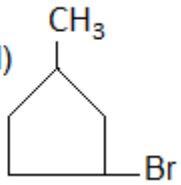
8. In the following reaction 

The major product is

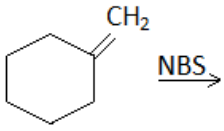
(a) 

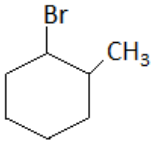
(b) 

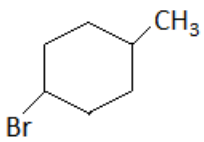
(c) 

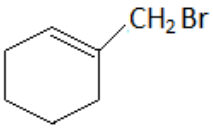
(d) 

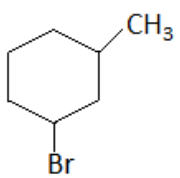
9. What will be the product in the following reaction?



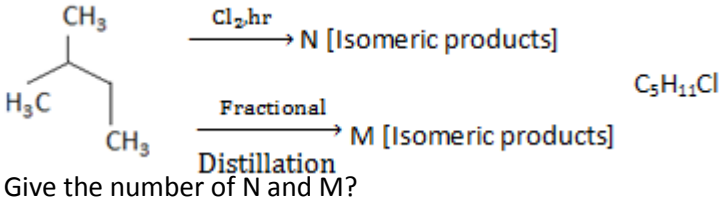
(a) 

(b) 

(c) 

(d) 

10.



Give the number of N and M?

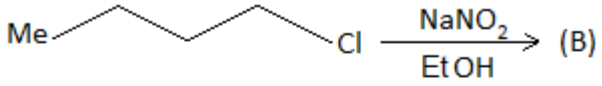
(a) 6, 6 (b) 6, 4 (c) 4, 4 (d) 3, 3

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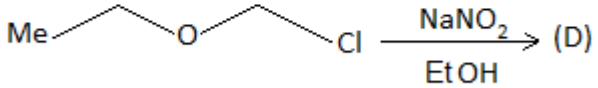
Topic: SN^1 & SN^2

1. Which of the following reaction(s) is/are neither stereospecific nor stereo-selective
   (a) SN^1 (b) SN^2 (c) E_2 (d) E_1CB

2.

I. 

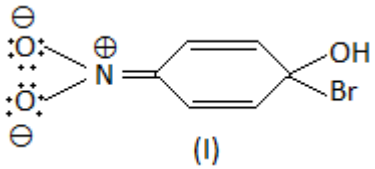
(A)

II. 

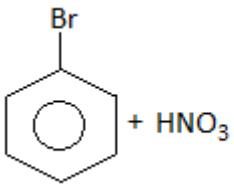
(C)

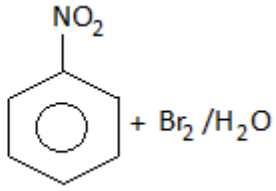
Which of the following statement is/are correct?
(a) both reactions (I) and (II) proceed via SN^2 mechanism
(b) both reactions (I) and (II) proceed via SN^1 mechanism
(c) reaction (I) proceeds via SN^1 and reaction (II) by SN^2 mechanism
(d) reaction (I) proceeds via SN^2 and reaction (II) by SN^1 mechanism

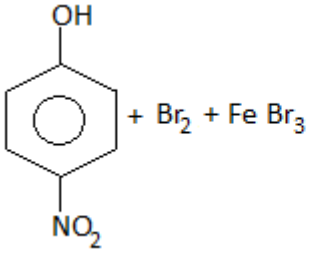
3. Which combinations of reactants will give species(I) shown as reactive intermediate?

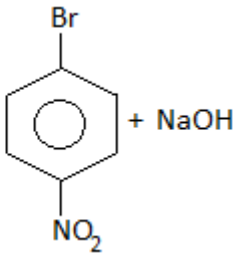


(I)

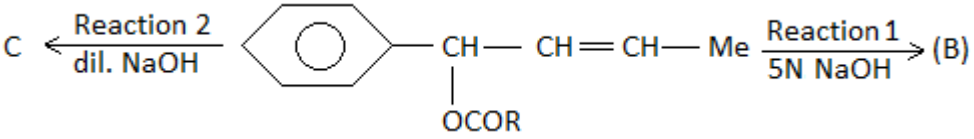
(a) 

(b) 

(c) 

(d) 

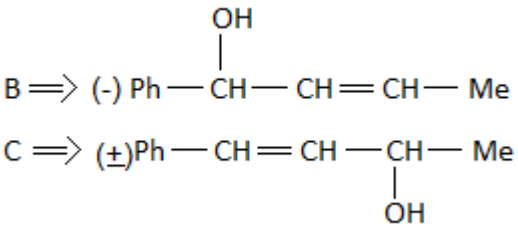
4. Which of the following statement are correct about the following reactions?



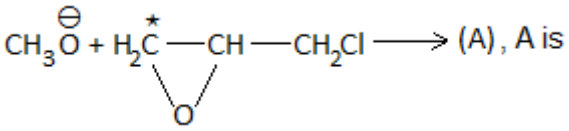
(a) Reaction 1 proceeds by SN^2 and reaction 2 by SN^1 mechanism

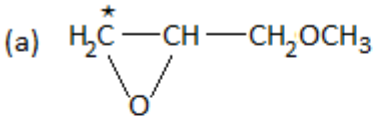
(b) Reaction 1 proceeds by SN^1 and reaction 2 by SN^2 mechanism

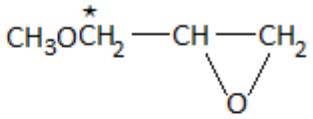
(c) The products (B) and (C) are respectively

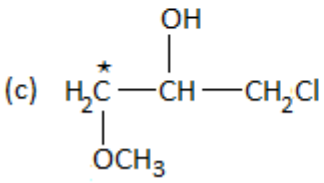


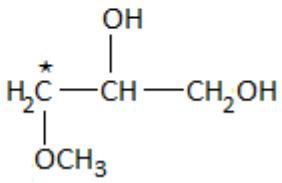
(d) both a and c

5. 

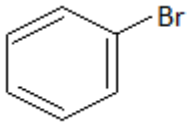
(a) 

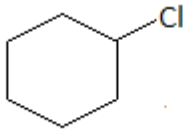
(b) 

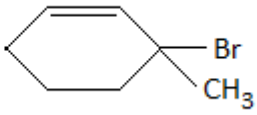
(c) 

(d) 

6. consider the following substrates undergoing SN^1 reaction

(I) 

(II) 

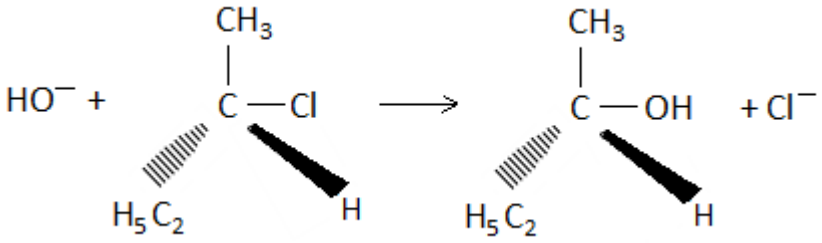
(III) 

(IV) $(CH_3)_3C-Cl$

The increasing order of the rate of reaction will be

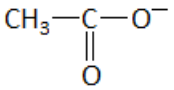
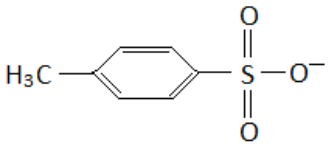
(a) IV < III < I < II (b) I < II < IV < III (c) IV < III < II < I (d) IV < II < III < I

7.



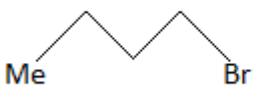
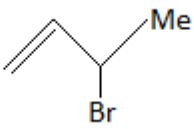
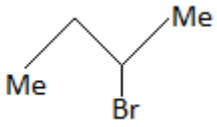
Which of the following statements are correct about the mechanism of this reaction?
I. A carbocation will be formed as an intermediate in the reaction
II. OH^- will attach the substrate (II) from one side Cl^- will leave it simultaneously from other side
III. An unstable intermediate will be formed in which OH^- and Cl^- will be attached by weak bonds.
IV. Reaction proceeds through SN^1 mechanism
(a) I & II (b) II & III (c) I & IV (d) I, II & III

8. The decreasing order of nucleophilicity among the nucleophiles is

(1)  (2) CH_3O^- (3) CN^- (4) 

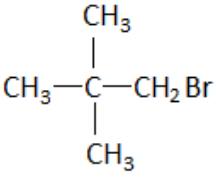
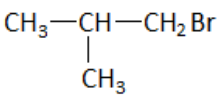
(a) 1, 2, 3, 4 (b) 4, 3, 2, 1 (c) 2, 3, 1, 4 (d) 3, 2, 1, 4

9. Consider the following bromides

(A)  (B)  (C) 

The correct order of SN^1 reactivity is
(a) C > B > A (b) A > B > C (c) B > C > A (d) B > A > C

10. In a SN^2 substitution reaction of the type $R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$
Which one of the following has the highest relative rate?

(a)  (b) CH_3CH_2Br (c) $CH_3CH_2CH_2Br$ (d) 

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
a	d	d	d	b	b	c	d	c	b

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PROPERTIES OF HALO ALKANES & HALO ARENES

1. 2-bromopentane $\xrightarrow{(CH_3)_3COK/(CH_3)_3COH}$ P

The major product (P) formed in the above reaction is

(a) pent-1-ene (b) cis pent-2-ene

(c) trans pent-2-ene (d) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - OC(CH_3)_3$

2. $CHCl_3$ on boiling with NaOH solution gives

(a) Sodium methoxide (b) methanal

(c) Sodium methanoate (d) Dichloromethanol

3. $(CH_3)_2CHBr \xrightarrow{Mg/ether} A \xrightarrow{C_6H_5COCH_3} B$

The product B in the above reaction is

(a) 2-phenyl-3-methyl butan-2-ol (b) 2-phenylpentan-2-ol

(c) 2-phenylpentan-2-ol (d) propan-2-ol and ethyl benzene

4. The reaction which is wrongly represented among the following is

(a) $CH_3 - CH_2Cl + NaI \xrightarrow{Acetone} CH_3 - CH_2I + NaCl$

(b) $CH_3COOAg + Br_2 \xrightarrow{CCl_4/reflux} CH_3Br + AgBr + CO_2$

(c) $CH_3COOAg + I_2 \xrightarrow{CCl_4/reflux} CH_3I + AgI + CO_2$

(d) $CH_3 - CH = CH_2 + Cl_2 \xrightarrow{775k} ClCH_2 - CH = CH_2 + HCl$

5. Which of the following statement is not correct regarding the solvoysis of 3-bromo-3-methylhexane?

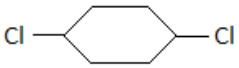
(a) Polar solvents accelerate the reaction

(b) The intermediate involves SP^2 carbon

(c) The rate of the reaction at a particular temperature depends only on the concentration of 3-bromo-3-methyl hexane

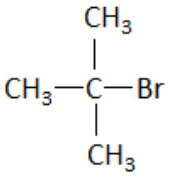
(d) The reaction involves inversion of configuration

6. Consider the following halogen containing compounds

(I) $CHCl_3$ (II) CCl_4 (III) CH_2Cl_2 (IV) CH_3Cl (V) 

The compounds with a net zero dipole moment are

(a) II, IV (b) II (c) III, IV (d) I, IV

7. *B(Major)* $\underset{CH_3CH_2OH}{\overset{CH_3CH_2O^-Na^+}{\rightleftarrows}}$  $\xrightarrow{CH_3CH_2OH}$ *A(Major) A and B are*

(a) Both A and B are $(CH_3)_3C - OCH_2CH_3$

(b) Both A and B are $(CH_3)_2C = CH_2$

(c) A is $(CH_3)_3C - OCH_2CH_3$ and B is $(CH_3)_2C = CH_2$

(d) A is $(CH_3)_2C = CH_2$ and B is $(CH_3)_3C - OCH_2CH_3$

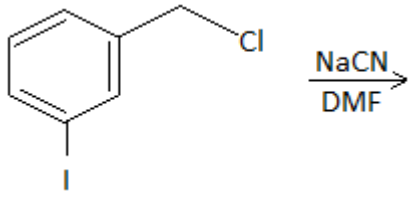
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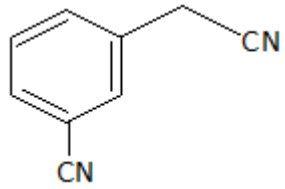
8. The major product formed on treatment of $CH_3CH_2CH(F)CH_3$ with CH_3O^-/CH_3OH is

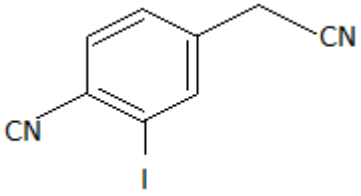
(a) $CH_3CH_2CH(OCH_3)CH_3$ (b) $CH_3CH = CHCH_3$

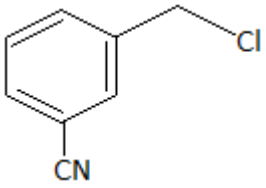
(c) $CH_3CH_2CH = CH_2$ (d) $CH_3CH_2CH_2OCH_3$

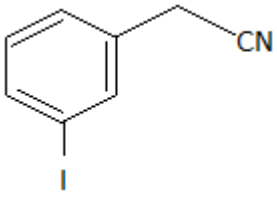
9. The structure of the major product formed in the following reaction is



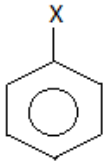
(a) 

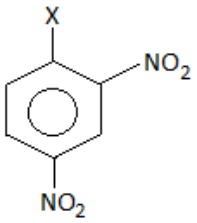
(b) 

(c) 

(d) 

10. The correct order of increasing reactivity of C – X bond towards nucleophile in the following compound is

(I) 

(II) 

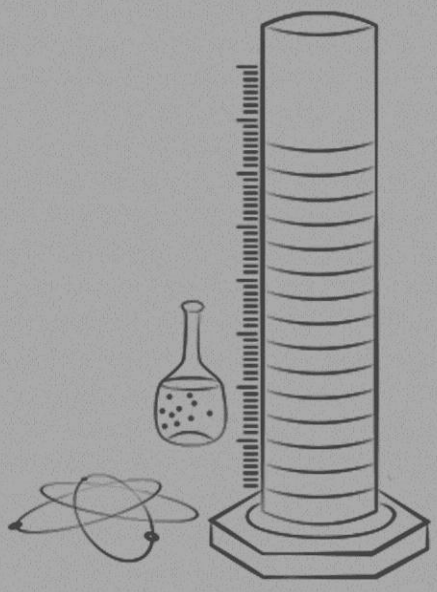
(III) $(CH_3)_3C—X$ (IV) $(CH_3)_2CH—X$

(a) III < II < I < IV (b) I < II < IV < III (c) II < III < I < IV (d) IV < III < I < II

ANSWER KEYS

1	2	3	4	5	6	7	8	9	10
a	c	a	c	d	a	c	c	d	b

Metallurgy



CHEMISTRY

1. Heating of Ores with flux to remove non fusible mass is called
   (a) Smelting (b) Calcination (c) Roasting (d) Cupellation

2. The process of converting hydrated Alumina into anhydrous alumina is called
   (a) Roasting (b) Calcination (c) Smelting (d) Refining

