

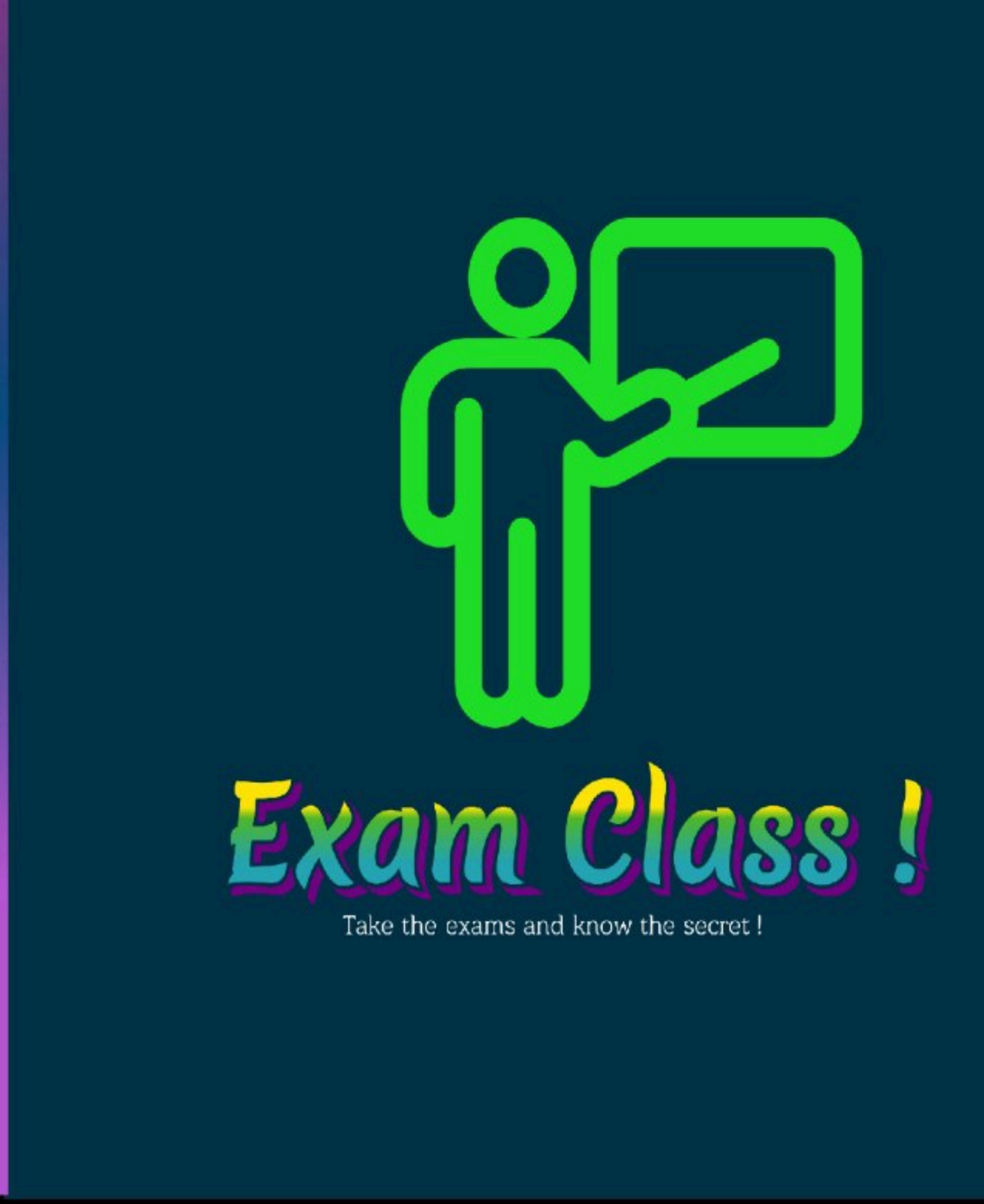

በ Exam Class ከ ቀለሜ ቻናል ጋር በመተባበር የተዘጋጀ !

Time Allowed 2 hr

GENERAL INSTRUCTIONS

1. This exam booklet contains 6 pages including the cover page and the Answer sheet. Part I (20 multiple choice) and Part II (6 short answer) questions.
2. Write your name on each page of question papers and answer sheet.
3. For Part I, blacken a circle that corresponds to your best choice on the answer sheet and for Part II, write your answer in the space provided. For questions involving calculations, write given and required before solving the questions.
4. No rough paper is allowed; you can use the question papers for rough work.
5. You are not allowed to use your mobile. You can use a calculator instead for calculations.
6. Don't detaches the answer sheet from the question paper.
7. Use the provided table in the first page whenever necessary.

