ADDIS ABABA CITY GOVERNMENT EDUCATION BUREAU

CHEMISTRY MODEL EXAMINATION FOR GRADE 12

NUMBER OF QUESTIONS: 80 **TIME ALLOWED**: - $2\frac{1}{2}$**HOURS**

GENERAL DIRECTONS

THIS BOOKLET CONTAINS **CHEMISTRY** MODEL EXAMINATION. THIS EXAMINATION CONSISTS OF A TOTAL OF **80 MULTIPLE CHOICE QUESTIONS**. CAREFULLY SELECT THE BEST ANSWER AND WRITE THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS ON BOTH THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY.

PLEASE DO NOT WRITE UNNECESSARY MARKS ON THE ANSWER SHEET.

YOU ARE ALLOWED TO WORK ON THE EXAMINATION FOR $\mathbf{2\frac{1}{2}}$ **HOURS**. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, PUT YOUR PEN DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT DURING THE EXAMINATION WILL RESULT IN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

PLEASE MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU BEGIN WORKING ON THE EXAMINATION.

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

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SECOND SEMISTER GRADE 12TH CHEMISTRY MODEL EXAM 2018/2026 G.C

YOU MAY REFER TO THE INFORMATION BELOW WHEN YOU NEED WORK ON SOME OF THE QUESTIONS:

PHYSICAL CONSTANTS

a. Ionization constant of water=$1x10^{-14}$
b. Faraday's constant, F = 96500 C/mol
c. Speed of light=3×10^{8}m/s
d. Rydberg constant, R_H= $2.18 x10^{-18}$J
e. plank's constant=$6.626 x10^{-34}$J/s
f. Gas constant, R= 8.314J/mol.k=0.0821L.atm/mol.k

ATOMIC NUMBERS (Z) AND ATOMIC WEIGHTS (A)

Element	H	B	C	N	O	F	Na	Mg	Al	P	S	Cl	Cr
Z	1	5	6	7	8	9	11	12	13	15	16	17	24
A	1	10	12	14	16	19	23	24	27	31	32	35.5	52

1. Who used the 'cathode ray tube'' to discover the electron and determine its charge to mass ratio?
   A. Robert. A. Millikan
   B. James Chadwick
   C. J.J. Thomson
   D. Ernest Rutherford

2. Among the following postulates of Dalton's atomic theory, the one that was modified in the modern atomic theory is
   A. Atoms are indivisible
   B. Atoms are the smallest particle of all elements
   C. Atoms of more than one element combine to form compounds
   D. Atoms are indestructible

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3. Which of the following statements can be used as an example to describe the law of definite proportion?
   A. 48g of magnesium ribbon burns in excess oxygen to form 80g of magnesium oxide
   B. The mass in gram of oxygen to phosphorus in P_4O_{10} to that in P_4O_6 is in 3:2 ratio
   C. White chalk consists of the elements Calcium, carbon and oxygen which are combined in the mass ratio of 10:3:12 regardless of its source.
   D. Water is a colorless liquid at room temperature

4. The statement "The properties of the elements are periodic functions of their atomic masses" is the
   A. Law of mass action
   B. Mendeleev's periodic law
   C. Modern periodic law
   D. Law of definite proportion

5. What was the main conclusion of the Rutherford Gold Foil Experiment conducted by Ernest Rutherford**?**
   A. Electrons carry a negative charge.
   B. A proton is a hydrogen atom without an electron.
   C. Electrons move around the nucleus in fixed orbits.
   D. Most of the mass and all the positive charge of an atom are concentrated in a very small nucleus

6. The number of protons, neutrons and electrons respectively in $^{112}_{48}Cd^{2+}$ are——.
   A. 48, 64, 48 B. 48, 64, 46 C. 48,64, 50 D. 48, 63, 46

7. 12grams of magnesium react with 48 grams of sulphur as the equation given below:

   Mg(s) + S(s) $\longrightarrow$ MgS(s) (molar mass of Mg=24,S=32)

   Which of the following statement is **not** true from the information given above?
   A. Sulphur is an excess reactant
   B. Magnesium is the limiting reactant
   C. 28g of magnesium sulfide is produced
   D. 16gram of sulfur is left (unreacted)

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8. One of the following remain the same as we move down the group
   A. Effective nuclear charge and atomic size
   B. Valence electron and effective nuclear charge
   C. Valence electron and nuclear charge
   D. Ionization energy and electron affinity

9. To which group and periods of the periodic table does an element with atomic number 33 belong?
   A. Group IIIB and period 4 C. Group VA and Period 4
   B. Group IIIA and Period 4 D. Group IV and period 4

10. An element **X** has two naturally occurring isotopes. The information about these isotopes is given in the table below.

