ADDIS ABABA EDUCATION BERUA

2012/2020 GRADE 12 CHEMISTRY MODEL EXAMINATIONS

TIME ALLOWED: 2:30 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **CHEMISTRY** EXAMINATION. THE EXAMINATION CONTAINS **80** ITEMS. ATTEPMT ALL THE ITEMS.USE ONLY PENCILE TO MARK YOUR ANSWERS.

THERE IS ONLY ONE BEST ANSWER FOR EACH ITEM. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND BLACKEN THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET.

YOU WILL BE ALLOWED TO WORK FOR **2:30 HOURS**. IF YOU FINISH BEFORE TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, LAY YOUR PENCIL DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

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

PHYSICAL CONSTANT

Mass of electron=$9.11x10^{-31}$kg

Velocity of light=$3.0x10^{8}$m/s

Planks constant=$6.626x10^{-34}$J.s

ATOMIC NUMBER (Z) OF ELEMENTS

Element	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl
Z	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

DIRECTIONS: Each of the following questions is followed by four possible alternatives. Read each questions and carefully **blacken** the letter of your best choice on the separate answer sheet provided

1. According to World Health Organization (WHO), the standard for the Concentration of alcohol used to prevent COVID-19 Virus is 70%. How much water has to be added to prepare the standard alcohol for 1L of 96% Alcohol?

   A. 1371.4ml B. 371.4L C. 371.4ml D. 30ml

2. In which of the following solvents would you expect the solubility of NaCl to be greatest?

   A. Carbon tetra chloride (CCl_4) C. Benzene (C_6H_6)

   B. Water (H_2O) D. methanol (CH_3OH)

3. Which of the following substances might stabilize a colloidal suspension of oil in water?

   A. Sodium stearate $NaCO_2(CH_2)_{16}CH_3$ C. H_2O

   B. Sodium bicarbonate (NaHCO3) D. CaCl2

4. How many moles of Unknown weak acid (HA) in a 100L solution are required to produce a solution with P^H=2 ? Ka of the Unknown weak acid (HA)=$5x10^{-3}$

   A. $3x10^{-3}$ B. $0.3x10^{-3}$ C. 3 D. 0.3

5. If different processes are used to bring about the same change the enthalpy changes during these processes are the same this is the statement of

   A. Hess's law C. 1st law thermodynamics

   B. Standard Enthalpy D. 2nd law thermodynamics

6. Which of the following 0.1M solutions has the lowest P^H?

   A. $NaNO_2$ B. $KClO_4$ C. NH_4Cl D. NH_3

7. The P^H of a 0.1M weak base B is 9.what is the K_b for B?

   A. $9.2X10^{-4}$ B. $2X10^{-6}$ C. $1X10^{-4}$ D. $1X10^{-9}$

8. Addition of HCl to an aqueous buffer solution containing NH_3 and NH_4Cl cause which of the following to occur?

   I. PH of the solution increase

   II. PH of the solution decrease

   III. NH_4^+ concentration increase

   IV. NH_3 concentration increase

A. I B. II C. I and III D. II and III

9. What is the equivalent point PH of the solution formed by the titration of 50ml of 0.15M of CH_3COOH using 25ml of 0.3 M NaOH? [USE Log 7.5=0.87, K_b of acetate ion = $5.6x10^{-10}$]

   A. 7.44 B. 6.22 C. 8.44 D. 8.87

10. The solubility of a particular salt in water is 9.9g/ml at room temperature. If 11.1g is completely dissolved in one milliliter of water, the solution is

