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OROMIA EDUCATION BUREAU

SECONDARY EDUCATION PROGRAM

SECOND ROUND MODEL EXAM FOR GRADE 12 STUDENTS, **2017/2025.**

TIME ALLOWED: 2 $\frac{1}{2}$

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS *CHEMISTRY* SECOND ROUND MODEL EXAM FOR GRADE 12. IN THIS BOOKLET, THERE ARE TOTAL OF **80** MULTIPLE CHOICE QUESTIONS.

THERE IS ONLY ONE BEST ANSWER FOR EACH QUESTION. CHOOSE THE CORRECT ANSWER FROM THE GIVEN ALTERNATIVES AND WRITE THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET PROVIDED.

YOU ARE ALLOWED TO WORK ON THE EXAM QUESTIONS FOR $2\frac{1}{2}$ hours **ONLY.**

WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING ON THE QUESTIONS AND PUT DOWN YOUR PEN/PENCIL AND WAIT FOR WHAT YOU MIGHT BE TOLD TO DO.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAM WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAM HALL AND CANCELLATION OF YOUR SCORE.

PLEASE MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU START TO WORK ON THE EXAM.

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DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

➢ PHYSICAL CONSTANTS

- Gas constant R= 8.314 J mol^{-} K^{-} = 0.0821 Latmmol^{-1} K^{-1}
- Avogadro"s number = 6.023 x10^{23} mol^{-}
- Plank"s constant h=6.626 x10^{-34} Js^{-},
- Rydberg constant= -2.18 *10^{-18} J
- Log 2.7=0.43, log1.8=0.255
- Kb (NH_3)=Ka (CH_3COOH)=1.8 ×10^{-5}
- Speed of light, C = 3x10^{8}m/s
- Faradays constant, F = 96500 C/mol
- Mass of an electron = 9.11x10^{-31} Kg
- Charge of electron= 1.6.x10^{-19} C

➢ Atomic Number (Z) and Atomic Weight (A)

Element	H	He	Li	Be	B	C	N	O	F
Z	1	2	3	4	5	6	7	8	9
A	1.0	4.0	6.9	9.01	10.8	12.0	14.0	16.0	19.0
Element	Ne	Na	Mg	Al	P	S	Cl	Ar	K
Z	10	11	12	13	15	16	17	18	19
A	20.2	23.0	24.3	26.98	31.0	32.1	35.5	39.95	39.0
Element	Ca	Mn	Cr	Cu	Zn	Br	Ag	I	pb
Z	20	25	24	29	30	35	47	80	82
A	40.08	54.9	52	63.55	65.38	79.90	108	200.6	207

➢ Standard *reduction potential values of selective species*

- ✓ $E^0(Zn^{2+}/Zn)$_____-0.76v
- ✓ $E^0(Cr^{3+}/Cr)$ _____-0.74v
- ✓ $E^0(Pb^{2+}/Pb)$ _____0.13v
- ✓ $E^0(Ni^{2+}/Ni)$ _____-0.25v
- ✓ $E^0(Al^{3+}/Al)$ _____-1.66v
- ✓ $E^0(Mg^{2+}/Mg)$ ____-2.37v
- ✓ $E^0(Fe^{2+}/Fe)$ _____-0.44V
- ✓ $E^0(Ag^{+}/Ag)$ _____0.8v
- ✓ $E^0(Mn^{2+}/Mn)$ ___-1.18v
- ✓ $E^0(Cu^{2+}/Cu)$ ____0.34v
- ✓ $E^0(Ca^{2+}/Ca)$ ____-2.87
- ✓ $E^0(Au^{3+}/Au)$ ___1.5v
- ✓ $E^0(Cd^{2+}/Cd)$ ____-0.4V