3. The flux used in extraction of Iron is
   (a) Limestone (b) Silica (c) Flint (d) Feldspar

4. Impurities physically associated with minerals are
   (a) Slag (b) Flux (c) Alloy (d) Matrix

5. Calamine is a mineral containing
   (a) ZnO (b) ZnS (c) $ZnSiO_3$ (d) $ZnCO_3$

6. Leaching is a process of
   (a) Reduction (b) Concentration (c) Refining (d) Oxidation

7. Purest form of Iron is
   (a) Cast Iron (b) Hard Steel (c) Stainless Steel (d) Wrought Iron

8. Roasting is generally done in case of
   (a) Oxide Ores (b) Silicate Ores (c) Sulphide Ores (d) Carbonate Ores

9. Zinc Blende is concentrated by
   (a) Electromagnetic Process (b) Calcination Process
   (c) Distillation (d) Froth Floatation Process

10. The most abundant metal in the Earth's crust is
    (a) Fe (b) Si (c) O (d) Al

ANSWER KEY:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	b	a	d	d	b	d	c	d	d

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1. Hydrometallurgy is useful in the extraction of
   (a) Sn (b) Al (c) Hg (d) Ag

2. An Ore which does not contain oxygen is
   (a)Bauxite (b) Haematite (c) Chalcopyrite (d) Calamine

3. Which of the following process is used in the extractive metallurgy of Magnesium?
   (a) Fused Salt Electrolysis (b) Self Reduction (c) Aqueous Solution Electrolysis (d) Thermite

4. In serpek's process, by product obtained in the purification of bauxite is
   (a) Al_2O_3 (b) N_2 (c) NH_3 (d) None

5. Which of the following dissolves in hot and concentrated solution of NaOH?
   (a) Zn (b) Fe (c) Ag (d) Cu

6. Which of the following contains both Ca and Mg?
   (a) Limestone (b) Dolomite (c) Chalk (d) Feldspar

7. An Alloy that does not contain copper
   (a) Bell Metal (b) Brass (c) Bronze (d) Solder

8. Duralumin is an Alloy of
   (a) Al and Mg (b) Mg and Ni (c) Al, Mg, Mn and Cu (d) Al and Ni

9. From Gold Amalgam, gold may be recovered by
   (a) Addition of Zn metal (b) Electrolytic Refining
   (c) Distillation (d) Dissolving it in HNO_3

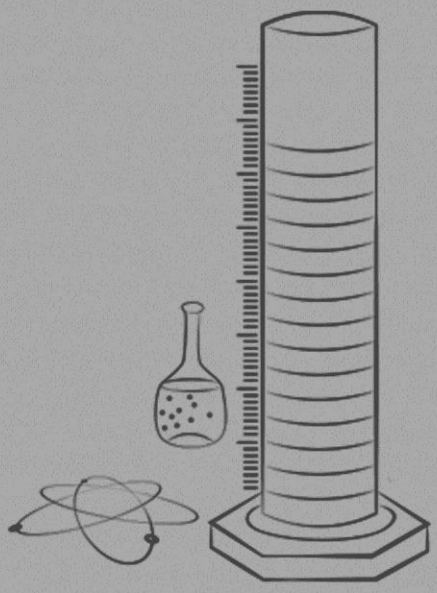
10. Radium is obtained from
   (a) Pitch blende (b) Haematite (c) Monazite (d) None of the Above

Answer Key :

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	c	a	c	a	b	d	c	c	a

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Compounds Containing Nitrogen



CHEMISTRY

Preparation and Properties of Amines

1. Aniline is not the major product in one of the following reactions. Identify that reaction.

(a) $C_6H_5OH + NH_3 \xrightarrow[300^\circ C]{ZnCl_2}$ (b) $C_6H_5NO_2 + Zn\ Powder \xrightarrow{alcoholic\ KOH}$

(c) $C_6H_5Cl + NH_3 \xrightarrow[Cu_2O]{300^\circ C}$ (d) $C_6H_5NO_2 + Fe + H_2O \xrightarrow{HCl}$

2. Which of the following amides will not undergo Hoffmann bromamide reaction?

(a) CH_3CONH_2 (b) $CH_3CH_2CONH_2$ (c) $C_6H_5CONH_2$ (d) $CH_3CONHCH_3$

3. Amongst the given set of reactants, the most appropriate for preparing 2° amine is _____

(a) 2° R – Br + NH_3

(b) 2° R – Br + NaCN followed by H_2/Pt

(c) 1° R – NH_2 + RCHO followed by H_2/Pt

(d) 1° R – Br (2 mol) + Potassium phthalimide followed by H_2O^+/heat

4. The reducing agent used for preparing aniline from nitro benzene in the laboratory is

(a) $LiAlH_4$ (b) Na / C_2H_5OH (c) Sn/HCl (d) Fe – steam and HCl

5. Which of the following pair is correctly matched

(a) Curtius reaction, carboxylic acid (b) Hoffmann rearrangement-acid azide

(c) Schmidt reaction-carboxylic acid (d) Lossen rearrangement-acid chloride

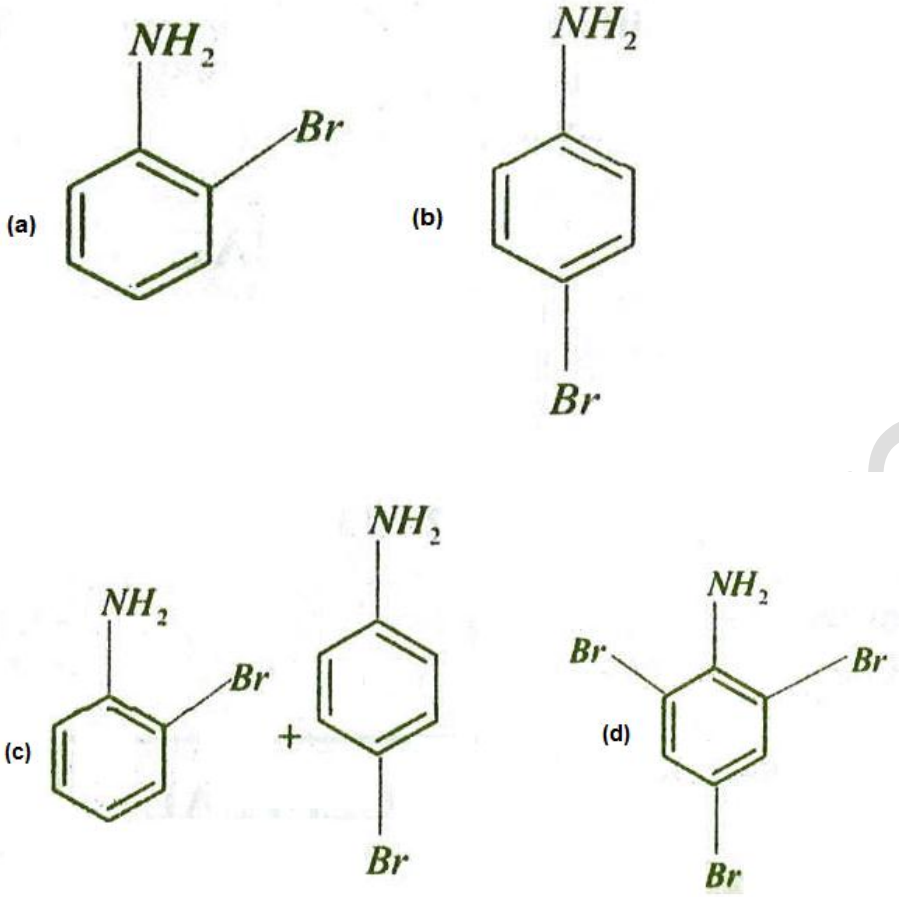
6. Arrange the following in the correct order of their basic character in gaseous phase

(I) NH_3 (II) RNH_2 (III) R_2NH (IV) R_3N

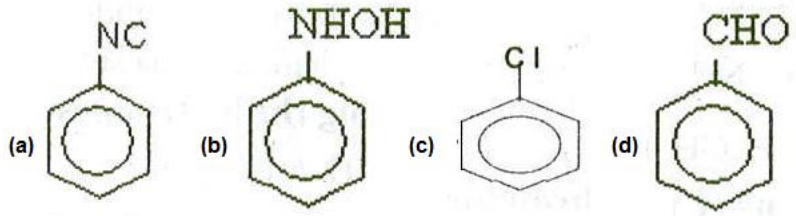
(a) IV > III > II > I (b) III > IV > II > I (c) III > II > IV > I (d) I > II > III > IV

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7. Aniline is treated with Br_2 water at room temperature to give the following product



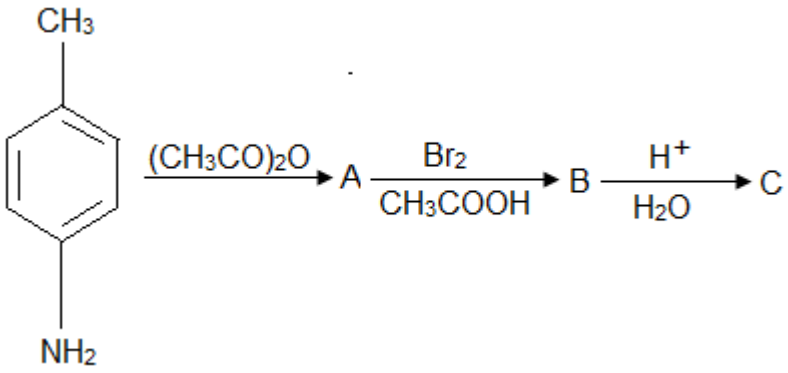
8. Aniline when treated with chloroform in presence of basic medium, gives following compound

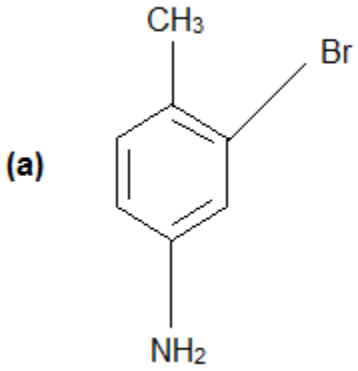


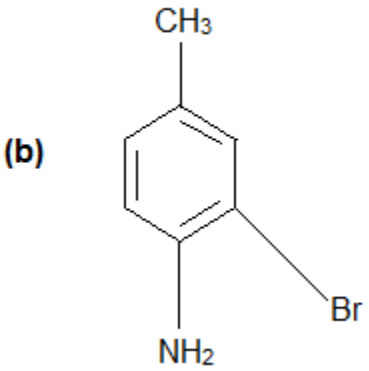
9. Acetamide is treated separately with the following reagents. Which one of these would give methylamine?

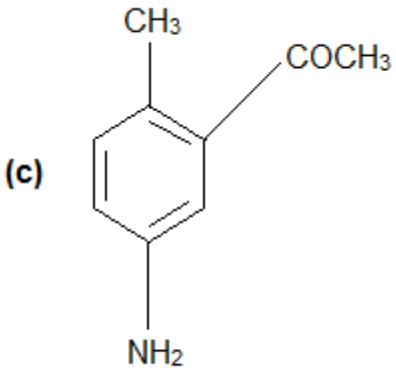
(a) PCl_5 (b) Sodalime (c) $NaOH + Br_2$ (d) Hot concentrated H_2SO_4

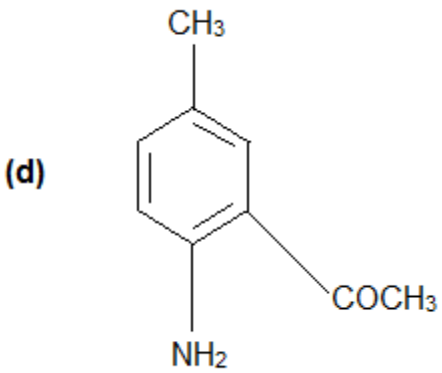
10.









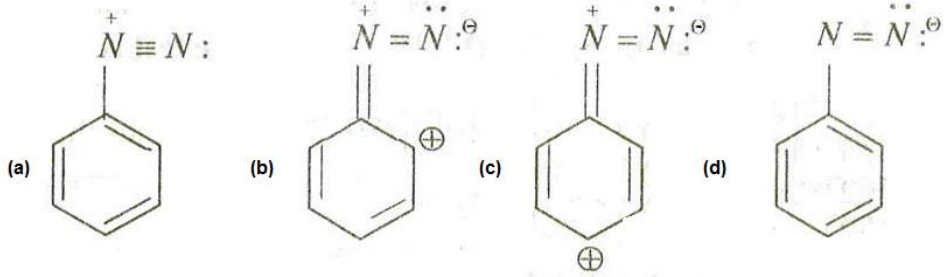


Answer Keys

1	2	3	4	5	6	7	8	9	10
b	d	c	c	c	a	d	a	c	b

Test of Amines, Basicity, Diazonium salts, Cyanides and Isocynaides

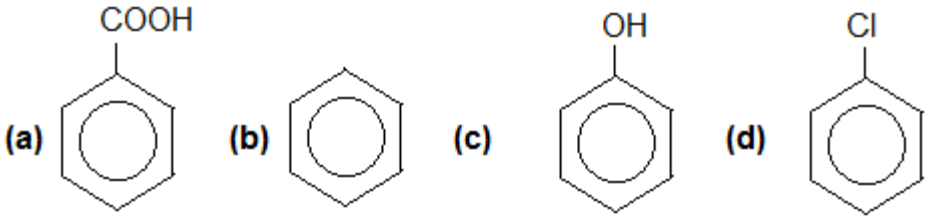
1. Among the following correct resonance structure of Benzene diazonium ion is



2. In the diazotization of arylamines with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to
   (a) Supress the concentration of free aniline available for coupling
   (b) Supress hydrolysis of phenol
   (c) Ensure a stoichiometric amount of nitrous acid
   (d) Neutralise the base liberated

3. Which of the following orders is correct regarding basicity of indicated molecules?
   (a) N, N – Dimethyltoluidine > p – toluidine > aniline > p – nitroaniline
   (b) Aniline > N, N – dimethyl – p toluidine > p – toluidine > aniline
   (c) p – Toluidine > N, N – dimethyl – p – toluidine > aniline > p – nitroaniline
   (d) N, N – Dimethyltoluidine > aniline > p – toluidine > p – nitroaniline

4. 'Z' in the following sequence of reaction is $C_6H_6 \xrightarrow[\Delta]{HNO_3/H_2SO_4}$ W $\xrightarrow{Zn/HCl}$ X $\xrightarrow[HCl,\,0-5°C]{NaNO_2}$ Y $\xrightarrow{H_2O/H_3PO_2}$ Z



5. Aniline and diphenylamine may be distinguished by
   (a) Azo – dye test (b) Hingsberg reagent (c) Carbylamine test (d) Acetyl chloride

6.