    A. Saturated C. Unsaturated

    B. Supersaturated D. dilute

11. The hybrid orbitals in a molecule of methane are oriented.
    A. Towards to the corners of tetrahedron centered on the carbon atom.
    B. Towards to the corners of a cube centered on the carbon atom.
    C. Towards to the corners of a triangle centered on the carbon atom.
    D. Towards to the corners of a rectangle centered on carbon a tom.
12. Which one of the following best describes chemical equilibrium?
    A. Concentrations of products are higher than concentration of reactants.
    B. Forward and reverse reactions continue with no effect on the concentration of reactants and products.
    C. Reactions stop only reactants have been converted to products.
    D. Forward and reverse reactions have stopped so that the concentration of the reactants equals to the concentration of products.
13. Based on the Valance shell electron pair repulsion (VSEPR) theory which of the following would have a tetrahedral arrangement of electrons around the central atom?
    A. BH_3 C. NO_2^-
    B. CO_3^{2-} D. SiH_4
14. When the 1s-orbitals of two hydrogen atoms combine to form a hydrogen molecule, then which molecular orbitals are formed?
    A. One bonding molecular orbital only.
    B. Two bonding molecular orbitals.
    C. One bonding molecular orbital and one ant- bonding molecular orbitals.
    D. Two ant- bonding molecular orbital's
15. Which of the following solid substance contains positive ions immersed in a sea of mobile electrons?
    A. O_2 C. CuO
    B. Cu D. SiO_2

16. Which one of the following compound contains both covalent and ionic bond.

A. CCl_4 C. $MgCl_2$

B. KCl D. NH_4Cl

17. Oxygen, nitrogen and Fluorine bond with hydrogen to form molecules, these molecules are attracted to each other by

A. Coordinate covalent bonds C. ionic bonds

B. Electro covalent bond D. hydrogen bonds

18. Given the reaction : $H_2 + Cl_2 \rightarrow H{-}Cl$

Which statement best describes the energy changes as bonds are formed and broken in this reaction.

A. The forming of the H−Cl bond releases energy.

B. The forming of the H−Cl bond absorbs energy.

C. The breaking of the H−H bond releases energy.

D. The breaking f the Cl−Cl bond releases energy.

19. The reaction $CHCl_3$ (g) + Cl_2 (g) $\rightarrow CCl_4$ (g) + HCl (g) has the following rate law: Rate= k [$CHCl_3$] [Cl_2]. If the concentration of $CHCl_3$ is increased by a factor of five while the concentration of Cl_2 is kept the same ,the rate will be

A. Stay the same C. decreased by a factor of five

B. Increased by a factor of five D. Doubled

20. The steps in a reaction mechanism as follows.

Step1: Ag^+ (aq) +Ce^{4+} (aq) $\leftrightarrow$$Ag^{2+}$aq) +$Ce^{3+}$ (aq)

Step2: Tl^+ (aq) + Ag^{2+} (aq) $\rightarrow$$Tl^{2+}$ (aq) +Ag^+ (aq)

Step3:Tl^{2+} (aq) + Ce^{4+} (aq) $\rightarrow$$Tl^{3+}$(aq) + Ce^{3+} (aq)

From the above step of reaction which species acting as a catalyst.

A. Tl^+ C. Ce^{3+}

B. Ag^+ D. Tl^{3+}

21. What are the four quantum numbers of $4d^6$ orbital?

	n	l	m_l	m_s
A	4	2	1	$\pm$1/2
B	4	2	-2	-1/2
C	4	0	0	-1/2
D	4	2	1	-1/2

22. Lava is a foam colloid. The dispersed phase and dispersion medium are respectively:

A. gas – liquid B.Solid – gas C. liquid- gas D. gas-solid

23. Which of the following salts would form an acidic solution?

I. KCl III. NH_4Cl

II. NaF IV. $CaCO_3$

A. I and III B. I and IV C. III and IV D. only III

24. Which of the following is a Lewis acid but not a Bronsted acid?

A. HBr B. BBr_3 C. NH_3 D. CH_4

25. What is the percentage dissociation of a 0.1M unknown weak acid (HA) solution?

[Use Ka of HA = $9X10^{-9}$]

A. $9X10^{-9}$ B.$3X10^{-9}$C. $9X10^{-2}$ D. $3X10^{-2}$

26. A chemist adds water to 120ml of a 6M solution of HCl until the final volume of 2L. What is the molarity of the resulting solution?

A. 0.94M B. 2.3M C. 0.36M D. 8.7M

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

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

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

28. The standard enthalpy formation of Nitrogen (N_2) is?

A. 1 B. 0 C.-1 D. 4

29. We have three aqueous solutions of NaCl labeled as 'A', 'B', and 'C' with concentrations 0.1m, 0.01m and, 0.001m, respectively. The van't Hoff factor for these solution will be

A. iA<iB<iC B. iA>iB>iC C. iA= iB= iC D. iA<iB>iC

30. Which of the following is TRUE for the sublimation of solid carbon dioxide at room temperature and pressure?

A. Change in Enthalpy is negative, and change in Entropy is positive.

B. Change in Entropy is negative, and change in Enthalpy is positive.

C. Change in Enthalpy and change in Entropy are positive.

D. Change in Gibbs free energy is positive.

31. Which one of the following is the rate law expression for the reaction:

2A +2B +2C→Products, using data given below?