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1. Which of the following atomic models is NOT expressed correctly?
   A. Dalton's atomic model…….billiard ball model
   B. Thomson's model of atom ……...Plum pudding model
   C. Thomson's model of atom ……Planetary model
   D. Rutherford atomic model…….Nuclear model
2. Suppose an unknown element does NOT deflect cathode rays in an electric field but has significant mass. Based on atomic models, which subatomic particle could it be composed of, and how would this impact the element's atomic structure?
   A. Protons; making the nucleus positively charged
   B. Neutrons; contributing to atomic mass without charge
   C. Electrons; moving freely in orbitals
   D. Positrons; leading to an unstable atom
3. A student is studying an atom with a mass number of 23 and an atomic number of 11. Based on nuclear composition, which of the following statements is correct?
   A. The nucleus contains 11 protons and 12 neutrons
   B. The nucleus contains 11 neutrons and 12 protons
   C. The nucleus contains only 11 protons
   D. The nucleus contains 23 neutrons and 11 protons
4. A scientist shines red and blue light on a metal surface. The red light does not eject electrons, but the blue light does. What conclusion can be drawn?
   A. The red light has higher intensity than the red light
   B. The blue light has a higher frequency and sufficient energy
   C. The red light has more energy than the blue light
   D. The photoelectric effect depends only on intensity, not frequency
5. The maximum kinetic energy of photo electrons ejected from a metal when it is subjected to a radiation of frequency 3.0×10^{15} Hz is 6.63×10^{-19} J. The threshold frequency, ν_o of the photo electron of the metal is
   A . 1.0×10^{15} Hz B. 2.0×10^{-15} Hz C. 3.0×10^{15} Hz D. 2.0×10^{15} Hz
6. Which of the following correctly explains Heisenberg's Uncertainty Principle?
   A. The exact position and momentum of a particle can be simultaneously determined.
   B. The more precisely the position of an electron is known, the less precisely its momentum
   C. It suggests that electrons move in fixed circular orbits around the nucleus.
   D. It only applies to macroscopic objects and not quantum particles.
7. Which of the following combinations of quantum numbers is allowed?
   A. $n = 4,\ l = 1,\ m_{(l)} = 0,\ m_{(s)} = -\frac{1}{2}$
   B. $n = 2,\ l = 2,\ m_{(l)} = 0,\ m_{(s)} = +\frac{1}{2}$
   C. $n = 3,\ l = 0,\ m_{(l)} = 1,\ m_{(s)} = +\frac{1}{2}$
   D. $n = 0,\ l = 1,\ m_{(l)} = -1,\ m_{(s)} = -\frac{1}{2}$
8. Why do ionic compounds typically have higher melting points than covalent compounds?
   A. Due to ionic bonds involve electron sharing.
   B. Due to ionic lattices have strong electrostatic forces.
   C. Due to covalent bonds are weaker than van der Waals forces.
   D. Due to ionic compounds have lower polarity?

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9. Using Born -Haber cycle, what is the lattice energy of NaCl, given the following data?
   - ✓ Sublimation energy of Na =+108kJ/mol
   - ✓ Ionization energy of Na=+496kJ/mol
   - ✓ Bond dissociation of Cl_2= +240Kj/mol
   - ✓ Electron affinity of Cl- = -349KJ/mol
   - ✓ Enthalpy formation of NaCl= -411KJ/mol

   A. -750KJ/mol -880KJ/.mol C. -786KJ/mol D. -920KJ/mol

10. Which of the following molecules is an exception to the octet rule due to having an incomplete octet?
   A. CO_2 B. $BeCl_2$ C. NH_3 D. CH_4

11. Which molecular shape is expected when a central atom has three bonding pairs and one lone pair?
   A. Trigonal planar B. Tetrahedral C. Trigonal pyramidal D. Trigonal bipyramidal

12. According to valence shell electron pair repulsion (VSEPR) theory, what is the molecular shape of **PF_5?**
   A. Trigonal planar B. Tetrahedral C. Trigonal bipyramidal D. Octahedral

13. Which of the following sample routine correctly indicate the extraction of copper from is principal-ore?
   A. Concentration of ores → Reduction → Roasting → Purification
   B. Concentration of ores → Roasting → Reduction → Purification
   C. Concentration of ores → Purification → Roasting → Reduction
   D. Purification → Concentration of ores → Reduction → Roasting

14. Though Graphite is a non-metal, it conducts electricity. Which of the following is correctly explaining this property?
   A. Due to the presence of delocalized electrons within its structure that allow charge movement.
   B. Because it is made of ionic bonds, allowing ions to move freely.
   C. Because it contains metallic bonds similar to those in metals.
   D. Due to Graphite atom are arranged randomly, which increases conductivity.