Elements	H	Na	N	O	F	P	Mg	Cl	I	K	Ca	S	Br	Fe	Sr	C	Cu
Atomic No	1	11	7	8	9	15	12	17	53	19	20	16	35	26	38	6	29
Mass No	1	23	14	16	19	31	24	35.5	127	39	40	32	80	56	88	12	63.6

Part I

Choose the Correct Answer (20 pts)

1) Which one of the following compounds formed from $_{17}L$ and $_{38}M$ elements shows correct name and formula, respectively?
A) Selenium chloride, $SeCl_2$ B) Strontium chloride, $SrCl_2$
C) Scandium chloride, $ScCl_3$ D) A and C E. None

2) What is the molecular formula for the empirical formula of CH_2 (M = 42.08 g/mol)?
A) C_2H_4 B) C_3H_6 C) C_4H_8 D) None E) A and B

3) A strong electrolyte is one that _____ completely in solution.
A) reacts B) conjugates C) dissociates D) disappears E) A and C

4) A weak electrolyte exists predominantly as _____ in solution.
A) atoms B) ions C) molecules D) electrons E) an isotope

5) A neutralization reaction between an acid and a metal hydroxide produces _____.
A) water and a salt B) hydrogen gas C) oxygen gas D) sodium hydroxide E) ammonia

6) Which one of the following shows the increasing order of bond strength?
A) Br-Br > Cl-Cl > I-I B) I-I < Br-Br < Cl-Cl C) Cl-Cl < Br-Br < I-I D) A and C E.) None

7) The H-O bond in water is:
A) Ionic bond B) Coordinate covalent bond C) polar covalent bond
D) Hydrogen bond E) None

8) Which one of the following is true about the ionic compound?
A) Formed from similar electronegative elements B) Formed by sharing of electrons
C) Formed by complete transferring of valence electrons from one to another
D) None E) A and C

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9) For solution preparation which one of the following is true?
A) solute-solute interaction is greater than solute-solvent interaction
B) solute-solvent interaction is greater than solute-solute and solvent-solvent interaction
C) solvent-solvent interaction is greater than solute-solvent interaction
D)All of the above E) None

10) Which one of the following is true for supersaturated solutions?
A) Solvent holds more solute than is normally possible at that temperature.
B) Less than the maximum amount of solute for that temperature is dissolved in the solvent.
C. Solvent holds as much solute as is possible at that temperature. D) A and C E) None

11) What is the concentration (M) of CH_3OH in a solution prepared by dissolving 11.7 g of CH_3OH in sufficient water to give exactly 230 mL of solution?
A) 11.9 B) 1.59×10^{-3} C) 0.0841 D) 1.59 E) 11.9×10^{-3}

12) How many grams of H_3PO_4 are in 175 mL of a 3.5 M solution of H_3PO_4?
A) 0.61 B) 60 C) 20 D) 4.9 E) 612

13) An aqueous ethanol solution (400 mL) was diluted to 4.00 L, giving a concentration of 0.0400 M. The concentration of the original solution was _____ M.
A) 0.400 B) 0.200 C) 2.00 D) 1.60 E) 4.00

14) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is _____.
A) $HNO_3(aq) + Sr(OH)(aq) \rightarrow Sr(NO_3)_2(aq) + H_2(g)$
B) $HNO_3(aq) + Sr(OH)_2(aq) \rightarrow Sr(NO_3)_2(aq) + H_2O(l)$
C) $HNO_3(aq) + Sr(OH)_2(aq) \rightarrow SrNO_3(aq) + H_2O(l)$
D) $2HNO_3(aq) + Sr(OH)_2(aq) \rightarrow Sr(NO_3)_2(aq) + 2H_2O(l)$
E) $2HNO_3(aq) + Sr(OH)_2(aq) \rightarrow Sr(NO_3)_2(aq) + 2H_2(g)$

15) Which one of the following is a correct expression for ~~molarity~~ molality?
A) mol solute/L solvent B) mol solute/mL solvent C) mmol solute/mL solution
D) mol solute/kg solvent E) μmol solute/L solution