Experiment	Initial [A]	Initial [B]	Initial [C]	rate
1	0.273	0.763	0.400	3.0
2	0.819	0.763	0.400	9.0
3	0.273	1.526	0.400	12.0
4	0.273	0.763	0.800	6.0

A. Rate =k[A] [B] [C]

B. Rate=k$[A]^3$ $[B]^4$ $[C]^2$

C. Rate=k[A] $[B]^2$ [C]

D. Rate=k$[A]^2$$[B]^2$ $[C]^2$

32. Electrons exist only at fixed levels of potential energy. However ,if an atom absorbs sufficient energy, a possible results is that
    A. An electron may move to an electron shell farther out from the nucleus.
    B. An electron may move to an electron shell closer to the nucleus.
    C. The atom would become a positive charged or cation.
    D. The atom may become radioactive isotopes.
33. Consider this equilibrium reaction in a sealed container. H_2O (g) $\leftrightarrow H_2O$ (L), which one of the following will be the effect on the equilibrium of increasing the temperature from 20^0c to 30^0c?
    A. More of the water will be in the gaseous state of at equilibrium.
    B. More of the water will be in the liquid state at equilibrium.
    C. At equilibrium the rate of condensation will be greater than the rate of evaporation.
    D. At equilibrium the rate of evaporation will be greater than the rate of condensation.
34. Which one of the following best describes the formation of pi (π) bond?
    A. They are formed by sideways of parallel orbitals.
    B. They are formed by the axial overlaps of orbitals.
    C. They are formed by the sideways overlaps of an **s** and p orbital's.
    D. They are formed by the axial overlaps of either s or p orbital's.
35. Which one is the function of iron in the Haber process?
    A. It shifts the position of equilibrium towards the products.
    B. It decreases the rate of reactions.
    C. It provides an alternative reaction pathway with lower activation energy.
    D. It reduces the enthalpy change of the reaction.

36. Which types of solid materials typically hard, have high melting points and poor electrical conductivities?

I. Ionic

II. Metallic

III. Covalent- network

A. I and II only

B. I and III only

C. II and III only

D. I, II, and III

37. For the reaction below : $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$, at a certain temperature the equilibrium concentrations in mol/ml are $[H_2]= 0.2$, $[I_2]=0.2$ and $[HI]=2.0$, then based on this given data which one of the following is the equilibrium constant(Kc)?

A. 0.002

B. 20

C. 10

D. 100

38. Which statement is correct about the effect of adding a catalyst to a system at equilibrium?

I. The rate the of forward reaction increases.

II. The rate of reverse reaction increases.

III. The yield of the products increases.

A. I only

B. III only

C. I and II only

D. I , II and III

39. For the reaction: $N_2O_4\ (g) \leftrightarrow 2NO_2\ (g)$, kc = 8 x $10^{-}4$ mol/cm, in an equilibrium of mixture these two gases $[N_2O_4] = 8 \times 10^{-2}$ mol/cm^3, then which one is the equilibrium concentration NO_2 in mol/cm^3?

A. 8.0×10^{-1}

B. 8.0×10^{-2}

C. 8.0×10^{-3}

D. $4.5 X10^{-4}$

40. For the reaction: C_2H_4 (g) $+H_2$ (g) $\rightarrow C_2H_6$ (g), ΔH = -137KJ, which statement about the information is correct?
    A. The total energy of the bonds broken in the reactant is greater than the total energy of the bonds formed in the product.
    B. The bonds broken and the bonds made are of the same strength.
    C. The total energy of the bonds broken in the reactants is less than the total energy of the bonds formed in the product.
    D. No conclusion can be made about the sums of the bond enthalpies in the product compared with reactants.
41. Under what conditions can we absolutely say a system is at equilibrium at constant temperature and pressure?
    A. Change in Enthalpy is equal to Zero.
    B. Change in Gibbs free energy is equal to Zero.
    C. Change in Entropy is greater than Zero
    D. Change in Enthalpy is greater than Zero.
42. Which of the following substance would you except to have the highest entropy at 1 atm of pressure?
    A. 1 mol of $H_2O_{(l)}$
    B. 1 mol of $H_2O_{(s)}$
    C. 0.5 mol of ethanol in 0.5 mol of $H_2O_{(l)}$
    D. a gaseous solution of 0.5mol of $CH_{4(g)}$ and 0.5 mol of $H_2O_{(g)}$
43. Which of the following is capable of acting both as an oxidizing and reducing agent?
    A. $SnCl_2$ B. H_2O_2 C. NaF D. $KMnO_4$