Isotope	Atomic Mass (u)	Natural Abundance (%)
X–40	40	80
X–44	44	20

What is the average atomic mass of element X?

A. 40.8 u B. 41.5 u C. 40.0 u D. 42.0 u

11. In which of the following blocks of the periodic table does an element with atomic number 16 located?
   A. s B. p C. d D. f

12. All of the following compounds contain ionic and covalent bonds except:
   A. NH_4Cl B. $CaCO_3$ C. NH_3BF_3 D. Na_3PO_4

13. Which of the following molecules considered to be a polar molecule?
   A. NH_3 B.BF_3 C.CO_2 D. CCl_4

14. Which one of the following molecules does not contain dative bond?
   A. H_3O^+ B. NH_3 C. NH_3BF_3 D. NH_4^+

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15. The attraction force which is created by a temporary redistribution of electrons in neighboring atom is called?

A. Hydrogen bond
C. Dipole- dipole
B. London dispersion
D. ionic bond

16. Which one of the following does the sulphur atom have the lowest oxidation number?

A. SO_3 B. S_2F_{10} C. H_2SO_3 D. H_2S

17. The concept like dissolves like is illustrated by which of the following?

A. NaCl is more soluble in CCl_4 than water
B. I_2 is more soluble in CCl_4 than water
C. $CuSO_4$ is more soluble in CCl_4 than water
D. CCl_4 soluble in water

18. What is the mole fraction of methanol (CH_3OH) in a mixture of equal mass of methanol and water?

A. 0.36 B. 0.64 C. 0.53 D.0.44

19. Which of the following acid is a monoprotic acid?

A. H_2SO_4 B. CH_3COOH C. H_3PO_4 D. H_2CO_3

20. What is the PH of a solution that has a $[OH^-]$ of 10,000 times greater than a solution with pOH of 5?

A. 2 B. 13 C. 14 D.1

21. Student A and Student B are grade 12 students. They carryout laboratory experiment on detection of metallic ions in different salts as per their laboratory assistance intended them to do so. Student A achieved yellow color after he carry out the flames tests of different salts whereas Student B obtained green color from the same tests on different salts. Which ions did Student A and student B detected respectively?

A. Ca^{2+} & K^+ B. Na^+ & Ba^{2+} C. Ca^{2+} & Mg^{2+} D. Ba^{2+} & Li^+

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22. Which of the following is an example of double displacement reaction

A. $Cl_2 + 2KI \longrightarrow 2\,KCl + I_2$

B. $NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$

C. $Na_2O + H_2O \longrightarrow 2\,NaOH$

D. $NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$

23. Which of the following is correct statement about endothermic reaction?

A. Heat energy is written in the right side of the equation

B. Enthalpy change of the reaction has a negative value

C. chemical reaction that releases heat energy to the surrounding.

D. Heat is absorbed to the system from the surrounding.

24. The two gaseous elements that can be obtained from atmosphere by fractional distillation of liquid air are:

A. Nitrogen and hydrogen

B. Oxygen and hydrogen

C. Nitrogen and oxygen

D. Ammonia and carbon dioxide

25. According to Markovnikov's' rule, the alcohol produced from propene, $CH_2 = CH - CH_3$, during the addition of water in the presence of acid catalyst is

A. 2- propanol

B. 1- propanol

C. Hexanol

D. 2- hexanol

26. Which of the following molecules does **not** exhibit geometrical isomerism

A. 2-butene

B. 1-butene

C. 3-hexene

D. 1, 2-dichloro ethene

27. 4-ethyl-2, 3-dimethyl heptane contains____ tertiary ___secondary and ___ primary carbon atoms, respectively.

A. 3, 3, 5 B. 3, 2, 4 C. 4, 3, 2 D. 2, 2, 4

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28. Among the following methods, which one can be used to prepare alkyne in the laboratory?

A. Dehydration of alcohols with concentrated H_2SO_4

B. Hydrogenation of alkene with a metal catalyst.

C. Dehydrohalogenation of alkyl halides with a base

D. Dehydrohalogenation of Vicinal dihalides with a base.

29. What is the wave length of a photon emitted when a hydrogen atom undergoes a transition from n=5 to n=2?

A. 434mm B. 434pm C. 434nm D. 434um

30. An electron in a Bohr hydrogen atom has energy of $-5.45x10^{-19}$. The value of n for this electron is _____.

A. 2 B. 3 C. 4 D. 5

31. In hydrogen atomic spectrum, a series limit is found at $12186cm^{-1}$. Then it belongs to

A. Lyman series C. Balmer series

B. Paschen series D. Brackett series

32. What is the wavelength associated with an electron of mass, m= 9.11×10^{-28}g, travelling at 10% of the velocity of light?