List – I		List – II	
A.	HVZ reaction	1.	$NaNO_2$ + HCl
B.	Clemmensen reduction	2.	hydrazine + KOH(alc)
C.	Diazotisation	3.	Sn/HCl
D.	Wolf-Kishner reduction	4.	Zn-Hg/Conc. HCl
		5.	Cl2/red P

The correct matching is

(a) A – 3, B – 1, C – 4, D – 3 (b) A – 5, B – 4, C – 1, D – 2

(c) A – 2, B – 5, C – 1, D – 3 (d) A – 1, B – 2, C – 4, D – 5

7. N-Ethyl formamide on dehydration with $POCl_3$ in presence of pyridine gives

(a) Ethyl amine (b) Ethyl cyanide (c) Ethyl isocyanide (d) Methyl isocyanide

8. Which of the following product is obtained when methyl isocynaide reacts with chlorine

(a) $CH_3N = CCl_2$ (b) $CH_3NCl – CCl_2$ (c) $ClCH_2NC$ (d) Cl_2CHNC

9. Acetaldoxime reacts with phosphorous pentoxide to give

(a) Methyl cyanide (b) Methyl cyanate (c) Ethyl cyanide (d) Ethyl isocyanide

10. Electrophilic and Nucleophillic reagents give addition on the same atom of the molecule in

(a) Cyanide (b) Isocyanide (c) Aldehyde (d) Ketone

Answer Keys

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	a	a	b	c	d	c	a	a	b

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Preparation and Properties of Amines
JEE Advanced

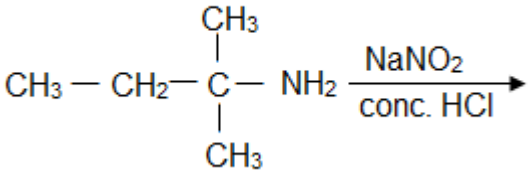
1. Hofmann degradation of m-bromobenzamide gives
   (a) aniline (b) m-bromoaniline (c) bromobenzene (d) m-bromoethyl benzene

2. An aromatic amine(A) was treated with alcoholic potash and another compound 'Y' then a foul smelling gas was formed with formula C_6H_5NC, 'Y' was formed by reacting a compound 'Z' with Cl_2 in presence of slaked lime. The compound 'Z' is
   (a) $C_6H_5NH_2$ (b) CH_3OH (c) CH_3COCH_3 (d) $CHCl_3$

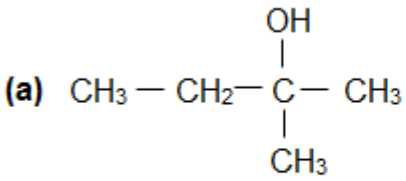
3. $CH_3CH_2Cl \xrightarrow{NaCN} X \xrightarrow{Ni/H_2} Y \xrightarrow[anhydride]{Acetic} Z$

   Z in the above sequence is
   (a) $CH_3CH_2CH_2NHCOCH_3$ (b) $CH_3CH_2CH_2NH_2$
   (c) $CH_3CH_2CH_2CONHCH_3$ (d) $CH_3CH_2CH_2CONHCOCH_3$

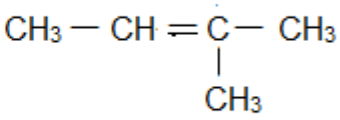
4. In the given reaction

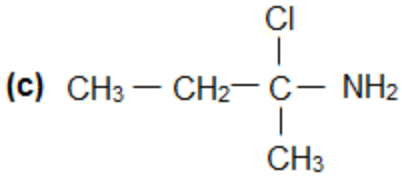


product(s). Products(s) will be



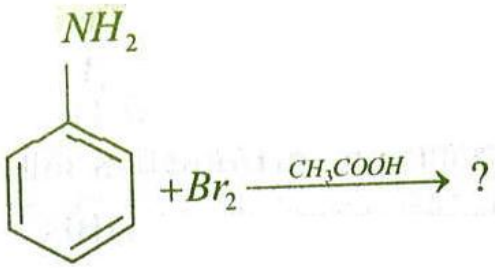
(b)

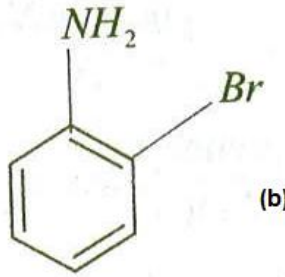




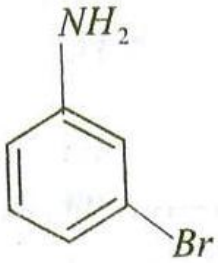
(d) All

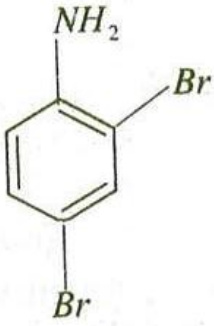
5.



(a) 

(b) 

(c) 

(d) 

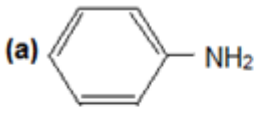
6. In the reaction, $C_6H_5NH_2 \xrightarrow[0-5°C]{NaNO_2+HCl}$ **(A)** $\xrightarrow[KCN]{Cu_2(CN)_2}$ **(B)** $\xrightarrow{H^+/H_2O}$ **(C)** the product (C) is

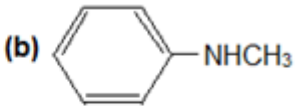
(a) $C_6H_5CH_2NH_2$ (b) C_6H_5COOH (c) C_6H_5OH (d) all the above

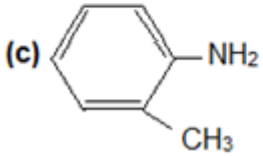
7. $C_6H_5Cl \xrightarrow[Cu_2O,\ 200°C]{NH_3}$ X ; X $\xrightarrow[0-5°C]{HNO_3}$ Z; X + Z → A; the no. of σ and π bonds in 'A' are

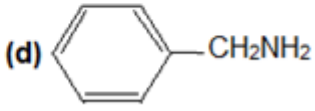
(a) 25σ, 6π (b) 25σ, 7π (c) 27σ, 7π (d) 27σ, 6π

8. Which of the following is the strongest base?

(a) 

(b) 

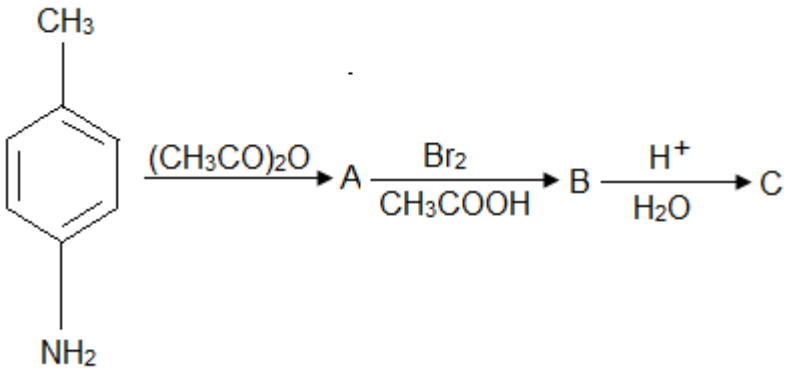
(c) 

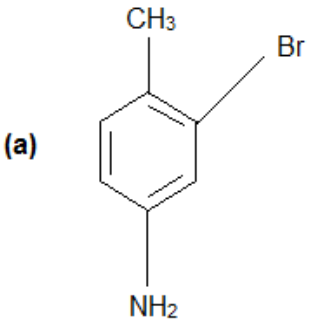
(d) 

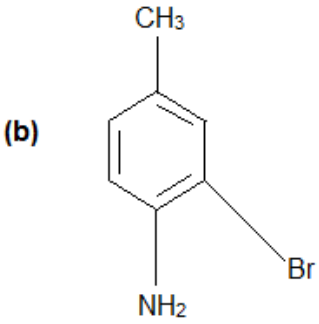
9. Which of the following compounds will dissolve in an alkali solution after it has undergone reaction with Hinsberg reagent?

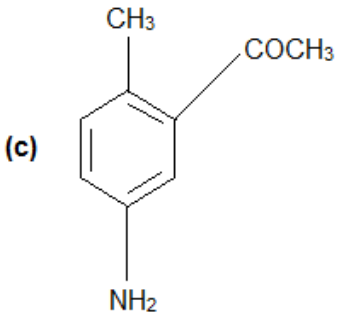
(a) (C_2H_5) NH (b) $(CH_3)_3N$ (c) CH_3NH_2 (d) $C_6H_5NHC_6H_5$

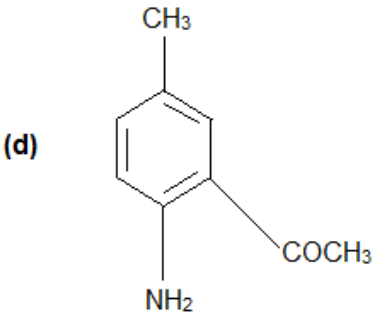
10.









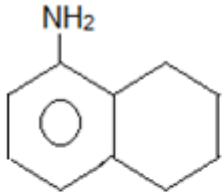


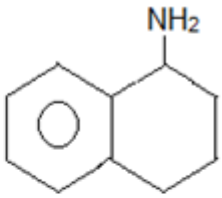
Answer Keys

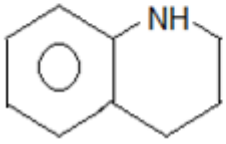
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b	c	a	d	c	b	c	d	c	b

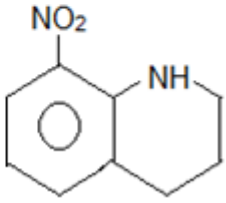
Test of Amines, Basicity, Diazonium salts, Cyanides and Isocynaides

1. Which of the following is the strongest base?

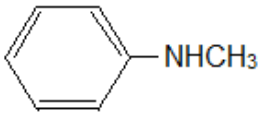
(a) 

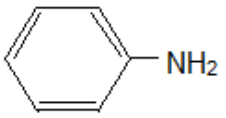
(b) 

(c) 

(d) 

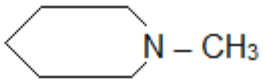
2. Which of the following has maximum pK_b value?

(a) $CH_3CH_2NH_2$ **(b)** 

(c) $(CH_2CH_2)_2NH$ **(d)** 

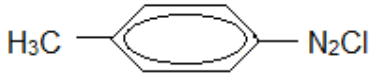
3. Amine which will not respond to Benzoylation reaction is

(a) $C_6H_5NH_2$ **(b)** 

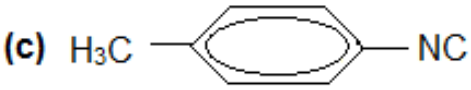
(c) 

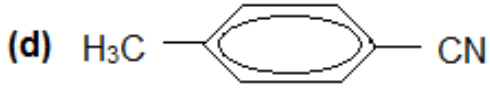
(d) $C_6H_5NHCH_3$

4. The reaction of chloroform with alcoholic KOH and p – toluidine forms

(a) 

(b) 

(c) 

(d) 

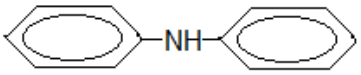
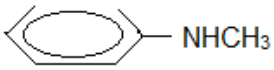
5. The compound which on reaction with aqueous nitrous acid at low temperature produces an oily nitrosoamine is
(a) methylamine (b) ethylamine (c) diethylamine (d) triethylamine

6. In the reaction, $C_6H_5NH_2 \xrightarrow[0-5°C]{NaNO_2+HCl}$ **(A)** $\xrightarrow[KCN]{Cu_2(CN)_2}$ **(B)** $\xrightarrow{H^+/H_2O}$ **(C)** the product (C) is

(a) $C_6H_5CH_2NH_2$ (b) C_6H_5COOH (c) C_6H_5OH (d) all the above

7. Maximum pK_b value is of

(a) $(CH_3)_2$ NH (b) $(CH_3CH_2)_2$ NH

(c)  **(d)** 

8. The only stable organic functional group in which carbon is divalent is

(a) $:CCl_2$ (b) $:CH_2$ (c) $:CBr_2$ (d) R – NC

9. A positive carbylamines test is given by

(a) N, N-dimethyl aniline (b) isopropyl amine (c) diethyl amine (d) trimethyl amine

10. Libermann's nirtoso reaction is used for testing

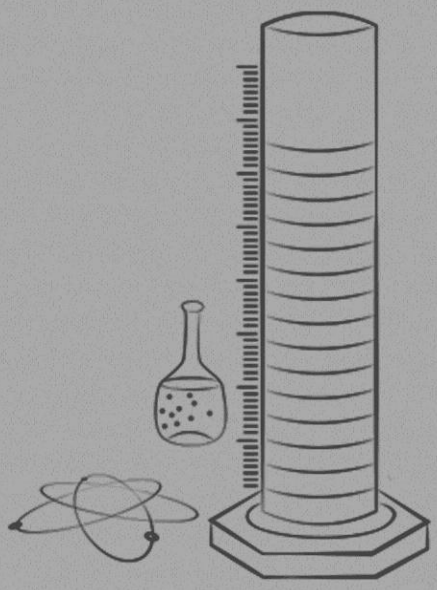
(a) Aniline (b) N-Methylaniline (c) N,N-Dimethylaniline (d) O-, m- or P-Toluidine

Answer Keys

1	2	3	4	5	6	7	8	9	10
b	d	c	c	c	b	c	d	b	b

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p – Block Elements



CHEMISTRY

1. Phosphorus forms its chloride in its first excited state in which the percentage of p-character in the hybridized orbital of phosphorus is
   a) 75 b) 20 c) 50 d) 60

2. Ortho phosphoric acid on heating gives
   a) phosphine b) phosphorous pentoxide
   c) phosphorous acid d) pyro phosphoric acid

3. Oxidation state of nitrogen in its acidic hydride is
   a) –3 b) –2 c) –1/3 d) +3

4. The number of unprotonated oxygen atoms linked to phosphorous in H_3PO_2, H_3PO_3 and H_3PO_4 respectively are
   a) 1, 2, 3 b) 2, 1, 0 c) 2, 3, 4 d) 1, 1, 1

5. Among the following, most volatile and least volatile pair is
   a) NH_3, SbH_3 b) PH_3, NH_3 c) PH_3, SbH_3 d) AsH_3, PH_3

6. In P_4O_{10} the number of oxygen atoms which are not acting as bridges
   a) 2 b) 4 c) 6 d) 8

7. A and B are two gases. 'A' is identified with the glass rod dipped in NH_3 and B is identified with the glass rod dipped in HCl. Then A, B are
   a) HCl, NO_2 b) HCl, NH_3 c) NH_3, HCl d) NH_3, SO_2

8. The trend that is not observed down the group in hydrides of V A group elements is
   a) bond length decreases b) bond angle decreases
   c) reducing nature increases d) bond energy decreases

9. Calcium cyanamide on treatment with steam under pressure gives ammonia and
   a) calcium carbonate b) calcium hydroxide
   c) calcium oxide d) calcium bicarbonate

10. A tribasic acid with peroxy bond is
    a) H_3PO_2 b) H_3PO_3 c) H_3PO_4 d) H_3PO_5

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
D	D	C	D	C	B	B	A	A	D

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1. Which among the following does not give oxyacid on hydrolysis ?
   a) SCl_4 b) NO_2 c) OF_2 d) PCl_5

2. More acidic gaseous oxide of VIA group elements is
   a) SO_2 b) SO_3 c) TeO_3 d) TeO_2

3. Fluorine can be freed from HF by passing the mixture through
   a) H_2O b) NaOH c) conc.H_2SO_4 d) NaF

4. Match the following :

Compound	Oxidation state of S
A) H_2SO_4	I) 0
B) H_2SO_3	II) +2.5
C) S_8	III) +6
D) $Na_2S_4O_6$	IV) +4
	V) +7

	A	B	C	D
a)	III	IV	I	II
b)	III	V	I	II
c)	III	IV	I	II
d)	I	V	III	IV

5. The chalcogen which has the number of electrons in penultimate and antipenultimate shell
   a) oxygen b) sulphur c) selenium d) tellurium

6. Elementary sulphur is obtained in the reaction between
   a) $H_2S + F_2$ b) $H_2S + Cl_2$ c) $Na_2S_2O_3 + Cl_2$ d) 2 and 3

7. Which of the following is the most acidic hydride?
   a) H_2Te b) H_2Se c) H_2O d) H_2S

8. Semiconducting chalcogen is
   a) oxygen b) selenium c) polonium d) arsenic

9. S-O-S bond is present in
   a) thiosulphuric acid b) pyrosulphuric acid c) Caro's acid d) Marshall's acid

10. When 1 gram Ca is completely burnt in oxygen,
    a) mass increases by 40% b) mass increases by 20%
    c) mass decreases by 40% d) no change in mass

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	B	D	A	D	D	A	B	B	A

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1. O-Cl-O bond angle is least in
   a) ClO_2^- b) ClO_3^- c) ClO_4^- d) all have same bond angle