15. Which type of intermolecular force is primarily responsible for the high boiling point of water?
   A. Ion-dipole interactions C. Hydrogen bonding
   B. London dispersion forces D. Covalent bondin

16. Which of the following represents the correct molecular orbital electron configuration of O_2?
   A. $\sigma 1s^2\ \sigma^*1s^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2px^2\ (\pi 2py^2 = \pi 2pz^2)\ (\pi^*2py^1 = \pi^*2pz^1)$
   B. $\sigma 1s^2\ \sigma^*1s^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2px^2\ \ \pi 2py^2 = \pi 2pz^2\ \pi^*2py^2$
   C. $\sigma 1s^2\ \sigma^*1s^2\ \sigma 2s^2\ \sigma^*2s^2\ \ \pi 2py^2 = \pi 2pz^2\ \ \sigma 2px^2\ \ \pi^*2py^2 = \pi^*2pz^1$
   D. $\sigma 1s^2\ \sigma^*1s^2\ \sigma 2s^2\ \sigma^*2s^2\ \sigma 2px^2\ \ \pi 2py^2 = \pi 2pz^2\ \pi^*2pz^2$

17. Why the molecular geometry of ammonia (NH_3) does a trigonal pyramidal shape rather than being a tetrahedral shape?
   A. Due to the presence of lone pair-bonding pair repulsion on nitrogen
   B. Due to the presence of hydrogen bonding in ammonia molecule.
   C. Because nitrogen exhibits sp-hybridization
   D. Because the hydrogen atoms are different in size

18. If a molecule has sp hybridization, what will its molecular geometry?
   A. Tetrahedral B. Trigonal planar C. Linear D. Bent

19. If the temperature of a gas decreases while the volume remains constant, what happens to the pressure?
   A. Increases B. Decreases C. Stays the same D. Doubles

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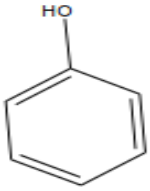
20. A gas occupies 2 L at 300 K. If the temperature increases to 600 K at constant pressure, what will be its new volume?

A. 1 L B. 2 L C. 4 L D. 6 L

21. Why do solids have a fixed shape?

A. Their particles are far apart and move freely
B. Their particles are tightly packed
C. Their particles slide past each other
D. Their particles have the highest kinetic energy

22. What type of bond you observe in phenol?



A. 5 C-H, 3 C=C , 5 C-C and 1 O-H
B. 5 C-H, 3 C=C , 3 C-C, 1 C-O and 1 O-H
C. 5 C-H, 6 C - C, 2 C- O and 1 O-H
D. 5 C-H, 4 C=C , 2 C-C, 2 C-O and 1 O-H

23. Which of the following statements about the three states of matter is FALSE?

A. Solids have definite shape and volume
B. Liquid attain the shape of container
C. Gases have definite shape and volume
D. Gases can be compressed easily

24. Which of the following is NOT factor affecting rate of reaction?

A. Pressure of gaseous substance
B. Surface area of solid substance
C. Concentration of product
D. Temperature of solid

25. In the reaction $X + 3Y \rightarrow 2Z$, how does disappearance rate of Y compare with the rate of appearance of *Z*?

A. The rate of disappearance of *Y* is 1/2 the rate of appearance of *Z*
B. The rate of disappearance of *Y* is 3/2 the rate of appearance of *Z*
C. The rate of disappearance of *Y* is 2/3 the rate of appearance of *Z*
D. The rate of disappearance of *Y* is 1/3 the rate of appearance of *Z*

26. How does catalyst generally affect the rate of a chemical reaction?

A. Positive catalyst promote the rate of reaction by increasing activation energy
B. Positive catalyst promote the rate of reaction by decreasing activation energy
C. Inhibitor facilitate the rate of reaction with constant activation energy
D. Catalyst doesn't affect rate of reaction

27. If you need to design an experiment to increase the rate of reaction between magnesium and hydrochloric acid, which combination of factors would work best?

A. Use large pieces of magnesium and decrease temperature
B. Crush magnesium block into powder and use a catalyst
C. Reduce hydrochloric acid concentration and add a catalyst
D. Increase pressure and decrease reactant concentration

28. What does Le Chatelier's Principle predict when the concentration of reactants in a system at equilibrium is increased?

A. The equilibrium will shift to favor the reactants.
B. The equilibrium will shift to favor the products.
C. The equilibrium will not shift
D. The reaction will stop.