A. 6.06×10^{-15}m C. 6.06×10^{-12}m

B. 2.42×10^{-15}m D. 2.42×10^{-11}m

33. For the four quantum numbers needed to describe an electron, which of these combinations are **not** possible?

A. (1, 0, 0, +½) B. (2, 1, 1,-½) C. (3, 2,-2,-½) D. (1, 0,-1, +½)

34. Which of the following is the most stable electronic configuration for the element $_{24}Cr$?

A. $1s^2\ 2s^2\ 2P^6\ 3s^2\ 3P^6\ 4s^2\ 3d^4$ C. $1s^2\ 2s^2\ 2P^6\ 3s^2\ 3p^6\ 3d^6$

B. $1s^2\ 2s^2\ 2P^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$ D. $1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6\ 3d^4\ 4s^2$

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35. Which pairs of molecules is geometrically similar?

A. CF_4 and SF_4

B. NCl_3 and BF_3

C. CO_2 and OF_2

D. NH_3 and PH_3

36. What hybridization change, if any occurs at the underlined atom in the following reaction?

$\underline{C}O_2 + H_2O \longrightarrow H_2\underline{C}O_3$

A. Sp^2 to sp^3 B. sp to sp^2 C. sp^3 to sp^3d D. No hybridization change observed

37. Which of the following molecules does **not** obey the octet rule

A. NCl_3 B. CCl_4 C. CO_2 D. ClO_2

38. Which of the following explains why gases are highly compressible?

A. Gas particles are tightly packed together.

B. Gas particles have weak intermolecular forces.

C. Gas particles are far apart and have large empty spaces between them.

D. Gas particles lose energy when compressed.

39. At what temperature will the volume of a gas be double if its original temperature is 27 ^{0}C at constant pressure?

A. 150 K B. 300 K C. 600 K D. 700 K

40. The rate of diffusion of methane (CH_4) is twice that of an unknown gas. What is the molecular mass of the unknown gas?

A.32 B. 64 C.44 D. 48

41. The intermolecular force of three liquids is given as follow: Liquid A< Liquid B< Liquid C

Which statement is correct?

A. Molar heat of vaporization: liquid A>Liquid B> liquid C

B. Normal boiling point: Liquid B< liquid A< liquid C

C. Rate of vaporization: liquid C<Liquid B<liquid A

D. Vapor pressure liquid C>Liquid B> liquid A

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42. What is a valid rate expression for the following reaction?

$2NO + 2H_2 \longrightarrow N_2 + 2H_2O$

A. $\frac{1}{2}\frac{\Delta[NO]}{\Delta t}$ B. $-\frac{1}{2}\frac{\Delta[H_2o]}{\Delta t}$ C. $-\frac{1}{2}\frac{\Delta[NO]}{\Delta t}$ D. $-\frac{\Delta[N_2]}{\Delta t}$

43. The rate of a chemical reaction will be increased by all of the following factors **EXCEPT**.

A. the presence of a high activation energy
B. increasing the surface area of a reactant
C. the presence of a catalyst
D. an increase in temperature

44. What is the process that converts liquid vegetable oils to solid fats?

A. Hydration B. Hydrogenation C. Hydrolysis D. Saponification

45. What is the mass action expression for the following reaction?

$4Cr(s) + 3CCl_4(g) \leftrightarrow 4CrCl_3(g) + 3C(s)$

A. $\frac{[CrCl_3]^4}{[CCl_4]^3}$
B. $Kc=\frac{[CrCl_3]}{[CCl_4]}$
C. $Kc=\frac{[C]^3}{[CrCl_3]^3}$
D. $[CrCl_3]/[Cr]^4$

46. The correct relationship between Kc and Kp for the reaction **$CO(g) + H_2O(g) \leftrightarrow CO_2(g) + H_2(g)$** at equilibrium is.

A. $Kp=Kc(RT)^2$
B. $Kp=Kc(RT)$
C. $Kp=Kc$
D. $Kp=Kc(RT)^4$

47. At 445°C Kc for the following reaction is 0.020. $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

A mixture of H_2, I_2 and HI in a vessel at 445°C has the following concentrations: [HI] = 2.0 M, $[H_2]$ = 0.50 M and $[I_2]$ = 0.10 M. Which one of the following statements concerning the reaction quotient, Q_c, is **True** for the above system?