44. Which of the following is ***NOT*** true about the anode of electrolytic cell?

A. Oxidation occurs at it.

B. It is assigned as the positive pole.

C. Cations in solution move away from the surface of the electrode as the redox reaction occurs.

D. It is deficient in number of electrons.

45. The reaction shown below is not balanced.

$MnO_4^- + C_2O_4^{2-} \rightarrow MnO_2 + CO_3^{2-}$

If the reaction balanced using basic medium or solution, the coefficient of OH^- and H_2O will be respectively?

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

46. In which of the following aqueous solution can water is oxidized and O_2 forms at the anode and water is reduced and H_2 forms at the cathode?

A. KBr B. MgSO4 C. AgNO3 D. NaBr

47. If you wants to plate out iron spoon with silver metal, then which of the following is ***TRUE***?

A. The electrolyte must be contain silver ion

B. The iron spoon must be set at the anode

C. The silver metal must be the cathode

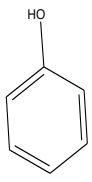
D. The material to be plated must be the anode

48. The standard state of water is?

A. Steam B. Liquid C. Ice D. Vapour state

49. What type of bond you observe in phenol other than 5 C-H bond?

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



phenol

50. Which batteries are faced with leak out and environmental problem respectively?

A. Nickel- cadmium and fuel cells

B. Nickel- cadmium and dry cells

C. Dry cells and Mercury cells

D. Dry cells and fuel cells

51. When the compounds below are listed in order of decreasing boiling point (highest to lowest) which one is the correct order?