2. The true statement about oxides of chlorine is
   a) the acidic nature decreases from Cl_2O_7 to Cl_2O
   b) the oxidation state on Cl atom increases from Cl_2O_7 to Cl_2O
   c) the oxidation power decreases from Cl_2O_7 to Cl_2O
   d) the number of lone pairs on Cl atom decreases from Cl_2O_7 to Cl_2O

3. Cl-O bond length in the following order
   a) $ClO^- > ClO_3^- > ClO_2^- > ClO_4^-$ b) $ClO_3^- > ClO_2^- > ClO_4^- > ClO^-$
   c) $ClO^- > ClO_2^- > ClO_3^- > ClO_4^-$ d) $ClO_4^- > ClO_3^- > ClO_2^- > ClO_4^-$

4. Two gases A and B can respectively bleach the vegetable coloured matter by oxidation and reduction
   a) SO_2 and Cl_2 b) Cl_2 and O_3 c) Cl_2 and SO_2 d) O_3 and Cl_2

5. Chlorine reacts with hot and concentrated NaOH to form
   a) NaCl, NaClO b) NaClO, $NaClO_3$ c) $NaClO_2$, NaClO d) NaCl, $NaClO_3$

6. With excess ammonia the products formed by chlorine are
   1) NCl_3 and HCl 2) NCl_3 and NH_4Cl 3) N_2 and NH_4Cl 4) NH_4Cl and HCl

7. The number of p□-d□ bonds present in perchlorate ion is
   a) 1 b) 2 c) 3 d) 4

8. The F_2 is passed through water
   a) HF and HOF are formed b) HF and O_2 are formed
   c) HF and ozonised oxygen are formed d) only HOF and O_2 are formed

9. Order of bond energies of halogens
   a) $F_2 > Cl_2 > Br_2 > I_2$ b) $Cl_2 > Br_2 > F_2 > I_2$ c) $Cl_2 > Br_2 > I_2 > F_2$ d) $Cl_2 > F_2 > Br_2 > I_2$

10. An oxoacid of chlorine formed will have one p□ - d□ bond in a particular excited states. In the same excited state if chlorine forms an inter halogen compound A, then which of the following is correct about A.
    a) the molecule is pyramidal b) in the molecule Cl is in sp^3d hybridization
    c) central atom will have two lone pairs d) the molecule has T shape
    a) i and ii b) only ii c) ii, iii and iv d) i, ii and iii

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
A	A	C	C	D	C	C	C	B	C

1. XeF_4 is formed by Xe in its
   a) first excited state b) second excited state
   c) third excited state d) fourth excited state

2. Oxidation state of sulphur is minimum in
   a) sulphuric anhydride b) Caro's acid c) sulphuric acid d) thionyl chloride

3. Correct order of abundances of gases in air
   a) $N_2 > O_2 > Ar > He$ b) $N_2 > O_2 > He > Ar$ c) $Ar > He > N_2 > O_2$ d) $O_2 > N_2 > He > Ar$

4. Number of bond pairs and lone pairs present respectively on the central atom of xenon difluoride are
   a) 4, 4 b) 2, 3 c) 6, 1 d) 4, 2

5. Correct combination of the following
   a) XeO_3 – sp^2, plane triangle b) XeO_4 – sp^3, square planar
   c) XeF_4 – sp^3d^2, tetrahedral d) XeF_6 – sp^3d^3, distorted octahedral

6. The number of $d\pi$-$p\pi$ bonds in XeO_3 molecule is
   a) 1 b) 2 c) 3 d) 4

7. Correct statements of the following:
   a) XeO_4 is formed in fourth excited state of Xe
   b) overlapping involved in XeO_4 are σsp^3-p and $d\pi$-$p\pi$
   c) XeO_3 is hygroscopic and explosive
   d) XeO_3 has one lone pair on central atom
   a) all are correct b) A, B, C c) A, C, D d) A, D

8. Match the following :

List-I	List-II
A) Helium	I) Detection of neutral mesons
B) Neon	II) Beacon lights
C) Argon	III) Miners cap lamps
D) Xenon	IV) Gas thermometers
	V) Fluorescent tubes

	A	B	C	D
a)	IV	II	V	I
b)	IV	II	V	III
c)	IV	III	V	I
d)	I	V	II	IV

9. Which of the following is used in locating defect in steel casting?
   a) He b) Ar c) Xe d) Rn

10. Pair of gases with nearest boiling point is
    a) Ne, Ar b) N_2, O_2 c) Ar, O_2 d) O_2, Kr

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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	D	A	B	D	C	A	A	D	C

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1. Which of the following is used for drying of ammonia ?
   A) conc. H_2SO_4 B) CaO C) P_2O_5 D) anhydrous $CaCl_2$

2. Which one of the following oxides of nitrogen is a coloured gas ?
   A) N_2O_5 B) NO_2 C) NO D) N_2O

3. Nitrogen dioxide can not be obtained by heating
   A) KNO_3 B) $Pb(NO_3)_2$ C) $Ca(NO_3)_2$ D) $AgNO_3$

4. White phosphorus reacts with caustic soda. The products are PH_3 and NaH_2PO_2. This reaction is an example of
   A) oxidation B) reduction C) neutralization D) oxidation and reduction

5. Amongst the trihalides of nitrogen, which one is least basic ?
   A) NF_3 B) NCl_3 C) NBr_3 D) NI_3

6. Which one of the following is the strongest base ?
   A) AsH_3 B) SbH_3 C) PH_3* D) NH_3

7. Which of the following oxides of nitrogen is the anhydride of nitrous acid ?
   A) NO B) N_2O_3 C) N_2O_4 D) N_2O_5

8. One mole of calcium phosphide on reaction with excess of water gives
   A) one mole of phosphine B) two moles of phosphoric acid
   C) two moles of phosphorus pentaoxide D) two moles of phosphine

9. When ammonia is passed over heated CuO, it is oxidised to
   A) HNO_2 B) N_2O C) N_2 D) NO_2

10. The CN^- ion and N_2 are isoelectronic. But in contrast to CN^-, N_2 is chemically inert because of
    A) low bond energy
    B) absence of bond polarity
    C) unsymmetrical electron distribution
    D) presence of more number of electrons in bonding orbital

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	B	A	D	A	D	B	D	C	B

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1. When $AgNO_3$ is heated strongly, the products formed are
   A) NO and NO_2 B) NO_2 and N_2O C) NO_2 and O_2 D) NO and O_2

2. By the action of conc. H_2SO_4, phosphorus changes to
   A) phosphorus acid B) metaphosphoric acid
   C) orthophosphoric acid D) pyrophosphoric acid

3. Which of the following species is paramagnetic ?
   A) O_2^{2-} B) NO C) CO D) CN^-

4. The increasing order of acidity of H_2O_2, H_2O and CO_2 is:
   A) $H_2O > H_2O_2 > CO_2$ B) $H_2O < H_2O_2 < CO_2$ C) $H_2O_2 > CO_2 > H_2O$ D) $H_2O_2 > H_2O > CO_2$

5. H_2S does not produce metallic sulphide with:
   A) $CdCl_2$ B) $ZnCl_2$ C) $COCl_2$ D) $CuCl_2$

6. The bond orders of the given species are such that:
   A) $O_2^{2-} > O_2^+ > O_2^- > O_2$ B) $O_2^+ > O_2 > O_2^- > O_2^{2-}$
   C) $O_2^+ > O_2^{2-} > O_2^- > O_2$ D) $O_2^{2-} > O_2^- > O_2^+ > O_2$

7. Among the species O_2^+, O_2^{2+}, CO^+ and O_2^{2-}, a sigma bond only is present in:
   A) O_2^{2-} B) O_2^{2+} C) CO^+ D) O_2^+

8. Which of the following compounds is chemically inert:
   A) SF_4 B) SH_2 C) SF_6 D) XeF_2

9. Which of the following is the correct order of gradually decreasing basic nature of oxides:
   A) Al_2O_3. MgO, Cl_2O_7, SO_3 B) Cl_2O_7, SO_3, Al_2O_3, MgO
   C) SO_3, Cl_2O_7, MgO, Al_2 D) MgO, Al_2O, SO_3, Cl_2O_7

10. The correct order of acidic strength is:
   A) $Cl_2O_7 > SO_2 > P_4O_{10}$ B) $CO_2 > N_2O_5 > SO_3$
   C) $Na_2O > MgO > Al_2O_3$ D) $K_2O > CaO > MgO$

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	C	B	B	C	B	A	C	C	A

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1. Which of the following does not have S - S linkage:
   A) $S_2O_8^{2-}$ B) $S_2O_6^{2-}$ C) $S_2O_5^{2-}$ D) $S_2O_3^{2-}$

2. Which of the following is the most acidic:
   A) N_2O_5 B) P_2O_5 C) As_2O_5 D) Sb_2O_5

3. At ordinary temperature and pressure, among halogens, chlorine is a gas, bromine is a liquid and iodine is a solid. This is because
   A) The specific heat is in the order $Cl_2 > Br_2 > I_2$
   B) Intermolecular forces among molecules of chlorine are the weakest and those in the iodine the strongest
   C) The order of density is $I_2 > Br_2 > Cl_2$
   D) The order of stability is $I_2 > Br_2 > Cl_2$

4. Which of the following statement is true ?
   A) Silicon exhibits coordination number in its compounds
   B) Bond energy of F_2 is less than Cl_2
   C) Mn (III) oxidation state is more stable than Mn (II) in aqueous state
   D) Elements of 15th group show only +3 and +5 oxidation states

5. Mark the incorrect statement.
   Halogens are coloured because
   A) The excitation energy required by small fluorine atom is smaller than required by the large iodine atom.
   B) Large iodine molecules absorb low energy (yellow and green radiations) and appear violet in colour.
   C) The small fluorine molecules absorb high energy (violet radiations) and appear yellow.
   D) Of absorption of visible light by their molecules resulting in the excitation of outer electrons to higher energy level.

6. Which reaction is not feasible ?
   A) $2KI + Br_2 \rightarrow 2KBr + I_2$ B) $2KBr + I_2 \rightarrow 2KI + Br_2$
   C) $2KBr + Cl_2 \rightarrow 2KCl + Br_2$ D) $2H_2O + 2F_2 \rightarrow 4HF + O_2$

7. The correct order of electron affinity among the following is
   A) Br > Cl > F B) Cl > F > Br C) F > Cl > Br D) F > Br > Cl

8. Fluorine is isolated by the electrolysis of
   A) Anhydrous hydrogen fluoride
   B) Molten cryolite
   C) A mixture of potassium hydrogen fluoride and anhydrous hydrogen fluoride
   D) All of the above

9. When cold NaOH reacts with Cl_2 which of the following is formed ?
   A) NaClO B) $NaClO_2$ C) $NaClO_3$ D) None

10. One gas bleaches the colours of flowers by reduction and the other by oxidation. The two gases are respectively
    A) CO and CO_2 B) H_2S and Br_2 C) SO_2 and Cl_2 D) NH_3 and SO_2

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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
A	A	B	B	A	B	B	C	A	C

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1. Bleaching power is obtained by the interaction of chlorine and
   A) Dry slaked lime B) Dilute solution of $Ca(OH)_2$
   C) Dry calcium oxide D) Conc. Solution of $Ca(OH)_2$

2. In the manufacture of bromine from seawater, the mother liquor containing bromides is treated with
   A) CO_2 B) Cl_2 C) I_2 D) SO_2

3. Tincture of iodine contains
   A) I_2, KI and rectified spirit B) I_2 and rectified spirit
   C) KI and rectified spirit D) I_2 and water

4. When I_2 is dissolved in CCl_4, the colour that results is
   A) brown B) violet C) colourless D) bluish green

5. The solubility of iodine in water is increased, if it is mixed with
   A) Alcohol B) Chloroform C) Sodium hydroxide D) Potassium iodide

6. Which halogen is used as an antiseptic ?
   A) F_2 B) Cl_2 C) Br_2 D) I_2

7. When SO_2 is passed through an aqueous solution of iodine, it becomes colourless. This is due to
   A) Bleaching of SO_2 B) Formation of HI
   C) Combination of SO_2 and I_2 D) Formation of HIO_3

8. HCl is a gas, but HF is a low boiling liquid. This is because
   A) H - F bond is strong
   B) H - F bond is weak
   C) The molecules aggregate because of hydrogen bonding
   D) HF is weak acid

9. Assertion (A) : In the preparation of HBr from NaBr, HNO_3 is used in preference to H_3PO_4.
   Reason (R) : HNO_3 is a stronger acid than H_3PO_4
   A) Both A and R are true and R is the correct explanation for A
   B) Both A and R are true, but R is not the correct explanation for A
   C) A is true, but R is false
   D) A is false, but R is true

10. HI cannot be prepared by the action of conc. H_2SO_4 on KI because
   A) HI is stronger than H_2SO_4 B) HI is more volatile than H_2SO_4
   C) H_2SO_4 is an oxidising agent D) H_2SO_4 forms complex

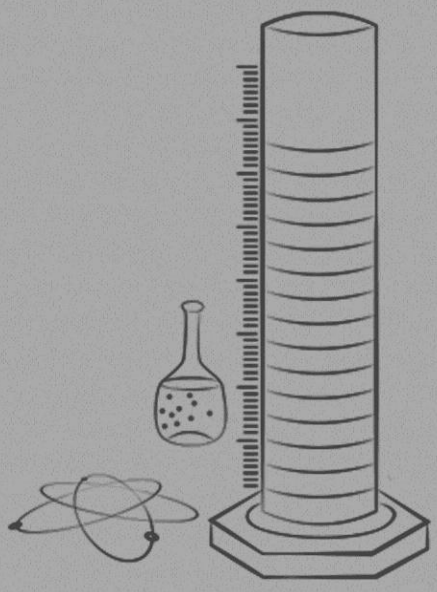
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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
A	B	A	B	D	D	B	C	D	C

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Polymers



CHEMISTRY

MCQ [One Correct Option]

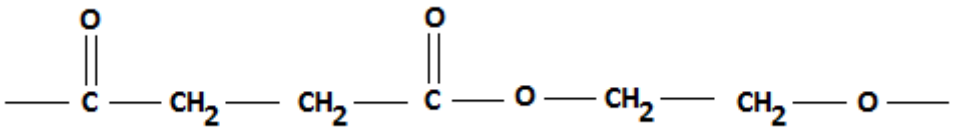
1. Thermosetting polymers
   (a) Normally remain soluble. (b) do not melt or soften on heating.
   (c) cross linking occurs during heating (d) All are correct.

2. Formaldehyde is used in the manufacture of
   (a) Teflon (b) Bakelite (c) Gammexane (d) Dynamite

3. In vulcanization of Rubber
   (a) Sulphur reacts to form a new compound. (b) Sulphur cross links are introduced.
   (c)Sulphur forms a very thin protective layer over rubber (d) All statements are correct.

4. An example of condensation polymer is
   (a) PVC (b) Terylene (c) Polypropylene (d) Polystyrene

5. What type of polymer is represented by the following segment ?



   (a) Polyamide (b) Polyester (c) Polyolefin (d) Polyethylene

6. A high molecular weight molecule which does not contain repeating structural units is called a
   (a) Polymer (b) Macromolecule (c) Both A and B (d) None of these.

7. Which one of the following molecules cannot serve as a monomer for an addition polymer?
   (a) ClCH=CH_2 (b) CH_2=CHCN (c)CH_2=CH-C_6H_5 (d) CH_3- COOH

8. Polymers which contain a foreign molecule in addition to the recurring unit are known as
   (a) Telomers (b) Addition polymers
   (c) Synthetic polymers (d) Condensation polymer.

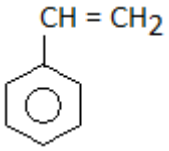
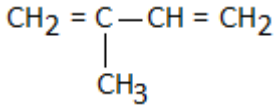
9. Addition polymer formation from monomers generally starts by
   (a) condensation reaction between monomers.
   (b) coordination reaction between monomers.
   (c) conversion of monomer to monomer radicals.
   (d)Hydrolysis of Monomers.