A. $Q_c=K_c$;the system is at equilibrium
B. Q_c is less than K_c; more H_2 and I_2 will be produced.
C. Q_c is less than K_c; more HI will be produced.
D. Q_c is greater than K_c; more H_2 and I_2 will be produced.

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48. when propene, C_3H_6 undergo a complete combustion reaction, what will be the coefficient of oxygen?

A. 9 B. 6 C. 4 D. 3

49. The percentage ionization of a 0.01 mol/L weak acid HA solution whose pH is 4 is

A. 0.1% B.1% C.2.5% D.4%

50. The PH from the titration of weak acid and strong base at the equivalent point is---------

A. below 7 B. equal to 7 C. above 7 D. not determined

51. The conjugate base and conjugate acid for hydrogen carbonate ion, HCO_3^- respectively is

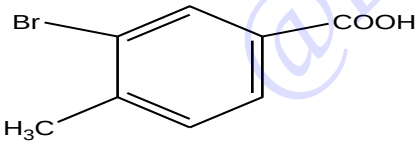
A. CO_3^{2-} and HCO_3^- C. CO_3^{2-} and H_2CO_3

B. H_2CO_3 and CO_3^{2-} D. HCO_3^- and H_2CO_3

52. The dissociation constant of a weak acid is $1x10^{-4}$ in order to prepare a buffer solution with a PH = 5,the (acid)/(salt) ratio should be

A. 1: 10 B. 4: 5 C. 10: 1 D. 5: 4

53. Which of the following is an acceptable common name for the organic compound shown below?



A. α- bromo- γ- methyl benzoic acid

B. α- bromo -γ- methyl benzene carboxylic acid acid

C. m-bromo- p-methyl benzoic acid

D. 3- bromo -4- methyl benzene carboxylic acid

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54. What is the product for the following reaction given below?

$$CH_3CH_2CH_2COOCH_2CH_3 \xrightarrow{LiAlH_4}$$

A. $CH_3CH_2CH_2COOH$&CH_3CH_2OH C. $CH_3CH_2CH_2COOH$&CH_3COOH

B. $CH_3CH_2CH_2CH_2OH$&CH_3CH_2OH D. $CH_3CH_2CH_2CHO$&CH_3CH_2OH

55. Which of the following combinations does **NOT** form a buffer solution?

A. NH_3/HCl in 2:1 mole ratio C. N_2H_4/N_2H_5Cl

B. HNO_3/KNO_3 in 1:1mole ratio D. HCOOH/HCOOK

56. Which of the following salts give acidic solutions when dissolved in water?

I) $N_2H_5NO_3$ II) K_2CO_3 III) NaBr IV) CH_3COONa V) NH_4Cl

A. II, V B. I, V C. I, III, V D. I, III, V

57. Which substance is the reducing agent in the following reaction?

$$4H^+(aq) + 2Cl^-(aq) + MnO_2(s) \rightarrow Cl_2(g) + Mn^{2+}(aq) + 2H_2O(l)$$

A. $H^+(aq)$ C. $Cl_2(g)$

B. $Cl^-(aq)$ D. $MnO_2(s)$

58. Which one of the following statements is **not** true regarding the electrolysis of concentrated sodium chloride solution?

A. chlorine gas is produced at the anode.

B. oxygen gas is produced at the anode.

C. Hydrogen gas is formed at the cathode.

D. after the electrolysis, the remaining solution becomes basic.

59. The volume of O_2 formed at STP when Na_2SO_4 is electrolyzed by passing 100A in 965 seconds?

A. 9.6 L B. 22.4 L C. 5.6 L D. 0.25 L

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60. If the reaction proceeds spontaneously, which of the following sets of conditions is satisfied?

A. $\Delta G^0 < 0$, $K < 1$, $E^0 < 0$ C. $\Delta G^0 < 0$, $K > 1$, $E^0 > 0$

B. $\Delta G^0 > 0$, $K > 1$, $E^0 < 0$ D. $\Delta G^0 > 0$, $K < 1$, $E^0 < 0$

61. Which one of the following **is not** true about electroplating of a tray made of iron with chromium?

A. chromium metal placed in the anode

B. A tray made of iron placed in the cathode

C. Use iron salt solution as an electrolyte

D. Use chromium salt solution as an electrolyte

62. Two cells are connected in series.one contains $AgNO_3$ and the Other contains $CuSO_4$. If 8g of Cu is deposited at one electrode, how many grams of Ag is deposited at the other electrode? (molar mass Ag=108g/mol, Cu=64g/mol)

A. 4 B. 14 C. 27 D. 54

63. Which industrial chemicals **mismatched** with its manufacturing process

A. NH_3 - Haber –Bosch process C. H_2SO_4- contact process

B. HNO_3 - Ostwald process D. Na_2CO_3- Frasch process

64. Among the following nitrogen-based fertilizers which is a high percentage nitrogen content?

A. Anhydrous ammonia C. Urea

B. Urea-ammonium nitrate (UAN) solutions D. DAP

65. All of the following undergoes addition polymerization except

A. Polyvinyl chloride (PVC) B. Teflon C. Nylon D. Polystyrene

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66. The correct order of preparatory stages in the tanning processes of animal hide or skin?