16) What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 200 mL to make a 1.50 M solution of sodium hydroxide?
A) 0.05 B) 50.0 C) 45 D) 800 E) 0.800

17) Which one of the following substances is produced during the reaction of an acid with a metal hydroxide?
A) H_2 B) H_2O C) CO_2 D) NaOH E) O_2

18) Which of the following is NOT a characteristic of a solution?
A) It will separate while standing B) It has uniform composition
C) It cannot be separated by filtration D) It can be separated into pure component E) A and C

19) What is the name of K_2HPO_4
A) Potassium phosphate B) Sodium hydrogen phosphate C) Potassium bicarbonate
D) Potassium hydrogen phosphate E) Potassium hydrogen sulphate

20) What is the formula of Ammonium sulphate is
A) $(NH_4)_3PO_4$ B) $(NH_4)_2SO_4$ C) $(NH_4)_3SO_4$ D) $(NH_4)_2HSO_3$ E) $(NH_4)_3SO_3$

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AGHMC, General

20/20 Excellent !

Part II. Short answer questions (20 pts)
Write your answer in the space provided. For calculation questions show all necessary steps.

1) How many grams of water are produced in the oxidation of 1.00 g of glucose, $C_6H_{12}O_6$? (2 pt)

$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

1 mol (180 g) — 6 mol (18 g)

$\frac{1\,g}{180\,g} = \frac{x}{6(18)\,g}$ ∴

$x = \frac{6(18)\,g}{180\,g} \simeq \underline{0.6\,g}$ of H_2O is produced

(2)

Mm = molar mass

4

2) How would you prepare the following aqueous solutions? (4 pts)

(a) 355 mL of 8.74×10^{-2} M KH_2PO_4 from solid KH_2PO_4

$V = 355\,ml$, $M = 8.74 \times 10^{-2}\,M$ } KH_2PO_4

$M_m = 39 + 2 + 31 + 64$
$97 + 39 = 136\,g/mol$

$M = \frac{n}{V}$ $n = MV = \left(8.74 \times 10^{-2}\,\frac{mol}{L}\right)(355 \times 10^{-3}\,L)$

$n = 31.02 \times 10^{-3}\,mol$

$n = \frac{m}{M}$
$m = nM_m$
$m = (31.02 \times 10^{-3})(136)$
$m = 4.22\,g$

Shake & add to flask
we can prepare the sol'n : 4.22 gram of KH_2PO_4 ~~from sol~~ add to 8.74×10^{-2} M until it becames 355ml.

(b) 425 mL of 0.315 M NaOH from 1 .25 M NaOH

$V_f = 425\,ml$, $M_f = 0.315\,M$ NaOH
$M_i = 1.25\,M$

$M_i V_i = M_f V_f$ or $C_i V_i = C_f V_f$

$V_i = ?$ ~~$M_i = C_i = ?$~~

~~$M_i = M_f V_f$~~ $V_i = \frac{M_f V_f}{M_i}$
~~V_i~~

$V_i = \frac{425 \times 10^{-3}\,L \times 0.315\,M}{1.25\,M}$

$V_i = \underline{0.107\,L}$

we can prepare solution:
0.107 L or 107 ml of ~~solute~~ mixed with 0.315 M to until it becomes 426 ml or 0.4 L.

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3) 13 g of Iron (III) reacts with 35.5 g chlorine gas to form ferric chloride produced (MWt of Cl_2 = 71 g/mol, Fe = 56 g/mol). (4 pts)
a) Determine the limiting and excess reactants
b) How many grams of ferric chloride are produced?
c) How many gram of reactant is left in excess?
d) If 33.5 g of ferric chloride are produced, then determine the percent yield of ferric chloride?

only used from 35.5 g

Left = 35.5g − 24.72g

= 10.78g is left

$13g \quad 35.5g \quad X$

$2Fe + 3Cl_2 \rightarrow 2FeCl_3$

$2(56) \quad 3(71) \quad 2(56+106.5)$

$71+35.5$

106.5

for Fe case I $\frac{13g}{2(56)g} = \frac{X}{2(162.5)g}$

mass of $FeCl_3$ = $X = 37.72g$ of Fe

for Cl_2 $\frac{35.5g}{213g} = \frac{X}{325}$

$X = 54.16g$

(A) Fe is limiting reactant
Cl is Excess reactant
(B) mass of ~~ferric~~ $FeCl_3$ is 37.72g
(C) 10.78g is left
(D) $\%Y = \frac{AY}{TY} \times 100 = \frac{33.5g}{37.72g} \times 100 = 88.81\%$

4) Calculate the molality, molarity, and mole fraction of NH_3 in an 8.00 mass/mass % aqueous solution (d = 0.9651g/mL). (3 pts)

8% m/m assume 100g of Solution

Solution = Solute + Solvent

100g = 8g + 92g

m = 8g of NH_3 (solute)

m = 92g of H_2O (solvent)

m = ? d = 0.9651g/mL

M = ?