29. The value of the equilibrium constant, Kc for the reaction given: $A + 2B \rightleftharpoons 2C$ is 10.
What is the value of the equilibrium constant for the reaction: $6C \rightleftharpoons 3A + 6B$ Kc'

A. 0.010 B. 1000 C. 0.001 D. 10

30. Which elements are commonly found in the alloy of bronze?

A. Copper and tin
B. Iron and carbon
C. Aluminum and zinc
D. Nickel and chromium

31. In general, melting point of fat is _____ and melting point of oil is _____

A. Higher, higher
B. Lower, lower
C. Higher, lower
D. Lower, higher

32. Given the general structure of organic compounds:

- $R\text{-}CH_2\text{-}CH_2CH_2\ OH$……..…….. monohydric alcohol
- $R\text{-}CH_2\text{-}CH_2COOH$……..….Carboxylic acid
- $R\text{-}CH_2CH_2CHO$….. …….Aldehyde

Then which general formula derived for monohydric alcohol, carboxylic acid and aldehyde respectively?

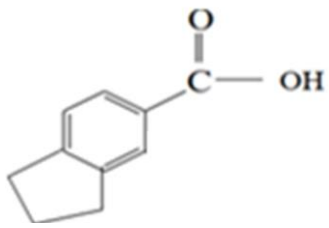
A. $C_nH_{2n+1}(OH)$, $C_nH_{2n}(O)_2$, $C_nH_{2n-2}(O)$
B. $C_nH_{2n}(OH)$, $C_nH_{2n}(O)$, $C_nH_{2n}(O)$
C. $C_nH_{2n}(OH)$, $C_nH_{2n+1}(O)$, $C_nH_{2n}(O)$
D. $C_nH_{2n}(OH)$, $C_nH_{2n}(O)$, $C_nH_{2n}(O)_2$

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33. Why carboxylic acids are more acidic than alcohols both of them have a hydrogen atom attached to an oxygen atom (—O—H)? Because:

A. Carboxylic acids can release proton easier than alcohols.
B. The intermolecular force of carboxylic acid is stronger than that of alcohol
C. The boiling point of carboxylic acid is higher than that of alcohol
D. The surface area of carboxylic acid is greater than that of alcohol

34. What functional group is presented in the structural formula given below?

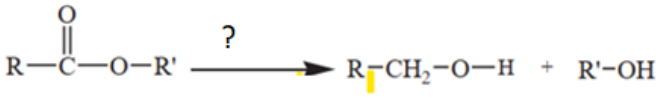


A. Carboxylic and alcohol ester
B. Carboxylic acid and ester
C. Aromatic and ester
D. Aromatic and carboxylic acid

35. In which of the following compounds, IUPAC name, common name and its structure is NOT correctly matched?

	IUPAC Name	Common Name	Structure
A	Ethanedioic acid	Oxalic acid	$HO_2C\text{-}CO_2H$
B	Propanedioic acid	Malonic acid	$HO_2CCH_2CO_2H$
C	Butanedioic acid	Succinic acid	$HO_2C(CH_2)_2CO_2H$
D	Pentanedioic acid	Glutaric acid	$HO_2CCH_2\ CO_2H$

36. Esters are reduced to primary alcohols by special reducing agents given in the reaction below



What is the most appropriate reagent used to do this reduction?

A. $LiAlH_4/H^+$ B. V_2O_5 C. $KMnO_4$ D. Pt/Pd

37. Which of the following are the correct postulates of Dalton atomic theory that **inconsistent** with modern atomic theory?

A. All elements are made up of small particles called atoms
B. Compounds are formed when atoms of more than one element combine
C. Any matter is composed from indivisible atoms
D. Atoms of the same elements have identical chemical properties.

38. What is the main product when benzene is treated with a mixture of concentrated nitric acid and sulfuric acid?

A. Nitrobenzene
B. Phenol
C. Benzaldehyde
D. Toluene

39. What is the period and group of the element with atomic number 13?

A. Period 2, Group IIA
B. Period 3, Group IIA
C. Period 3, Group IIIA
D. Period 4, Group IIA

40. Which of the following is TRUE about the periodic properties of elements?

A. Alkali metals lose electrons more easily due to lower ionization energy
B. Halogens gain electrons less readily due to higher electron affinity
C. Both alkali metals and halogens are more readily to lose electron at arbitrary condition
D. Alkali metals gain electrons more readily than halogens.

41. Which of the following statements is TRUE about polar covalent molecules?

A. They have equal sharing of electrons
B. They always involve symmetrical geometry
C. They dissolve easily in benzene.
D. They have unequally sharing of electron.