10. Which of the following is a natural polymer?
   (a) Terylene (b) Orlon (c) Starch (d) Dacron

ANSWERS

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	b	b	b	b	b	d	a	c	c

MCQ [One Correct Option]

1. Natural rubber is a polymer of
   (a) CH_2=CH-CH=CH_2 (b) CH_2=CH_2
   (c)  (d) 

2. Which of the following glycol is an important constituent?
   (a) Dacron (b) Acrilan (c) Teflon (d) Viscose system

3. Which one of the following is a chain growth polymer?
   (a) Polypropylene (b) Nylone-66 (c) Nylone-6 (d) Bakelite

4. Which of the following is a polyamide?
   (a) Teflon (b) Nylon-66 (c) Nylon-6 (d) Bakelite

5. Natural rubber and Gutta-percha respectively are
   (a) cis-polyisoprene and trans-polyisoprene (b) Both are cis-polyisoprene
   (c) Both are trans-polyisoprene (d) trans-polychoroprene and cis-polychloroprene.

6. Which of the following is fully fluorinated polymer?
   (a) Neoprene (b) Teflon (c) Thiokol (d) PVC

7. Which one is a protein fibre ?
   (a) Cotton (b) Rayon (c) Silk (d) Polyester

8. Heating of Rubber with sulphur is known as
   (a) Galvanisation (b) Bessemerisation (c) Vulcanisation (d) Sulphonation

9. Polymer used in Bullet proof glass is
   (a) PMMA (b) Lexan (c) Nomex (d) Kevlar

10. Polymerization of caprolactum yields
    (a) Terylene (b) Orlon (c) Nylon-66 (d) Nylon-6

ANSWERS KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	a	a	b	a	b	c	c	b	d

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MCQ [One Correct Option]

1. Among cellulose, polyvinyl chloride,Nylon and natural rubber, the polymer in which the inter molecular force of attraction is weakest is
   (a)Nylon (b)Polyvinyl chloride (c) Cellulose (d) Natural Rubber

2. Which of the following alkenes is most reactive towards cationic polymerization?
   (a) $CH_2=CHCH_3$ (b) $CH_2=CHCl$
   (c) $CH_2=CHC_6H_5$ (d) $CH_2=CHCOOCH_3$

3. Polyethylene is obtained from calcium carbide.
   (a)$C_aC_2+2H_20 \longrightarrow (Ca(OH)_2 + C_2H_2$
   (b)$C_2H_2+H_2 \longrightarrow C_2H_4$
   (C)n $C_2H_4 \longrightarrow (CH_2-CH_2)n$
   Therefore the amount of polyethylene obtained for 64 k_g CaC_2 is
   (a) 7kg (b) 14kg (c) 21kg (d) 28kg

4. Which of the following monomers on polymerization give polyorymethylene also known as Polyacetal and which does not exist is isotactic, syndiotactic and and a tactic forms?
   (a) Methoxyethene (b) Formaldehyde (c)Ethoxyethene (d) Propene

5. Which one of the following monomers gives the polymer Neoprene on polymerization?
   (a) $CH_2=CHCl$ (b) $CCl_2=CCl_2$ (c) $CH_2=CCl-CH=CH_2$ (d) $CF_2=CF_2$

6. A Polymer which has better light transmission properties than even glass is
   (a) Perspex (b) Bakelite (c) Buna-s (d) Polyethyl Acrylate.

MCQ [More than one correct option]

7. Which of the following are addition Homopolymers?
   (a) Teflon (b) SBR (c) PVC (d) Natural Rubber

8. Which of the following are not used as vulcanizing Agent?
   (a) Sulphur (b) Graphite (c) Carbon Black (d) $C0_2$

9. Which of the following are Biodegradable polymers?
   (a) Nylon-66 (b) PHBV (c) Nylon-2-Nylon-6 (d) Polychloroprene.

10. Cross-Linking is not present in
    (a) Polythene (b) Bakelite (c) Nylon-6 (d) polyester.

ANSWERKEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	c	d	b	c	a	a,c,d	b,c,d	b, c	a,c,d

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MCQs] [One Correct Option]

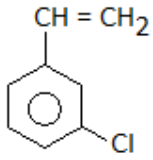
1. When polythene bags are burnt the nomious fumes produced are
   (a) Hcl, HCN, CO (b)CO_2,H_2O (c) CS_2, NO_2,CO_2 (d) All the Above

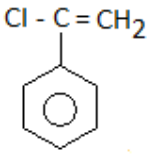
2. When the unit of polythene is treated with B_2H_6, Followed by alkaline H_2O_2 the product obtained is
   (a) CH_3CH_2OH (b) CH_3COOH (c) CH_3COCH_3 (d) None of these.

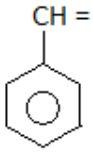
PASSAGE [Comprehension Type]

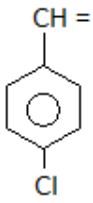
Passage: An Aromatic compound (C_8H_7Cl) decolorizes Br_2/H_2O. In presence of Pt when heated , (A) forms a homopolymer. Ozonolysis of mother compound gives aldehydes as the products. Mother compound can also be to obtain renowned oxidizing agent (MCPBA).

3. The suspected mother compound is

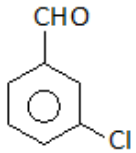
(a) 

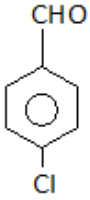
(b) 

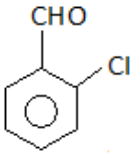
(c) 

(d) 

4. The suspected aldehyde is

(a) 

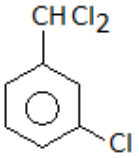
(b) 

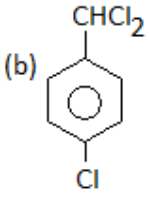
(c) 

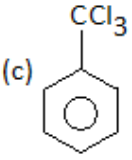
(d) HCHO

5. Halogenation of the mother compound using haloacids readily follows.
   (a) Aromatic Nucleophilic substitutions (b) Aromatic Electrophilic substitution.
   (c)Markownikoff's Rule (d) None of these.

6. When the ozonized product is treated with PCl_5 the new product obtained is

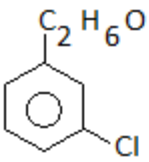
(a) 

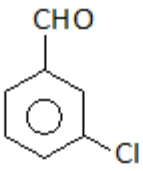
(b) 

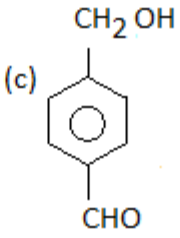
(c) 

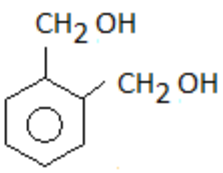
(d) None of these

7. When above product is hydrolysed which of the following product is Obtained

(a) 

(b) 

(c) 

(d) 

Assertion [Reason ,Type]

Each Question contains statement 1 (Assertion) and Statement -2 (Reason) of these statements, Mark correct choice if
(a) Statements-1 and 2 are true and statement is a correct explanations for statements-1.
(b) Statement-1 and 2 are true and statement -2 is not a correct explanation for statement-1.
(c) Statement-1 is true, Statement-2 is false.
(d) statement-1 is false,statement-2 is true.

8. Statement-1: In vulcanization of rubber, sulphur cross-links are introduced.
Statement-2: Vulacanisation is a free radical initiated chain reaction
(a) (b) (c) (d)

9. Statement-1 The monomer of Neoprene is 1,3- butadiene.
Statement-2: Neoprene is Non-Inflammable.
(a) (b) (c) (d)

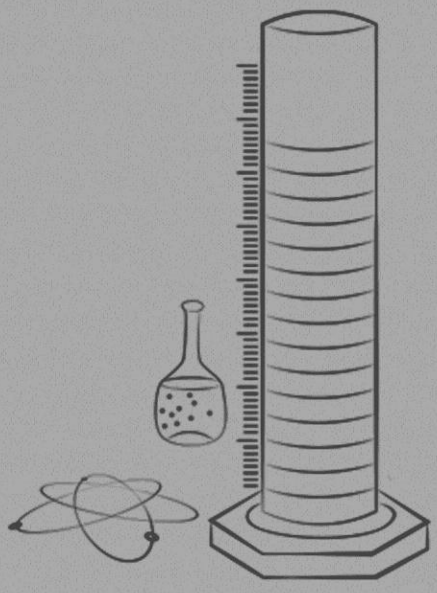
10. Statement-1 : Thermoplastics become hard on heating and soft on cooling.
Statement-2 : Thermoplastics are linear polymers which are soluble in many organic solvents.
(a) (b) (c) (d)

ANSWERS KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	a	a	a	c	a	b	b	d	d

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Solid State



CHEMISTRY

1. Tetragonal crystal system has the following unit cell dimensions:
   (a) a = b = c and $\alpha = \beta = \gamma = 90^{\circ}$ (b) a = b $\neq$ c and $\alpha = \beta = \gamma = 90^{\circ}$
   (c) a $\neq$ b $\neq$ c and $\alpha = \beta = \gamma = 90^{\circ}$ (d) $a = b \neq c$ and $\alpha = \beta = 90^{0}, \gamma \neq 90^{0}$

2. The number of atoms per unit cell in a simple cubic, face-centred cubic and body-centred cubic are x, y and z respectively, then $\frac{x+y}{z}$ is ;
   (a) 6 (b) 3 (c) 2.5 (d) 4

3. A compound formed by elements X,Y and Z. Atoms of Y forms ccp lattice and X occupies half the octahedral voids and Z occupies half the tetrahedral voids. The formula of compound is :
   (a) XY_2Z_3 (b) XY_2Z_4 (c) X_2YZ_3 (d) XY_2Z_2

4. Atoms of element B forms hcp lattice and those of the element A occupy 2/3rd of tetrahedral voids. The formula of the compound formed by these elements A and B is :
   (a) A_3B_4 (b) A_4B_3 (c) A_2B_3 (d) A_3B_2

5. In a solid , oxide ions are arranged in CCP. Cations 'A' occupy one sixth of the tetrahedral voids and cations 'B' occupy one third of octahedral voids. The formula of the compound is :
   (a) ABO_3 (b) AB_2O_3 (c) A_2BO_3 (d) $A_2B_2O_3$

6. The following lattice system primitive unit cells has $a \neq b \neq c$, except
   (a) Orthorhombic (b) Monoclinic (c)Triclinic (d)Hexagonal

7. Which of the following is not a covalent solid?
   (a) Diamond (b) Graphite (c) Ice (d)Carborundum

8. Which is not true about a BCC unit cell?
   (a) The number of atoms in the unit cell is 2
   (b) In addition to an atom at the centre of the body, in a unit cell there are 8 atoms at 8 different corners
   (c) 1/8th of an atom at a corner of the unit cell
   (d) In BCC unit cell body centre is occupied by an anion

9. Match the following

Type of Crystal	**Example**
(A) Molecular solid (polar)	(p) Ar ,CCl_4
(B) Molecular solid (Non-polar)	(q) Ice
(C) Molecular solid (H-bonded)	(r) CaF_2
(D) Ionic solid	(s) SO , HCl

   (a) A-s; B-p; C-q; D-r (b) A-p; B-s; C-q; D-r (c) A-s; B-p; D-r; C-q (d) A-q; B-s; C-p; D-r

10. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of eight. The crystal class is
    (a) Simple cubic (b) Body centred cubic (c) Face centred cubic (d) None

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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	C	D	B	A	D	C	D	A	B

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1. Lithium forms BCC crystals. The atomic radius of lithium if the edge of side of a unit cell of lithium is 351 pm
(a) 702pm (b) 152pm (c) 175pm (d) 504pm

2. How many unit cells are present in 39 g of potassium that crystallizes in body-centred cubic structure
(a) N_A (b) $\frac{N_A}{4}$ (c) $0.5N_A$ (d) $0.75N_A$

3. In a closed packed array of N spheres ,the total number of tetrahedral and octahedral holes are :
(a) 3 N (b) N (c) 2N (d) 4 N

4. If a metal crystallizes in face-centred cubic and body-centred cubic lattice with edge length 'a'. Then the ratio between radius of metal atom in FCC to the BCC is
(a) $\sqrt{3} : \sqrt{2}$ (b) $2\sqrt{2} : \sqrt{3}$ (c) $\sqrt{2} : \sqrt{3}$ (d) $2 : \sqrt{3}$

5. An element has a body-centred cubic structure with cell edge of 288 pm. The density of the element is 7.2 g/cc. How many atoms are present in 208 g of the element?
(a)24.17×10^{23} (b) 12.7×10^{23} (c) 6.023×10^{23} (d) 3×10^{23}

6. Total volume of atoms present in a face-centred cubic unit cell of a metal is :
(a) $\frac{20}{3}\ \pi r^3$ (b) $\frac{24}{3}\ \pi r^3$ (c) $\frac{12}{3}\ \pi r^3$ (d) $\frac{16}{3}\ \pi r^3$

7. In which of the following arrangements , a metal would have least density?
(a) BCC (b) CCP (c)HCP (d) same in all these

8. The ratio between fraction of the volume occupied by the spheres in a hexagonal close packed structure to the cubic close packed structure would be:
(a) 1:2 (b) 1.08 : 1.00 (c)1.42 : 1.00 (d) 1 : 1

9. A metal crystallizes into two cubic phases, face centred cubic and body centred cubic whose unit cell lengths are 3.5 and 3.0 nm, respectively. The ratio of densities of FCC and BCC will be:
(a) 3.5 : 3.0 (b) 1 : 1 (c) 1.259 : 1 (d)1 : 1.5

10. NH_4Cl crystallizes in a body-centered cubic type lattice with a unit cell edge length of 387 pm. The distance between the oppositely charged ions in the lattice is
(a) 335.1 pm (b) 83.77 pm (c) 274.46 pm (d) 137.23 pm

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	C	A	C	A	D	A	D	C	A

1. In a solid lattice ,the cation has left a lattice site and is located at interstitial position ,the lattice defect is :
(a) F-centre (b) Schottky defect (c)Vacancy defect (d) Frenkel defect

2. Analysis shows that a metal oxide has the empirical formula of $M_{0.96}O_{1.00}$. The percentage of M^{+3} ions in this crystal is:
(a) 91.7% (b) 16.8% (c) 8.3% (d) 96%

3. How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00 g?
(a) 2.57×10^{21} (b) 5.14×10^{21} (c) 1.28×10^{21} (d) 1.71×10^{21}

4. If NaCl is dopped with 10^{-4} mole % of $SrCl_2$, the concentration of cation vacancies will be :
(a) $6.02 \times 10^{12}\ mol^{-1}$ (b) $6.02 \times 10^{17}\ mol^{-1}$
(c) $6.02 \times 10^{14}\ mol^{-1}$ (d) $6.02 \times 10^{15}\ mol^{-1}$

5. Which one of the following statements is wrong about Zinc blende type structure
(a) Each zinc ion is surrounded by four sulphide ions tetrahedrally
(b) Sulphide ions form FCC arrangement
(c) AgBr has zinc blende type structure
(d) Cuprous halides have zinc blende type structure

6. AgCl has same structure as that of $NaCl$. The edge length of unit cell of $AgCl$ is found to be 555 pm and the density of $AgCl$ is 5.561 g/cc. The percentage of sites that are unoccupied is:
(a) 0.066% (b)0.003% (c)0.087% (d)0.245%

7. In Antifluorite structure the percentage of tetrahedral voids occupied by cations is:
(a) 0% (b) 25% (c) 50% (d) 100%

8. Assertion: Group-13 doped with crystals of Si are called P-type semiconductors.
Reason: Positive holes are responsible for the semi conducting properties.
(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not explanation of A
(c) 'A' is True but 'R' is False
(d) 'A' is False but 'R' is True