X_{NH_3} = ?

$n_{NH_3} = \frac{8}{17g/mol} = 0.47mol$

X_{NH_3} = ?

$n_{H_2O} = \frac{92}{18} = 5.1mol$

$m = \frac{n}{kg_{solvent}} = \frac{0.47mol}{0.092kg} = 5.108$ Molal

$n_{NH_3} = 0.47mol$

92g of H_2O = 0.092kg

$\rho = m/V$

$V = m/\rho$

$M = \frac{n}{V} = \frac{0.47mol}{0.1036}$

$\frac{100g}{0.9658}$

$V = 103.6mL$

$M = 4.65$ Molar

$V = 0.1036L$

$X_{NH_3} = \frac{n_{NH_3}}{n_{NH_3} + n_{H_2O}}$

$X_{NH_3} = \frac{0.47mol}{0.47mol + 5.1mol}$

$X_{NH_3} = \frac{0.47mol}{5.57mol}$

$X_{NH_3} = 0.084$

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5) How many grams of $Ca(OH)_2$ are needed to neutralize 25.0 mL of 0.100 *M* HNO_3 based on the following reaction? (4 pts)

A HNO_3 (aq) + B $Ca(OH)_2$ (s) → C H_2O (l) + D $Ca(NO_3)_2$ (Aq)

0.0925 g of $Ca(OH)_2$ is needed

0.16 g

$2HNO_3 + Ca(OH)_2 \rightarrow 2H_2O + Ca(NO_3)_2$

2(64 g/mol) 74 g/mol

V = 25 mL

M = 0.1 M HNO_3

$M = \frac{n}{V}$

$n = MV$

$(0.1)(25 \times 10^{-3})$

$n = 0.0025$ mol of HNO_3

$n = \frac{m}{Mm}$

$m = nMm$

$(0.0025)(64) = 0.16$ g

$(nMm = 64$ g/mol)

$\frac{0.16\text{ g}}{128\text{ g}} = \frac{x}{74\text{ g}}$

$x = 0.0925$ g of $Ca(OH)_2$ is needed

$16 + 48 = 64$

6) A 5.325-g sample composed of carbon, hydrogen and oxygen only which is used in the manufacture of perfumes, is found to contain 3.758 g of carbon, 0.316 g of hydrogen, and 1.251 g of oxygen. What is the empirical formula of this substance? (3 pts)

Sample mass = 5.325 g

C	H	O
3.758 g	0.316 g	1.251 g
12 g/mol	1 g/mol	16 g/mol
C	H	O
0.313 mol	0.316 mol	0.078 mol

3

divide for small no ration is 0.078 mol

C	H	O_2
$\frac{0.313\text{ mol}}{0.078\text{ mol}}$	$\frac{0.316\text{ mol}}{0.078\text{ mol}}$	$\frac{0.078\text{ mol}}{0.078\text{ mol}}$
4.01 ≈ 4	4.05 ≈ 4	1

C_4H_4O is the Emphrerical formula of a Sample

Name [redacted] ID No 2663 Department CN Group

Answer sheet for Part I 15

Blacken a circle that corresponds to your best choice on the answer sheet

	A	B	C	D	E
1)	O	●	O	O	O
2)	O	●	O	O	O
3)	O	O	O	O	●
4)	O	●	O	O	O
5)	●	O	O	O	O
6)	O	●	O	O	O
7)	O	O	●	O	O
8)	O	O	O	O	●
9)	O	●	O	O	O
10)	O	O	O	●	O
11)	O	O	O	●	O
12)	O	●	O	O	O
13)	●	O	O	O	O
14)	O	O	O	●	O
15)	O	O	O	●	O
16)	O	O	O	●	O
17)	O	●	O	O	O
18)	●	O	O	O	O
19)	O	O	O	●	O
20)	O	●	O	O	O

Answer For Chemistry ExamClass

Chemistry final Exam ExamClass