42. A Grade 12 student claims that hydrogen bonding and dipole-dipole forces are equally strong. How would you asses this statement?

A. The student is correct because both forces occur between polar molecules.
B. The student is incorrect because dipole-dipole forces are weaker than hydrogen bonding.
C. The student is incorrect because dipole-dipole interactions only exist in ionic compounds.
D. The student is correct because both forces require permanent dipoles.

43. Which of the following is the best example of the Law of Conservation of Mass?

A. 10 g of hydrogen reacts with 80 g of oxygen to form 90 g of water.
B. 10 g of hydrogen reacts with 40 g of oxygen to form 30 g of water.
C. 10 g of hydrogen reacts with 10 g of oxygen to form 5 g of water.
D. 10 g of hydrogen reacts with 5 g of oxygen to form 20 g of water

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44. 180 g of calcium carbonate $CaCO_3$ is allowed to react with 156 g of HCl according to the following reaction. $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$
which of the following substances is the limiting reagent?
A. $CaCO_3$ B. HCl C. H_2O D. CO_2

45. Which of the following is TRUE about conjugated acid- base pair?
A. The stronger the acid, the weaker its conjugate acid.
B. The stronger the acid, the stronger its conjugate base.
C. Conjugated acid has one more hydrogen than its base.
D. Conjugated base has one fewer negative charge than its acid.

46. For the reaction given: $HOBr + OH^- \rightleftharpoons H_2O + OBr^-$ which of the following is the correct conjugated acid - base pair?
A. $HOBr / OBr^-$
B. OH^- / H_3O^+
C. OBr^- / OH^-
D. OBr^- / H_2O

47. Given the reaction: $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$. How can H_2O act as both an acid and a base?
A. By donating a proton and accepting a proton.
B. By donate a proton only
C. By accepting a proton only
D. By remains neutral

48. A 0.20 M solution of HF has a Ka of 6.6×10^{-4}. How would you determine the pH of this solution?
A. Solve $[H_3O^+]$ then use $pH = -\log[H_3O^+]$
B. Assume $[H_3O^+] = [OH^-]$ and solve pH
C. Use $Ka = [HA] / [H_3O^+]$ to find pH
D. Assume pH = 7 because HF is a weak acid

49. A solution of NaOH has initial concentration of 0.01 M. Calculate the $[OH^-]$ and determines the pOH.
A. $[OH^-] = 0.01M$, pOH = 2
B. $[OH^-] = 0.01M$, pOH = 3
C. $[OH^-] = 0.001M$, pOH = 2
D. $[OH^-] = 0.1M$, pOH = 1

50. Two solutions A and B have pH values of 2 and 4 respectively. Which of the following is correctly described?
A. Solution A is more basic than solution B.
B. The concentration of H^+ in solution B is 100 times greater than that of solution A.
C. The concentration of H^+ in solution A is 1000 times greater than that of solution B.
D. The concentration of H^+ in solution A is 100 times greater than that of solution B.

51. Which of the following statements best evaluates the impact of increasing temperature on the ionization constant of water?
A. The value of Kw remains unchanged, and the pH of pure water stays constant.
B. The value of Kw increases, leading to an increase in both $[H_3O^+]$ and $[OH^-]$.
C. The value of Kw decreases, reducing the ionization of water and increasing the PH.
D. The value of Kw is unaffected by temperature, but $[H_3O^+]$ and $[OH^-]$ change independently.

52. If the pH of a buffer solution is lower than the pKa of component, which of the following is TRUE?
A. The concentration of acid is greater than the conjugated base.
B. The concentration of acid is less than the conjugated base
C. The buffer has lost its buffering capacity
D. The solution is neutral

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53. Which of the following is NOT a component of a buffer system?

A. A weak acid/strong conjugated base
B. A weak base/strong conjugated acid
C. A strong acid/weak conjugated base
D. A weak base/its salt

54. A buffer solution is prepared by mixing an acid (HA) and its salt (NaA). If the concentration of ion, A^- increases relative to an acid, HA, which of the following expressions should be used to determine the resulting pH of the solution?