9. Which of the following will show schottky defect
(a) CaF_2 (b) ZnS (c) AgCl (d) CsCl

10. An ionic compound AB has ZnS type structure. If the radius of A^+ is 22.5 pm, then the ideal radius of B^- would be
(a) 54.35 pm (b) 100 pm (c) 145.16 pm (d) none of these

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
D	C	A	B	C	D	D	A	D	B

1. Which is not the property of crystalline solid ?
   (a) Isotropic (b) Sharp M.pt
   (c)A definite and regular geometry (d) High intermolecular forces

2. The number of atoms per unit cell in a simple cubic, face-centred cubic and body-centred cubic are $x, y \, and \, z$ respectively, then $\frac{x+y}{z}$ is ;
   (a) 6 (b) 3 (c) 2.5 (d) 4

3. A compound formed by elements X,Y and Z. Atoms of Y forms ccp lattice and 'X' occupies half the octahedral voids and 'Z' occupies half the tetrahedral voids. The formula of compound is :
   (a) XY_2Z_3 (b) XY_2Z_4 (c) XY_2Z_2 (d) XY_2Z_2

4. Atoms of element B forms hcp lattice and those of the element A occupy 2/3rd of tetrahedral voids. The formula of the compound formed by these elements A and B is :
   (a) A_3B_4 (b) A_4B_3 (c) A_2B_3 (d) A_3B_2

5. In a solid AB having the NaCl structure , 'A' atoms occupy the corners of the cubic unit cell. If all the face centred atoms along one of the axis are removed, then the resultant stoichiometry of the solid will be :
   (a) AB_2 (b) A_2B (c) A_4B_3 (d) A_3B_4

6. In a solid , oxide ions are arranged in CCP. Cations 'A' occupy one sixth of the tetrahedral voids and cations 'B' occupy one third of octahedral voids. The formula of the compound is :
   (a) ABO_3 (b) AB_2O_3 (c) A_2BO_3 (d) $A_2B_3O_3$

7. If the unit cell of a mineral has cubic close packed (ccp) array of oxygen atoms with 'm' fraction of octahedral holes occupied by aluminium ions and 'n' fraction of tetrahedral holes occupied by magnesium ions , then' **m'** and '**n'** respectively are
   (a) $\frac{1}{2}, \frac{1}{8}$ (b) $1, \frac{1}{4}$ (c) $\frac{1}{2}, \frac{1}{2}$ (d) $\frac{1}{4}, \frac{1}{8}$

8. Which is not true about a BCC unit cell?
   (a) The number of atoms in the unit cell is 2
   (b) In addition to an atom at the centre of the body, in a unit cell there are 8 atoms at 8 different corners
   (c) 1/8th of an atom at a corner of the unit cell
   (d) In BCC unit cell body centre is occupied by an anion

9. Match the following

Type of Crystal	**Example**
(A) Molecular solid (polar)	(p) Ar ,CCl_4
(B) Molecular solid (Non-polar)	(q) Ice
(C) Molecular solid (H-bonded)	(r) CaF_2
(D) Ionic solid	(s) SO_2 , HCl

   (a) A-s; B-p; C-q; D-r (b) A-p; B-s; C-q; D-r (c) A-s; B-p; D-r; C-q (d) A-q; B-s; C-p; D-r

10. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of eight. The crystal class is
    (a) Simple cubic (b) Body centred cubic (c) Face centred cubic (d) None

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
A	C	D	B	D	A	A	D	A	B

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1. If a metal crystallizes in face-centred cubic and body-centred cubic lattice with edge length 'a'. Then the ratio between radius of metal atom in FCC to the BCC is
(a) $\sqrt{3} : \sqrt{2}$ (b) $2\sqrt{2} : \sqrt{3}$ (c) $\sqrt{2} : \sqrt{3}$ (d) $2 : \sqrt{3}$

2. An element has a body-centred cubic structure with cell edge of 288 pm. The density of the element is 7.2 g/cc. How many atoms are present in 208 g of the element?
(a) 24.17×10^{23} (b) 12.7×10^{23} (c) 6.023×10^{23} (d) 3×10^{23}

3. A face centred cubic lattice is made up of a single type of atom and one of its corner is left unoccupied per unit cell. The packing fraction of such solid is:
(a) 0.74 (b) 0.68 (c) 0.54 (d) 0.717

4. An element crystallizes in FCC lattice having edge length of 400 pm. The maximum diameter which can be placed in interstitial sites without disturbing the structure is:
(a) 200 pm (b) 117.1 pm (c) 141.4 pm (d) 173.2 pm

5. Silver has a cubic unit cell with edge length 408 pm. Its density is 10.6 g/cc. Then the crystal structure of silver is:
(a) BCC (b) FCC (c) HCP (d) Primitive

6. CdO has structure similar to NaCl with density 8.27 g/cc. If the radius of O^{-2} is 1.24 pm. Then the ionic radius of Cd^{+2} is :
(a) 1.1 pm (b)2.25 pm (c) 1.48 pm (d) 1.96 pm

7. In diamond , carbon atom occupy FCC lattice points as well as alternate tetrahedral voids. If edge length of the unit cell is 356 pm, then the radius of carbon atom is:
(a) 77.07 pm (b)154.14 pm (c)251.7 pm (d)89 pm

8. Which is not a correct statement about three dimensional HCP system:
(a) Number of atoms in HCP unit cell is six (b) The volume of HCP unit cell is $24\sqrt{2}r^3$
(c) The empty space in HCP unit cell is 32% (d) The base area of HCP unit is $6\sqrt{3}r^2$

9. A metal crystallizes into two cubic phases, face centred cubic and body centred cubic whose unit cell lengths are 3.5 and 3.0 nm, respectively. The ratio of densities of FCC and BCC will be:
(a) 3.5 : 3.0 (b) 1 : 1 (c) 1.259 : 1 (d)1 : 1.5

10. Lithium boro hydride crystallizes in an orthorhombic system with 4 molecules per unit cell. The unit cell dimensions are a=6.8 A^0, b=4.4 A^0 and c= 7.2A^0 ; if the cell molar mass is 21.76 then the density of the crystal is
(a) 0.6708 gm/cc (b)1.6708 gm/cc (c)2.6708 gm/cc (d) 3.6708 gm/ cc

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	A	D	B	B	A	A	C	C	A

1. Analysis shows that a metal oxide has the empirical formula of $M_{0.96}O_{1.00}$. The percentage of M^{+3} ions in this crystal is:
(a) 91.7% (b) 16.8% (c) 8.3% (d) 96%

2. For a crystal ,the angle of diffraction (2θ) is 90^0 and the second order line has a 'd' value of 2.28 $\overset{0}{A}$. The wavelength (in $\overset{0}{A}$) of X-rays used in Bragg's diffraction is :
(a) 1.61 (b) 2.00 (c) 2.28 (d) 4.00

3. The correct statement among the following is :
(a) Number of unit cells present in one mole of NaCl crystal is N_0
(b) Number of ion pairs present in one mole of CsCl crystal is N_0 /4
(c) Number of ion pairs present per one unit cell of ZnS is four
(d) In CsCl ,the limiting radius ratio is 0.52

4. How many unit cells are present in a cube shaped ideal crystal of NaCl of mass 1.00 g?
(a) 2.57×10^{21} (b) 5.14×10^{21} (c) 1.28×10^{21} (d) 1.71×10^{21}

5. If NaCl is dopped with 10^{-4} mole % of $SrCl_2$, the concentration of cation vacancies will be :
(a) $6.02\times10^{12}\ mol^{-1}$ (b) $6.02\times10^{17}\ mol^{-1}$
(c) $6.02\times10^{14}\ mol^{-1}$ (d) $6.02\times10^{15}\ mol^{-1}$

6. The limiting radius ratio of the complex $\left[Ni(CN)_4\right]^{-2}$ is:
(a) 0.225-0.414 (b)0.414-0.732 (c)0.155-0.225 (d)0.732-0.99

7. $AgCl$ has same structure as that of $NaCl$. The edge length of unit cell of $AgCl$ is found to be 555 pm and the density of $AgCl$ is 5.561 g/cc. The percentage of sites that are unoccupied is:
(a) 0.066% (b)0.003% (c)0.087% (d)0.245%

8. In Antifluorite structure the percentage of tetrahedral voids occupied by cations is:
(a) 0% (b) 25% (c) 50% (d) 100%

9. What is the maximum ratio of foreign atom radius (i.e., H atom) to host atom (i.e., Ti radius) that can be occupied in tetrahedral voids without causing a strain in the host lattice
(a)0.225 (b)0.414 (c) 0.732 (d)0.9

10. Give the correct order of initials **T** (true) or **F** (false) for following statements.
I. In an anti-fluorite structure, anions form FCC lattice and cations occupy all tetrahedral voids.
II. If the radius of cations and anions are 0.2 Å and 0.95 Å then coordinate number of cation in the crystal is 4.
III. An atom/ion is transferred from a lattice site to an interstitial position in Frenkel defect.
IV. Density of crystal always increases due to substitutional impurity defect.
(a) TFFF (b) FTTF (c) TFFT (d) TFT

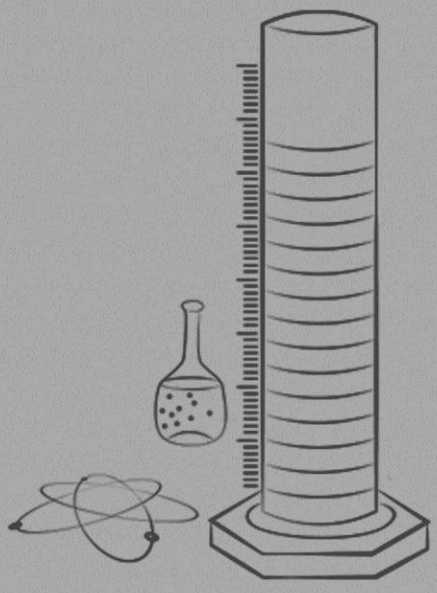
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ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	A	C	A	B	B	D	D	A	D

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Solutions



CHEMISTRY

1. Calculate the mass percentage of ethanol in a solution obtained by dissolving 50g of ethanol in 250g of water.
   (a) 16.667 (b) 27.667 (c) 11.667 (d) 16.868

2. 25ml of benzene is mixed with 150ml of toluene. Calculate the volume percentage of toluene in the solution.
   (a) 96.77 (b) 85.72 (c) 15.77 (d) 75.52

3. In a sample of water (200g) contains 6×10^{-4} g of dissolved oxygen. Calculate the ppm concentration of oxygen.
   (a) 14 (b) 19 (c) 07 (d) 3

4. 234g of benzene is mixed with 460g of toluene. Calculate the mole fractions of benzene and toluene in the solution.
   (a) 0.28 (b) 0.625 (c) 0.985 (d) 0.76

5. Calculate the molarity of a solution obtained by dissolving 10g of NaOH in 1500cc of solution. (Molecular mass of NaOH = 40)
   (a) 9.1667 M (b) 0.6968 M (c) 0.1667 M (d) 3.1697 M

6. Calculate the mole fraction of benzene in a solution containing 30% by mass of carbon tetrachloride.
   (a) 0.822 (b) 0.32 (c) 0.462 (d) 0.992

7. Calculate the molarity a solution of potassium iodide if the density of 20% (w/w) solution is 1.202g/cc.
   (a) 2.55M (b) 0.34 M (c) 6.15 M (d) 1.45M

8. A Solution of glucose in water is labelled as 10% (w/w). what is the molality of glucose in the solution? If the density of the solution is 1.2g/cc.
   (a) 0.61m (b) 0.7m (c) 0.44m (d) 2.69m

9. How many grams of dibasic acid (Mol. Wt = 200) should be present in 100mL of its aqueous solution to give decinormal strength
   (a) 1g (b) 2g (c) 10g (d) 20g

10. Specific gravity of commercial sulphuric acid is 1.8 and it is 98% pure. Volume of this acid required for preparing 7.2 litres of decinormal sulphuric acid is
    (a) 10mL (b) 20mL (c) 72mL (d) 4mL

11. If 50mL of 0.1M NaCl and 50mL of 0.1M $BaCl_2$ are mixed, molarity of Chloride ion in the resulting solution will be
    (a) 0.2M (b) 0.3M (c) 0.15M (d) 0.1M

    Key(c)

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ANSWER KEY

1. A	**2. B**	**3. D**	**4. B**	**5. C**	**6. A**	**7. D**	**8. A**	**9. A**	**10. B**

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1. Calculate the solubility of nitrogen gas in 1L of water if the partial pressure of nitrogen is 0.98bar. K_H of nitrogen = 76.5kbar.
   (a) 14.19×10^{-5} moles/litre (b) 7.11×10^{-4} moles/litre
   (c) 17.14×10^{-4} moles/litre (d) 12.16×10^{-3} moles/litre

2. Henry's law constant for carbon dioxide in water is 1.67×10^{8} Pa at 298K. Calculate the quantity of carbon dioxide in 500ml of soda water when packed under a pressure of 2.5atm of CO_2 at 298K
   (a) 0.568moles/500cc (b) 0.01moles/500cc
   (c) 1.0923moles/500cc (d) 0.0413moles/500cc

3. Vapour pressures of chloroform and dichloromethane are respectively equal to 200mm and 400mm of Hg at 298K. Calculate the vapour pressure of a mixture obtained by mixing 17g of dichloromethane and 29.875g of chloroform at 298K. Also calculate the mole fraction of chloroform in vapour phase.
   (a) 0.49 (b) 0.84 (c) 0.29 (d) 0.71

4. Benzene and toluene forms ideal solution at 300k. The vapour pressures of benzene and toluene at 300K are 90 mm and 32mm respectively. Also calculate the composition of toluene vapours at equilibrium.
   (a) 0.263 (b) 0.563 (c)0.36 (d) 0.8

5. The vapour pressure of pure solvent 'X' is 0.85bar at a certain temperature. 0.5g of a non – volatile solute is added to 39g of 'X'. The vapour pressure of solution is 0.845bar. Calculate the molar mass of solute.
   (a) 682g/mol (b) 396g/mol (c) 172g/mol (d) 226g/mol

6. The vapour pressure of 10% aqueous glucose solution at 100°C
   (a) 750mm (b) 755.6m (c) 752.4mm (d) 740mm

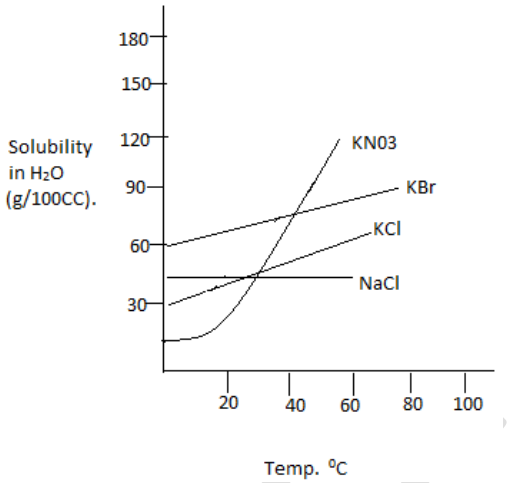
7. Benzene and toulene form nearly ideal solutions. At 20°C, the vapour pressure of benzene is 75torr and that of toulene is 22torr. The partial pressure of benzene at 20°C for a solution containing 78g of benzene and 46g of toulene in torr is
   (a) 50 (b) 25 (c) 37.5 (d) 53.5

8. The Henry's law constant for the solubility of N_2 gas in water at 298K is 1.0×10^5 atm. The mole fraction of N_2 is 0.8. The number of moles of N_2 from air dissolved in 10 moles of water at 298K and 5 atm pressure is
   (a) 4×10^{-4} (b) 4×10^{-5} (c) 5×10^{-4} (d) 4×10^{-6}

9. Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 2 mol of Xand 3 mol of Y is 550 mm Hg. At the same temperature if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure(in mm Hg) of X and Y in their pure state will be respectively
   (a) 200 and 300 (b) 460 and 610 (c)400 and 600 (d) 500 and 600

10. From the diagram given below which compound would be most easily purified by recrystallization from water?

(a) NaCl
(b) KCl
(c) KBr
(d) KNO_3



ANSWER KEY

1. B	**2. D**	**3. C**	**4. A**	**5. C**	**6. C**	**7. A**	**8. A**	**9. B**	**10. D**

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1. Vapour pressure of pure water is 23.8mm at 298K. 50g of urea is added to 850g of water. Calculate the relative lowering of vapour pressure.
   (a) 0.26 (b) 0.078 (c) 0.2648 (d) 0.0176

2. 18g of glucose is added to 1kg of water. At what temperature, the solution will boil at 1atm pressure? (Boiling point of pure water is 373K, K_b = 0.52K kg mol^{-1})
   (a) 373.52 (b) 489.57 (c)378.92 (d) 368.62

3. 50g of ethylene glycol is mixed with 800g of water. Calculate the freezing point of solution. (freezing point of Water = 273K, K_f = 1.86K kg mol^{-1})
   (a) 248.125K (b) 262.124K (c) 271.125K (d) 259.115K

4. A 5% solution (w/w) of cane sugar in water has a freezing point of 272.7K. Calculate the freezing point of 5% solution (w/w) of glucose in water. (freezing point of water = 273K)
   (a) 262.93K (b) 272.43K (c) 257.33K (d) 289.41K

5. 200cc of aqueous solution contains 1.3g of protein. The osmotic pressure of the solution is 2.6 $\times$ 10^{-3} bar at 300K. Calculate the molecular mass of protein.
   (a) 42,950 (b) 56,150 (c) 78,650 (d) 62,250

6. The vapour pressure of water at 23°C is 19.8 mm. 0.1 mole of glucose is dissolved in 178.2 g of water. What is the vapour pressure (in mm) of the resultant.
   (a) 19.0 (b) 19.602 (c) 19.402 (d) 19.202

7. Two elements A and B form compounds of formula AB_2 and AB_4. When dissolved in 20.0g of benzene 1.0g of AB_2 lowers freezing point by 2.3°C whereas 1.0g of AB_4 lowers freezing point by 1.3°C. The K_f for benzene is 5.1 K Kg/mol. The atomic masses of A and B are
   (a)27, 45 (b) 42, 25 (c) 52, 48 (d) 48, 52

8. What is the osmotic pressure of the solution obtained by mixing 300cc of 2% (m/v) solution of urea with 300cc of 3.42% solution of sucrose at 20°C? (R = 0.0821 L atm K^{-1} mol^{-1})
   (a) 5 atm (b) 5.2 atm (c) 2.6 atm (d) 4.5 atm

9. If the elevation in boiling point of solution of 10g of solute (molecular weight=100) in 100gm of water is ΔT_b, The ebulloscopic constant of water is
   (a) 10 (b) 10ΔT_b (c) ΔT_b (d) ΔT_b/10

10. The boiling point of a solution of 0.11g of a substance in 15g of ether was found to be 0.1^0c higher than that of pure ether. The molecular mass of the substance will be (K_b=2.16 K Kg/mol)
    (a) 148 (b) 158 (c) 168 (d) 178

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11. In the depression of freezing point experiment, it is found that

(i) the vapour pressure of the solution is less than that of pure solvent

(ii) the vapour pressure of the solution is more than that of pure solvent

(iii) only solute molecules solidify at the freezing point

(iv) only solvent molecules solidify at the freezing point

(a) i, ii (b) ii, iii (c) i, iv (d) i, ii, iii

Key: (c)

ANSWER KEY

1. D	**2. A**	**3. C**	**4. B**	**5. D**	**6. B**	**7. A**	**8. B**	**9. C**	**10. B**

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1. 1.8g of benzoic acid is dissolved in 25g of benzene shows a depression in freezing point of 1.62K. Calculate the percentage association of benzoic acid in benzene. $(K_f = 5\ K\ kg\ mol^{-1})$
   (a) 84.1 (b) 71.7 (c) 90.2 (d) 18.6

2. 0.6cc of acetic acid having density 1.06g/cc is dissolved in 1litre of water. The depression in freezing point is 0.0205K. Calculate the dissociation constant of acetic acid.
   (a) 2.74×10^{-2} (b) 1.69×10^{-5} (c) 6.38×10^{-4} (d) 8.9×10^{-5}

3. Which of the following will have hightest boiling point at 1 atm pressure?
   (a) 0.1m NaCl (b) 0.1m Sucrose (c) 0.1m $BaCl_2$ (d) 0.1m glucose

4. For a very dilute solution of H_3PO_3 van't Hoff factor is
   (a)i=7 (b) i=3 (c) i=4 (d) i=5

5. Osmatic pressure of 0.1M aqueous solution of $MgCl_2$ at 300K is 4.92 atm. What will be the percentage ionization of the salt?
   (a) 73% (b) 59% (c) 49% (d) 62%

6. The freezing point of equimolal aqueous solution will be highest for
   (a) $C_6H_5NH_3Cl$ (aniline hydrochloride) (b) $Ca(NO_3)_2$
   (c) $La(NO_3)_3$ (d) $C_6H_{12}O_6$ (glucose)

7. 0.1m aqueous solution of NaBr freezes at -0.335^0 C at atmospheric pressure, K_f for water is 1.86^0C. The percentage dissociation of the salt in solution is
   (a) 90 (b) 80 (c) 58 (d) 98

8. The Van't Hoff factor for 0.1M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is
   (a) 91.3% (b)87% (c) 100% (d) 74%

9. 12.2g of C_6H_5COOH is dissolved in 1kg of CH_3COCH_3 (K_b = 1.9k kg mol^{-1}) and in 1 kg C_6H_6 (K_b=2.6 K Kg/mole) separately - The elevations of boiling point are 0.19^0C and 0.13^0C respectively. In which solution is benzoic acid dimerizing.
   (a) Benzene (b) Acetone (c) In both (d) None

10. Calculate the freezing point of 0.1m HX solution which is 30% dissociated and K_f of water is 1.86 K.Kg. mol^{-1}
    (a) $-0.242^\circ C$ (b) $+0.242^\circ C$ (c) $-0.962^\circ C$ (d) $+0.562^\circ C$

ANSWER KEY

1. C	**2. B**	**3. C**	**4. B**	**5. C**	**6. D**	**7. B**	**8. B**	**9. A**	**10. A**

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1. 5g of NaCl is dissolved in 1000g of water. If the density of the resultant solution is 0.997g/cc, calculate the mole fraction of solute.
(a) 0.0143 (b) 0.0253 (c) 0.0019 (d) 0.00153

2. Calculate the molality of a solution made by mixing equal volume of 30% (w/w) H_2SO_4 (density = 1.22g/cc) and 70% (w/w) of H_2SO_4 (density = 1.6g/cc)
(a) 6.8m (b) 8.9 m (c) 7.58m (d) 11.36m

3. 400g of 20% (w/w) solution is cooled. 50g of solute is precipitated. What is the mass percentage of the remaining solution?
(a) 8.57 (b) 6.47 (c) 9.66 (d) 3.51

4. Specific gravity of commercial sulphuric acid is 1.8 and it is 98% pure. Volume of this acid required for preparing 7.2 litres of decinormal sulphuric acid is
(a) 10mL (b) 20mL (c) 72mL (d) 4mL

5. If 50mL of 0.1M NaCl and 50mL of 0.1M $BaCl_2$ are mixed, molarity of Chloride ion in the resulting solution will be
(a) 0.2M (b) 0.3M (c) 0.15M (d) 0.1M

6. 50mL of 0.2N $K_2Cr_2O_7$ is required to oxidise 40mL $FeSO_4$ solution in acidic medium. The weight of iron present in litres if atomic weight of iron is 56.
(a) 14g (b) 1.4g (c) 140g (d) 28g

7. The density of 2M solution of acetic acid (molecular weight 60) is 1.02g/mL. The morality of solution is
(a) 1.0m (b) 2m (c) 2.22 m (d) 2.25m

8. In the aqueous of sulphuric acid, the mole fraction of water is 0.849. The molality of the solution is
(a) 8.9m (b) 0.19m (c) 9.8m (d) 15m

9. Which among the following has the highest normality
(a) 8.0 g of KOH/100ml of solution (b) 0.5 M of H_2SO_4
(c) IN H_3PO_4 (d) 6g of NaOH/100 mL of solution.

10. Rectified spirit contains 95% ethanol by weight, the molefraction of ethanol will be
(a) 0.881 (b) 0.99 (c)0.118 (d) 0.81

ANSWER KEY

1. D	**2. D**	**3. A**	**4. B**	**5. C**	**6. D**	**7. C**	**8. C**	**9. D**	**10. A**

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1. Calculate the concentration of carbon dioxide in a soft drink bottle with a partial pressure of carbon dioxide of 4atm at 298K. The Henry's constant for carbon dioxide at 298K is $3\times 10^{-2}\ \text{molL}^{-1}\ \text{atm}^{-1}$
(a)0 .51mol/L (b) 0.2mol/L (c) 0.12mol/L (d) 0.84mol/L

2. At 37^0C and 0.8atm partial pressure, the solubility of nitrogen is 5.6×10^{-4}mol/L.A deep sea water diver breathes compressed air at a partial pressure a nitrogen equal to 4.0atm. The total volume of the blood in his body is 5L. After some time, he comes back to surface where the partial pressure of nitrogen is 0.8atm. Calculate the volume of nitrogen escaped during his return from depth to the surface at 37^0C and 1 atm pressure.
(a) 1.2L (b) 0.28L (c) 0.8L (d) 1.5L

3. The vapour pressure of benzene and toluene at 85^0C is 950mm and 370mm respectively. Calculate the composition of the mixture which boils at 85^0C
(a) 0.44,0.66 (b) 0.78,0.22 (c) 0.5,0.5 (d) 0.672,0.328

4. Two liquids A and B form an ideal solution. The total vapour pressure of mixture of A and B is given by the equation P = 250 – 120 X_A, where X_A is the mole fraction of A in the liquid mixture. Calculate the total vapour pressure of equimolar mixture of A and B.
(a) 190mm (b) 240mm (c) 360mm (d) 110mm

5. Benzene and toluene forms ideal solutions at 20^0C. The vapour pressures of pure benzene and toluene are 75mm and 22mm respectively at 20^0C. In a mixture of benzene and toluene, if the mole fraction of benzene in vapour phase is 0.63, calculate the total vapour pressure of the solution.
(a) 46.15mm (b) 38.65mm (c) 29.35mm (d) 39.65mm

6. Two liquids A and B form an ideal solution at 300K. The vapour pressure of a solution containing 1 mole of A and 3 moles of B is 550mm of Hg. On adding one more mole of B to the solution, the vapour pressure increases by 10mm of Hg. Calculate the vapour pressures of pure A and B.
(a) 400mm,600mm (b) 350mm,550m (c) 470mm,530mm (d) 580mm,220mm

7. Two liquids A and B form ideal solution. A mixture of A and B is placed in a cylinder fitted with a piston. The piston is pulled out isothermally so that volume of vapour increases and volume of liquid decreases. When negligibly small amount of liquid is remaining, the mole fraction of A in vapour phase is 0.6. if the vapour pressure of pure A and B are 0.6atm and 1.5atm respectively. Calculate the total pressure at which the liquid is almost vapourized.
(a) 0.8atm (b) 0.4atm (c) 0.56atm (d) 0.26atm

8. Benzene and toulene form nearly ideal solutions. At 20°C, the vapour pressure of benzene is 75torr and that of toulene is 22torr. The partial pressure of benzene at 20°C for a solution containing 78g of benzene and 46g of toulene in torr is
(a) 50 (b) 25 (c) 37.5 (d) 53.5

9. The Henry's law constant for the solubility of N_2 gas in water at 298K is 1.0×10^5 atm. The mole fraction of N_2 is 0.8. The number of moles of N_2 from air dissolved in 10 moles of water at 298K and 5 atm pressure is
(a) 4×10^{-4} (b) 4×10^{-5} (c) 5×10^{-4} (d) 4×10^{-6}

10. A solution containing benzene and toluene in the same ratio of 6:4 has a vapour pressure of 667.06 mm of Hg at 85^0C. A solution at same temperature containing C_6H_6 and $C_6H_5CH_3$ in the ratio of 4:6 has vapour pressure of 559.74, what would be the mole ratio of benzene and toluene which would boil at this temperature. (Atmospheric pressure = 760mm of Hg)

(a) 1:3 (b) 3:1 (c) 1:1 (d) 2:3

ANSWERKEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	B	D	A	D	A	A	A	A	B

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1. Calculate the mass of non – volatile solute (Mwt=40) which should be added to 342g of octane to reduce the vapour pressure to 60% of its initial value.
(a) 240g (b) 150g (c) 180g (d)3760g

2. The Osmotic pressure of the blood is 7.65atm at 37^0C. How much glucose should be dissolved in 100cc of the solution so that it can be used for an intravenous injection?
(a) 2.8g (b) 6.9g (c) 5.4g (d) 7.2g

3. An aqueous solution contains 5% by mass of urea and 10% by mass of glucose. Calculate the freezing point of this solution. $(K_f = 1.86\ kg\ mol^{-1})$
(a) -3.08^0C (b) -6.07^0C (c)- 8.02^0C (d) -3.03^0C

4. A mixture contains 0.55g of camphor and 0.045g of an organic solute freezes at 157^0C. The freezing point of pure camphor is 178.4^0C. The organic solute contains 93.5% carbon and 6.5% hydrogen. Calculate the molecular formula of the solute$(K_f = 37.7\ kg\ mol^{-1})$
(a) $(C_6H_5)_2$ (b) $(C_4H_5)_3$ (c) $(C_2H_4)_2$ (d) $(C_5H_5)_2$

5. A solution of urea has a boiling point of 100. 18^0C. Calculate the freezing point of the same solution.
$(K_f = 0.52K\ kg\ mol^{-1}$ and $K_f = 1.86K\ kg\ mol^{-1})$
(a) – 4.743^0C (b) – 2.643^0C (c) – 0.583^0C (d) – 0.643^0C

6. The temperature of a city was found to be -9.3°C. A car was used whose radiator was filled with 5L of water. What quantity fo antifreezing agent ethylene glycol were added to water of radiator in order to use the car for travelling? (K_f of water is 1.86K $Kgmol^{-1}$)
(a) 3200g (b) 1670g (c) 1550g (d) 2100g

7. Two elements A and B form compounds of formula AB_2 and AB_4. When dissolved in 20.0g of benzene 1.0g of AB_2 lowers freezing point by 2.3°C whereas 1.0g of AB_4 lowers freezing point by 1.3°C. The K_f for benzene is 5.1 K Kg/mol. The atomic masses of A and B are
(a) 27, 45 (b) 42, 25 (c) 52, 48 (d) 48, 52

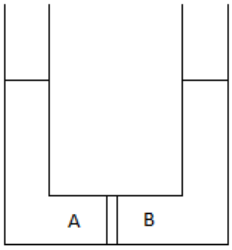
8. If the elevation in boiling point of solution of 10g of solute (molecular weight=100) in 100gm of water is ΔT_b , The ebulloscopic constant of water is
(a) 10 (b) $10\Delta T_b$ (c) ΔT_b (d) $\Delta T_b/10$

9. At 10^0C, the osmotic pressure of urea is 500mm. The solution is diluted and temperature is raised to 25^0 C, when the osmotic pressure is found to be 105.3mm, The extent of dilution will be
(a) 2 times (b) 5 times (c) 6 times (d) 4 times

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10. Compartments A and B have the following combinations of solution