1. Ethane 2. Fluoroethane 3.Ethanol 4. Ethanoic acid

A. 4,3,1,2

B. 4,3,2,1

C. 3,4,1,2

D. 2,1,3,4

52. Which one of the following is the formal charge on each atom in dichloromethane (CH_2Cl_2)?

A. C= 0 , H= 0 , Cl= 0

B. C= 0 , H= -1 Cl= +1

C. C= 0 , H= +1 , Cl = -1

D. C= -2 , H= +1 ,Cl =+1

53. Which one of the following species has the same molecular geometry: CO_2, H_2O, $BeCl_2$, and N_2O?

A. CO_2 and N_2O

B. H_2O andN_2O

C.CO_2 and $BeCl_2$

D. CO_2, $BeCl_2$ and N_2O

54. Which hybridization changes when does the carbon atom undergo in the combustion of methane?

$CH_4\ (g) + 2O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (g)$

A. $SP \rightarrow SP^2$

B. $SP^2 \rightarrow SP^3$

C. $SP^3 \rightarrow SP$

D. $SP^2 \rightarrow SP$

55. The amount of sigma and pi bonds present in benzene(C_6H_6) molecule is

A. 12 sigma and 3 pi bond

B. 3 sigma and 12 pi bond

C.18 sigma and 6 pi bond

D.6 pi and 18 sigma bond

56. Which one of the following characteristics applies to PCl_3?

I. Non polar molecule

II. Polar bonds

III. Trigonal-pyramidal molecular geometry

IV. SP^2 hybridized

A. I and II C.I, II and III

B. II and III D. I,II, III, and IV

57. According to the molecular orbital theory, which one of the following species is most likely to exist?

A. He_2 C. Ne_2

B. Be_2 D. Li_2

58. According to the molecular orbital theory, what is the bond order of O_2?

A. 1 C. 2.5

B. 2 D.1.5

59. Which of the following data give the most precise measurement?

A. 3.0 C. 3.000

B. 3.00 D. 3.0000

60. Which one is the correct order of increasing $Cl-A-Cl$ bond angle in the following species where A is central atom

I. BCl_3 II. $SiCl_4$ III. SCl_2 IV. PCl_3

A. III < IV < II< I C. IV < I < II < III

B. II < III< I < IV D. I< II< III < IV

61. What substance is reduced in an alkaline-cell battery?

A. $Zn(_s)$ B. $Zn^{2+}(_{aq})$ C. $NH_4^+(_{aq})$ D. $MnO_{2\,(s)}$

62. When iron is "galvanized," what metal is used to coat iron?

A. Al B. Mn C. Zn D. Cr

63. What is E° for the following balanced reaction?

$Zn(s) + Pb^{2+}(aq) \rightarrow Zn^{2+}(aq) + Pb(s)$

Half-reaction	Standard Reduction Potential
$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$	–0.763
$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$	–0.126

A. +0.637 V B. –0.889 V C. –0.637 V D. +0.889 V

64. The value of E° for the following reaction is 1.10 V. What is the value of E_{cell} when the concentration of Cu^{2+} and Zn^{2+} are equal to 0.025 M?

$Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$ E° = 1.10 V

A. 1.10 V B. 0.95 V C. 1.15 V D. 0.80 V

65. Natural rubber is a polymer of

A. butadiene B. isoprene C. neoprene D. styrene

66. Why the name given NYLON 66 co- polymer? This is because of

A. It is discovered in 1966
B. Both the monomers have 6 carbons each
C. The longest chain contains 6 carbons
D. It is the sixth polymer

67. Bakelite is obtained from phenol by reacting with

A. HCHO B. $(CH_2OH)_2$ C. CH_3CHO D. CH_3COCH_3

68. CO_2 chosen as a common gas for bottled soft drinks? because:

A. It is the most common atmospheric gas
B. Its high solubility
C. Its non-toxic
D. The bond is double bond

69. The froth-flotation process in metallurgy involves which of the following?

A. mining of an ore
B. concentration of an ore
C. smelting of iron
D. reduction of metal ion

70. Which of the following substances are added to natural rubber to toughen it?

A. Calcium B. Carbon C. Nitrogen D. Sulfur

71. Which will be the best method to decrease the random uncertainty of a measurement in an acid- base titration?

A. Repeat the titration
B. Use a different analyte
C. Use a different titrant
D. Use a different Indicator

72. Which of the following is the most important type of solute –solvent interaction in solution NaCl (s) in water?

A. Dispersion
B. Ion- dipole
C. Dipole-dipole
D. Hydrogen bonding

73. Which of the following hydride orbital is favoring the formation of see-saw?

A. sp^3d
B. sp^3d^2
C. sp^3
D. sp^3d^3

74. A neural molecule having the general formula AX_3 has one unshared pair of electrons on A. Which one is the hybridization of A?

A. sp^3
B. sp^3d
C. sp^3d^2
D. sp^3d^3

75. For lithium the enthalpy of sublimation is $+161kJ/mol$, and the first ionization energy is $+520kJ/mol$. The dissociation energy of fluorine molecule is $+154kJ/mol$, and the electron affinity of fluorine is $-328kJ/mol$. The lattice energy of LiF is $-1047kJ/mol$. The overall enthalpy of formation for LiF is:

A. –617KJ/mol
C. -694kJ/mol
B. 2134Kj/mol
D. 2066kJ/mol

76. Which of the following statements is correct about hydrogen cyanide(HCN)

A. It has liner geometry with C a central atom.
B. It has a bent or angular geometry with C a central atom.
C. It has a trigonal planar geometry with N a central atom
D. It has a bent or angular geometry with N a central atom.

77. Which one of the following electromagnetic-radiations has the highest energy?

A. X-rays
C. Uv-rays
B. Gamma ray
D. Microwaves

78. When electrons fall down from the higher energy level or energy state to the first excited state, the spectral lines correspond to:

A. Pfund series
C. Lyman series
B. Paschan series
D. Balmer series

79. The maximum number of electrons in $p-$orbital with $n=6,\ m_l=0$ is

A. 2
C. 6
B. 16
D. 14

80. Which of the following electrons, identified only by their n and l quantumnumbers have the highest energy?

A. $n = 3,\ l = 2$

B. $n = 4,\ l = 1$

C. $n = 4,\ l = 2$

D. $n = 3,\ l = 0$