A. Soaking → scudding → flesh removal → hair removal → deliming →curing

B. Scudding → soaking → flesh removal → hair removal → curing → deliming

C. Deliming → flesh removal → hair removal → soaking → scudding → curing

D. Curing → soaking → flesh removal → hair removal → scudding → deliming

67. What substance is used to bleach the brown syrup in the process of sugar manufacturing?

A. Potassium chlorate C. Calcium chloride

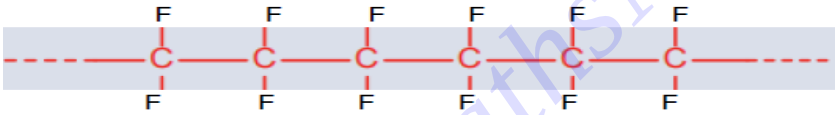
B. Sulfur dioxide D. Sodium hypochlorite

68. Which one of the following is a thermosetting plastic?

A. Bakelite C. Dacron

B. polyethylene D. Polyvinyl chloride

69. Poly tetra fluorine ethylene (Teflon) has the structure



How many monomer units are in a Teflon polymer that has molar mass of 2.8 x10^4g/mol(molar mass, F = 19 and C = 12)

A. 28 B. 100 C. 280 D.2800

70. Any discharge of a solid, liquid or gaseous substance or radiation (energy) in to an environment that causes unwanted changes is said to be:

A. Pollution B. Corrosion C. Contaminates D. Slug

71. The component of the environment consisting earth's upper outer most skin and accessible to human beings is Known as_____.

A. Atmosphere C. Lithosphere

B. Hydrosphere D. Biosphere

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72. Which of the following is **not** a greenhouse gas?

A. Carbon dioxide (CO_2)
C. Water vapor (H_2O)
B. Nitrogen dioxide (NO_2)
D. Oxygen (O_2)

73. Which principle of green chemistry focuses on eliminating waste rather than cleaning it up later?

A. Atom Economy
C. Design for Energy Efficiency
B. Prevention
D. Safer Solvents and Auxiliaries

74. Which principle emphasizes maximizing the desired product and minimizing by-products?

A. Design for energy efficiency
C. Less hazardous chemical synthesis
B. Use of renewable feedstock
D. Atom economy

75. Identify the correct statement about metallic conductivity and electrolytic conductivity.

A. Metallic conductivity decreases while electrolytic conductivity increases with increasing temperature
B. Both conductivities increase with increasing temperature
C. Both conductivities decrease with increasing temperature
D. Metallic conductivity increases while electrolytic conductivity decreases with increasing temperature

76. Equal energy of orbitals (degenerate orbitals) are each occupied by a single electron before the second electron of opposite spin enters the orbital ". This principle is

A. Avogadro´s principle
C. Paulis´ exclusion principle
B. Aufbau principle
D. Hund´s principle

77. 1 mole of $N_2O_4(g)$ was placed in an empty 1litre container and allowed to reach equilibrium according to the following equation: $N_2O_4(g) \leftrightarrow 2NO_2(g)$. At equilibrium, x mole of $N_2O_4(g)$ had dissociated. What is the value of the equilibrium constant, Kc, at the temperature of the experiment?

A. $\frac{2x}{(1-x)}$
B. $\frac{2x}{(1-x)^2}$
C. $\frac{4x^2}{(1-x)^2}$
D. $\frac{4x^2}{(1-x)}$

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78. Which of the following is true about homologous series? The Homologous series is?

A. The existence of chemical compounds that have the same molecular formula but different in structural formation

B. A structure in which the isomers have different functional group with respect to the double bond

C. The property of an element to form chains with the repetition of the same atom

D. A group of molecules each differing from the next member by a certain group

79. Which one of the following is not amphiprotic?

A. HS^- B. NH_4^+ C. H_2O D. HCO_3^-

80. A solution of H_2SO_4 is made by dissolving 245g of the acid in enough water to produce 500ml solution. What is the normality of the solution?(At. Wt. H=1,S=32,O=16)

A. 2 B. 4 C. 8 D. 10

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