	A	B
1.	0.1 M KCl	0.2M KCl
2.	0.1% (m/v) NaCl	10%(m/v) NaCl
3.	18g/L $C_6H_{12}O_6$	34.2 g/L Sucrose
4.	20% (m/v) $C_6H_{12}O_6$	10% (m/v) urea



The solution in which compartment B is hypertonic

(a) 1,2 (b) 2,3 (c) 3,4 (d) 1,4

11. The vapour pressure of solution of 5g of non-electrolyte in 100g of water at a particular temperature is 2985 Nm^{-2}. The vapour pressure of pure water at that temperature is 3000 N/m^2. The molecular weight of the solute is

(a) 180 (b) 90 (c) 270 (d) 200

Key: (a)

ANSWERKEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	C	D	A	D	C	A	C	B	A

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1. 0.1m aqueous solution of NaBr freezes at -0.335^0 C at atmospheric pressure, K_f for water is 1.86^{0}C. The percentage dissociation of the salt in solution is
(a) 90 (b) 80 (c) 58 (d) 98

2. The Van't Hoff factor for 0.1M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is
(a) 91.3% (b) 87% (c) 100% (d) 74

3. Tritium T^3 (an isotope of H) combines with flourine to form weak aid TF, which gets ionized to give $T^{\oplus}$ A freshly prepared aqueous solution of TF has pT (equivalent of PH) of 1.5 and freezes at -0.372^{0}C. If 600 mL of freshly prepared solution were allowed to be retained for 24.8 years, calculate the ionization constant of TF (given K_f for H_2O = 1.86)
(a) 7.299×10^{-3} (b) 14.598×10^{-3} (c) 7.299×10^{-2} (d) 14.599×10^{-2}

4. 12.2g of C_6H_5COOH is dissolved in 1kg of CH_3COCH_3 (K_b = 1.9k kg mol^{-1}) and in 1 kg C_6H_6 (K_b=2.6 K Kg/mole) separately - The elevations of boiling point are 0.19^{0}C and 0.13^{0}C respectively. In which solution is benzoic acid dimerizing.
(a) Benzene (b) Acetone (c) In both (d) None

5. A current of dry air was bubbled through a bulb containing 26.66g of an organic compound in 200g of H_2O, then through a bulb at same temperature containing water and finally through bulb containing anhydrous $CaCl_2$. The loss of mass in the bulb containing water was 0.087g and the gain in the mass of $CaCl_2$ tube was 2.036g ,the molecular mass of organic substance is
(a) 56.25 (b) 53.75 (c) 46.25 (d) 64.75

6. The values of observed and calculated molecular weights of silver nitrate are 92.64 and 170 respectively. The degree of dissociation of silver nitrate is
(a) 60% (b) 83.5% (c) 46.7% (d) 60.23%

7. A 0.2m aqueous solution of KCl freezes at −0.68^{0}C. Calculate the osmotic pressure of the solution at 273K. ($\mathrm{K_f = 1.86K\ kg\ mol^{-1}}$)
(a) 4.18atm (b) 5.26atm (c) 8.15atm (d) 7.25atm

8. A 0.01m aqueous solution of $K_3[Fe(CN)_6]$freezes at −0.07^{0}C. What is the degree of dissociation of the complex? ($\mathrm{K_f = 1.86K\ kg\ mol^{-1}}$)
(a) 58% (b) 69% (c) 45% (d) 92%

9. 1g of monobasic acid when dissolved in 100g of water lowers the freezing point by 0.168^{0}C. 0.2g of the same acid when dissolved and titrated requires 15.1cc of 0.1N alkali. Calculate the dissociation constant of the acid. ($\mathrm{K_f = 1.86K\ kg\ mol^{-1}}$)
(a) 0.003 (b) 0.026 (c) 0.08 (d) 0.0004

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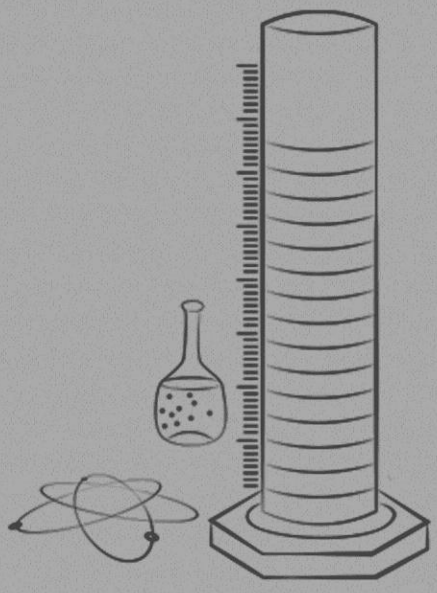
10. 1.1g of $CoCl_3.6NH_3$ (M = 267) was dissolved in 100g of water. The freezing point of the solution was – 0.29^0C. Determine the molecular formula of the complex. ($K_f = 1.86 K\ kg\ mol^{-1}$)
    (a) $[Co(NH_3)_5 Cl]CI_2$
    (b) $[Co(NH_3)_4 Cl2]Cl$
    (c) $[Co(NH_3)_6]Cl_3$
    (d) $[Co(NH_3)_3 Cl3]$

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
B	B	A	A	B	B	C	D	A	C

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Surface Chemistry



CHEMISTRY

1. There is no scum formation when hard water is being used. The Washing powder can be
   (a) $C_{17}H_{35}COO\ Na$
   (b) R  SO_3Na
   (c) Both of these
   (d) None of these

2. For coagulation of AS_2S_3 which is most effective?
   (a) Na_3PO_4 (b) $MgCl_2$ (c) $CaCl_2$ (d) $AlCl_3$

3. The extent of Adsorption of a gas on a solid depends on
   (a) Nature of Gas (b) Pressure of Gas
   (c) Temperature of the System (d) All are correct

4. Which gas is adsorbed to a greater extent?
   (a) O_2 (b) N_2 (c) NH_3 (d) H_2

5. Chromatography is based on
   (a) Chemical Adsorption (b) Physical Adsorption
   (c) Hydrogen Bonding (d) Sedimentation

6. Bredig's arc method cannot be used to prepare colloidal solution of
   (a)Pt (b) Fe (c) Ag (d) Au

7. The solution of rubber in Benzene is an example of
   (a) Multimolecular Colloid (b) Macromolecular colloid
   (c) Associated colloid (d) Lyophobic colloid

8. Gold Number is the index for
   (a) Protective colloid
   (b) Gold present in ornaments
   (c) Extent of Gold plating done
   (d) Weight of gold in milligrams present per litre of a gold sol

9. Difference between colloids and crystalloids of
   (a) Diameter (b) Particle Size (c) Radius (d) Solubility

10. A liquid is found to scatter a beam of light but leaves no residue when jpassed through the filter paper. The liquid can be described as
    (a) A Suspension (b) Oil (c) Colloidal Sol (d) True Solution

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
b	d	d	c	b	b	b	a	b	c

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1. The separation of colloidal particles from those of Molecular dimensions is known as
   (a) Photolysis (b) Dialysis (c) Pyrolysis (d) Peptisation

2. In which one of the following properties emulsions differ from colloidal sols?
   (a) Tyndall effect (b) Brownian Movement
   (c) Electrophoresis (d) Size of the particles of the dispersed phase.

3. At CMC the surfactant molecules
   (a) Decompose (b) Become completely soluble
   (c) Associate (d) Dissociate

4. During adsorption, which of the following is less than zero?
   (a) ΔG (b) ΔS (c) ΔH (d) All of these

5. For adsorption of a gas on a solid, the plot of log ($^{x}/_{m}$) Vs log P is linear with slope equal to (n being whole number)
   (a) K (b) log K (c) n (d) $\frac{1}{n}$

6. The equation for Langmuir adsorption isotherm under high pressure is
   (a) $\frac{x}{m} = \frac{a}{b}$ (b) $\frac{x}{m}$ = ap (c) $\frac{x}{m} = \frac{1}{ap}$ (d) $\frac{x}{m} = \frac{b}{a}$

7. Flocculation value is expressed in terms of
   (a) Millimole per litre (b) Mole per litre (c) Gram per litre (d) Mole per millilitre

8. Zeolites are micro porous aluminosilicates with general formula

   (a) $M_{x/n}$ [$(AlO_2)_x$ $(SiO_2)_y$] m H_2O (b) M_x [$(Sio_2)_y$] m H_2O

   (c) M_x [$(AlO_2)_x$ $(SiO_2)_y$] (d) M [(AlO_2)x] mH_2O

9. Energy of Activation of forward and backward reactions are equal in cases (numerical values) where
   (a) $\Delta H = O$ (b) No catalyse is present
   (c) $\Delta S = O$ (d) Stoichiometry is the mechanism

10. Sorption is the term used when
   (a) Adsorption takes place (b) No catalyst is present
   (c) Both take place (d) Desorption takes place

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
b	d	c	d	d	a	a	a	a	c

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1. Among the following, the surfactant that will form micelles in Aqueous solution at the lowest Molar concentration at ambient conditions is
   (a) $CH_3(CH_2)_{15}\ N^+\ (CH_3)_3\ Br^-$ (b) $CH_3(CH_2)_{11}\ OSO_3^-\ Na$
   (c) $CH_3(CH_2)_6COO^-Na^+$ (d) $CH_3(CH_2)_{11}\ N^+\ (CH_3)_3\ Br^-$

2. Among the electrolytes $Na_2\ SO_4$, $Ca\ Cl_2$, $Al_2(SO_4)_3$ and NH_4Cl , the most effective coagulating agent for $Sb_2\ S_3$ sol is
   (a) $Na_2\ SO_4$ (b) $Ca\ Cl_2$ (c) $Al_2(SO_4)_3$ (d) NH_4Cl

3. Rate of physisorption increases with
   (a) Decrease in temperature (b) Increase in temperature
   (c) Decrease in pressure (d) Decrease in Surface Area

4. Adsorption of gases on solid surface is generally exothermic because
   (a) Enthalpy is positive (b) Entropy decreases
   (c) Entropy Increases (d) Free energy increases

5. Lyophilic sols are
   (a) Irreversible sols (b) They are prepared from Inorganic Compound
   (c) Coagulated by adding electrolytes (d) Self-stabilizing

6. The addition of Alcohol to a saturated aqueous solution of Calcium acetate first forms a sol and then gets converted to a gelatinous mass called solid Alcohol which is a
   (a) Solid Sol (b) Aerosol (c) Solid form (d) Gel

7. Which of the following shows the Maximum hydrophobic behavioiur?
   (a) Glycine (b) Stearic Acid (c) Glucose (d) Adenine

8. Colloidal sol found effective in treating eye disease is
   (a) Colloidal Sulphur (b) Colloidal Antimony (c) Colloidal Gold (d) Colloidal Silver

9. Which of the following electrolytes is least effective in causing coagulation of ferric hydroxide sol?
   (a) KBr (b) $K_2\ SO_4$ (c) $K_2\ CrO_4$ (d) $K_3[Fe\ (CN)_6]$

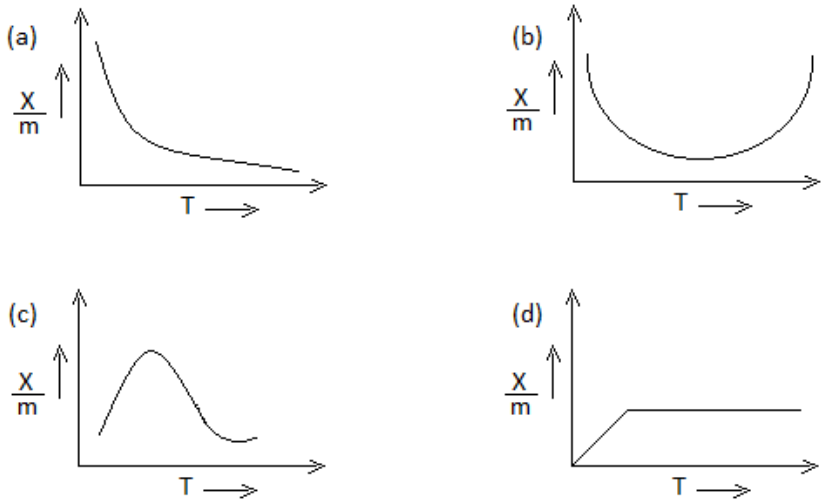
10. Oil soluble dye is mixed with emulsion and emulsion remains colourless. Then it is
   (a) O-in-W (b) W-in-O (c) O-in-O (d) W-in-W

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
a	c	a	b	d	d	d	d	a	a

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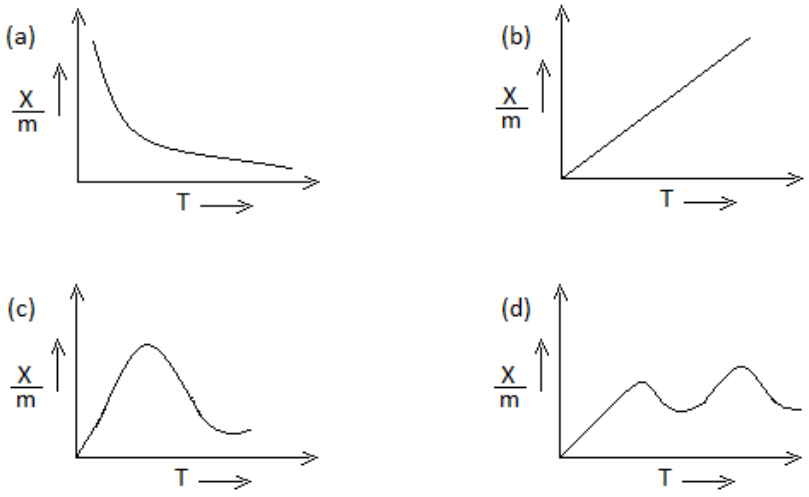
MCQs (One Correct Option)

1. Which plot is the adsorption isobar for chemisorptions?



2. Freundlich Adsorption isotherm gives a straight line on plotting
   (a) $\frac{x}{m}$ Vs P (b) log ($\frac{x}{m}$) Vs P (c) log ($\frac{x}{m}$) Vs log P (d) $\frac{x}{m}$ Vs $\frac{1}{P}$

3. Which of the following represents physical adsorption?



4. When $KClO_3$ is heated, it decomposes to KCl and O_2. If some MnO_2 is added, the reaction goes much faster because
   (a) MnO_2 acts as catalyst (b) MnO_2 converts $KClO_3$ into KCl
   (c) It provides heat (d) None of these

5. In oxidation of oxalic acid by $KMnO_4$, the colour of $KMnO_4$ disappears slowly at the start of reaction but disappears very fast afterwards. This is an example of
   (a) Induced catalysis (b) Auto catalysis (c) Negative catalysis (d) Enzyme catalysis

6. In the stoichiometry of Natural faujasite a zeolite with formula $Na_x\ [\ (AlO_2)_{56}\ (SiO_2)_{136}]\ 250\ H_2O$, the value of x is
(a) 12 (b) 56 (c) 136 (d) 256

7. In Ziegler-Natta polymerisation of ethene the active species is
(a) $Ti\ Cl_4$ (b) Ti^{3+} (c) $(C_2\ H_5)_3\ Al$ (d) $AlCl_3$

8. At low pressure, the fraction of the surface covered follows
(a) Zero Order Kinetics (b) First Order Kinetics
(c) Second Order Kinetics (d) Fractional Order Kinetics

9. 400ml of standard gold sol is just prevented from coagulation by the addition of 0.96g of starch before adding 1ml of 10% NaCl solution, the gold number will be
(a) 2.4 (b) 76 (c) 240 (d) 24

10. The rate of a certain biochemical reaction catalysed by an Enzyme in human body is 104 times faster than when it is carried out in the laboratory. The activation energy of this reaction is
(a) Zero (b) Different in two cases
(c) The same in both the cases (d) None of these

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
c	c	a	a	b	b	b	b	d	b

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