A. pH = log $[H^+]$
B. pH = pKa + log $([A^-]/[HA])$
C. pOH = pKa + log $([HA] / [A^-])$
D. pH = $[H^+] \times [OH^-]$

55. A buffer solution is made by mixing NH_4Cl and NH_3. Which species will react with added H^+ ions?

A. NH_4^+ B. NH_3 C. Cl^- D. H_2O

56. What is the pH of a buffer solution containing equimolar of acetic acid and sodium acetate having pKa = 4.76?

A. 4.46 B. 4.76 C. 5.06 D. 7.00

57. A compound having molecular formula C_7H_8 that **does not** decolorize in Br_2 in CCl4 or KMnO4 solution most likely belongs to which class of hydrocarbons?

A. Alkynes
B. Aromatic hydrocarbons
C. Alkanes
D. Alkenes

58. Which of the following salts undergoes **anionic** hydrolysis, resulting in a basic solution?

A. Sodium format (HCOONa)
B. Potassium chloride (KCl)
C. Sodium sulfate (Na_2SO_4)
D. Ammonium nitrate (NH_4NO_3)

59. A student prepares a 2.0 M HCl solution by dissolving hydrochloric acid in water. If they were to prepare the same molarity solution using sulfuric acid (H_2SO_4), what would be its normality?

A. 1.0 N B. 2.0 N C. 4.0 N D. 3.0 N

60. Which acid-base indicator is most suitable for a HCl-NaOH titration?

A. Methyl orange
B. Bromothymol blue
C. Phenolphthalein
D. Universal indicator

61. What is the sum of coefficient of reactant and product after the following ionic equation get balanced in acidic media? $MnO_4^- + Fe^{2+} \rightarrow Mn^{2+} + Fe^{3+}$

A. 19 B. 23 C. 24 D. 10

62. What is the difference between electrolytic cell and galvanic cell?

A. In a galvanic cell, non-spontaneous chemical reactions take place.
B. In an electrolytic cell, non-spontaneous chemical reactions take place.
C. In a galvanic cell, the anode is positive and the cathode is negative.
D. Galvanic cells convert electrical energy into chemical energy.

63. What is the half-reaction at the anode during the electrolysis of copper sulfate ($CuSO_4$) solution using Copper electrode?

A. $Cu^{2+} + 2e^- \rightarrow Cu$
B. $Cu \rightarrow Cu^{2+} + 2e^-$
C. $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$
D. $2Cl^- \rightarrow Cl_2 + 2e^-$

64. Which of the following is the correct increasing order of the atomic size of: **Mg^+, Na, Si^{3+}, and Al^{2+}?**

A. $Na < Mg^+ < Al^{2+} < Si^{3+}$
B. $Si^{3+} < Al^{2+} < Mg^+ < Na$
C. $Al^{2+} < Mg^+ < Na < Si^{3+}$
D. $Si^{3+} > Al^{2+} > Na > Mg^+$

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65. What gases are produced at the cathode and anode respectively if concentrated hydrochloric acid is electrolyzed?

A. Hydrogen gas and Oxygen gas
B. Chlorine gas and oxygen gas
C. Hydrogen and chlorine
D. Hydrogen and water

66. Which of the following best describes a line spectrum?

A. Continuous range of colors without any gape.
B. A spectrum that shows only specific wavelengths of light.
C. A spectrum emitted only by solids at high temperature.
D. A black and white representation of visible light.

67. What are the volume of H_2 and O_2 gases at 25°C and 1.00 atm that will be collected at the cathode and anode, respectively if $Na_2SO_4(aq)$ solution is electrolyzed for 2 hours with 10 amperes current?

A. 9L of oxygen and 4.5L of hydrogen
B. 6L of oxygen and 12L of hydrogen
C. 9 L of hydrogen and 4.5 L of Oxygen
D. Equal volume of oxygen and hydrogen gases are produced

68. A student is tasked with calculating the mass of copper deposited when a current is passed through a copper(II) sulfate solution for 3 hours using 5 amperes of current. Using Faraday's second law of electrolysis, how would they derive the formula for mass of copper deposited in terms of current, time, and the equivalent mass of copper?

A. $m=\frac{MIt}{nf}$
B. $\frac{It}{nF}$
C. $\frac{MnF}{It}$
D. $\frac{nFM}{It}$

69. What is the primary function of a sacrificial anode in corrosion protection?

A. To increase the rate of corrosion in metal structures.
B. To facilitate the oxidation reaction of other metal keeping itself at cathode.
C. To sacrifice itself to protect another metal from corrosion.
D. To enhance the electrical conductivity of the protected metal

70. When a piece of metal A is placed in a solution containing ions of B, metal B plated out on the piece of A. Which metal is being oxidized and reduced respectively?

A. Metal A and metal B
B. Metal B and metal A
C. Both metal A and metal B are equally reduced
D. Both metal A and metal B are equally oxidized

71. Given the reaction: **$Mg(s) + Zn^{2+}(aq) \rightarrow Mg^{2+}(aq) + Zn(s)$:** which of the following is the correct cell notation

A. $Zn^{2+}(aq) / Zn(s) // Mg(s) / Mg^{2+}(aq)$
B. $Zn^{2+}(aq) / Zn(s) // Mg^{2+}(aq) / Mg(s)$
C. $Mg(s) / Mg^{2+}(aq) // Zn(s) / Zn^{2+}(aq)$
D. $Mg(s) / Mg^{2+}(aq) // Zn^{2+}(aq) / Zn(s)$

72. Which of the following is TRUE about the reaction given below?

$2Au(s) + 3Ca^{2+}(0.1M) \rightarrow 2Au^{3+}(0.1M) + 3Ca(s)$

A. There are a total of 2 electron transfer in overall reaction
B. The value of ΔG^0 is large positive value make the reaction is spontaneous
C. The forward reaction is non-spontaneous
D. Gold can reduce calcium spontaneously

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73. How does industrial chemistry contribute to environmental sustainability?
   A. By promoting the excessive use of fossil fuel.
   B. By developing eco-friendly materials and sustainable production processes.
   C. By increasing chemical waste production.
   D. By reducing the use of recycling methods in manufacturing.

74. Which one of the following best describes the formation of pi (π) bond?
   A. They are formed by sideways of p orbitals.
   B. They are formed by the axial overlaps of s or d orbitals.
   C. They are formed by the sideways overlaps of an s and p orbitals.
   D. They are formed by the parallel overlaps of either s or p orbitals.

75. Which of the following are the correct steps in sulphuric acid (98%)manufacturing process?
   A. $S \rightarrow SO_2 \rightarrow H_2S_2O_2 \rightarrow H_2SO_4$
   B. $S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2S_2O_2 \rightarrow H_2SO_4$
   C. $S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2S_2O_7 \rightarrow H_2SO_3$
   D. $S \rightarrow SO_2 \rightarrow SO_3 \rightarrow H_2S_2O_7 \rightarrow H_2SO_4$

76. In which of the following aqueous solution provides the same electrolysis with water, when O_2 and H_2 are formed at anode and cathode respectively.
   A. Concentrated HCl solution
   B. $AgNO_3$ solution
   C. $CuSO_4$ solution
   D. Diluted H_2SO_4 solution

77. Thermoplastic polymers are those which melt when heated and re-solidify when cooled. Which of the following polymers is NOT a thermoplastic polymer?
   A. Dacron B. Bakelite C. Polyethylene D. Teflon

78. What is the molar mass of a polyethylene sample, $[— CH_2 —CH_2—]_n$, when n = 4600?
   (Atomic mass, H = 1 and C = 12).
   A. 1.288×10^3 g/mol
   B. 1.288×10^5 g/mol
   C. 1.196×10^3 g/mol
   D. 1.196×10^4 g/mol

79. Given the following monomers:
   i. $HO–CH_2CH_2–OH$ ii. $HOOC–CH_2CH_2–COOH$.

   Which of the following polymer can synthesis from these monomers?

   A. $[—O\text{-}CH_2CH_2\text{-}OOC\text{-}CH_2\text{-}CH_2\text{-}CO—]n$
   B. $[— (NH_2CH(R)(COOH —]$
   C. $[—OC\text{-}C_6H_4\text{ -}COO\text{-}(CH_2)_2\ O—]$
   D. $[—NH\text{-}CH_2\text{ -}CO\text{-}NH\text{-}CH_2\ CO—]$

80. An unknown salt when heated with a Bunsen flame produced a bright-yellow flame. An aqueous solution of this salt when reacted with dilute HCl released a gas that turns limewater milky. Upon addition of calcium chloride solution to an aqueous solution of this salt, a white precipitate is formed. What is the unknown salt?
   A. Na_2CO_3
   B. NH_4NO_3
   C. $Al_2(SO_4)_3$
   D. CH_3COONH_4

THE END

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