ADDIS ABABA CITY ADMINISTRATION EDUCATION BUREAU
ADDIS ABABA
GRADE 12 CHEMISTRY MODEL EXAMINATIONS
TAHASAS 2015/JANUARY 2023

NUMBER OF QUESTIONS: 80 **TIME ALLOWED: - 2:30 HOURS**

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **EXAMINATION FOR NATURAL SCINCE STUDENTS ONLY**.IN THIS EXAMINATION, THERE ARE A TOTAL OF **80 MULTIPLE CHOICE QUESTIONS**. CAREFULLY SELECT THE BEST ANSWER AND **BLACKEN** ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY. USE ONLY **PENCIL** TO MARK YOUR ANSWERS. YOUR ANSWER MARK SHOULD BE **HEAVY** AND **DARK**, COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY FROM YOUR ANSWER SHEET.

YOU ARE ALLOWED TO WORK ON THE EXAM FOR **2:30 HOURS**. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, PUT YOUR PENCIL DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN 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 START TO WORK ON THE EXAMINATION.

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

Addis Ababa Education Bureau

2022/2023 First Semester Chemistry Model Examination for Grade 12

Time Allowed: - 2:30 hours

Direction:-Each of the following questions is followed by four possible alternatives. Choose the correct answer and blacken the letter of your choice on the separate answer sheet provided.

1. Which one of the following is an intensive physical property of matter?

A. Mass C. Length

B. Volume D. Density

2. All of the following have four significant figures except

A. 0.05040 C. 09.060

B. 0.0012 D. 1.005

3. Which of the following is correct?

A. $1L=1dm^3$ C. $10L=1dm^3$

B. $1L=10dm^3$ D. $1L=1m^3$

4. What is the first step of the scientific method?

A. Performing an experiment

B. Forming a hypothesis

C. Making observation

D. Predicting the result of an experiment

5. The equivalent temperature value in Fahrenheit scale for 50^0c is

A.122 C. 100

B. 50 D. 90

6. Which of the following is possible while doing an experiment?

A. Washing hand with soap C. Dangling hair

B. Smelling chemicals D. Chewing gum

7. According to Modern atomic theory, one of the Dalton's atomic theory was wrong?

A. Atoms combine in small whole number ratios to form compounds
B. Atoms of the same element are identical in mass and other properties.
C. Elements are made up of small particles called atoms
D. Atoms of one element differ from atoms of other element.

8. The main purpose of Robert Millikan's oil drop experiment is to determine

A. the speed of electron

B. the ratio of mass of electron to charge of electron

C. the mass of electron

D. the magnitude of charge of electron

9. The sum of the number of electron, proton and neutron in $^{56}_{26}Fe$ is

A. 26 C. 82

B. 56 D. 30

10. Which region of electromagnetic spectrum is capable of inducing electron transition with the greatest energy?

A. Orange C. Violet

B. Red D. Green

11. What is the wavelength of the yellow sodium emission, which has a frequency of $5.09\times10^{14}S^{-1}$? ($C=3\times 10^{8}$m/s)?

A.400nm C. 670nm

B.589nm D. 890nm

12. What is the ratio of the energy of a photon of 300nm wavelength radiation to that of 600nm radiation?

A.1:2 C. 3:1

B. 1:1 D. 2:1

13. The ejection of electron from metals by shining light on the metal surface is

A. work function

C. photoelectric effect

B. binding energy

D. speed of light

14. The subshell representation for n=4, l=3

A.4p

C.4s

B.4d

D.4f

15. What are the possible values of the azimuthal no need of quantum number for an electron in the 4th energy level?

A. 0,1,2,3

C. 2, 3, 4

B. 1, 2, 3

D. 3, 4

16. How many 3d electrons are present in the ground state of $^{52}_{24}Cr$?

A. 4

C. 5

B. 6

D. 10

17. Within a specified period, an increase in atomic number is usually accompanied by

A. an increase in atomic radius and an increase in electronegativity

B. a decrease in atomic radius and an increase in electronegativity

C. an increase in atomic radius and a decrease in electronegativity

D. a decrease in atomic radius and a decrease in electronegativity

18. In which of the following block of the periodic table is an element with atomic number of 20 is placed?

A.s-block

C. d-block

B. p-block

D. f-block

19. A substance that does NOT conduct electricity as a solid but does conduct electricity when melted is most likely classified as:-

A. a metal

C. an ionic compound

B. a molecular compound

D. a non-metal

20. Which of the following ionic compounds has the highest lattice energy?

A. NaCl

C. MgO

B. NaF

D. AlN

21. Which one of the substance contains ionic, covalent and dative bonds between their atoms?

A. NH_4CN C. Mg_3N_2

B. KI D. CH_3OH

22. What is the total number of valence shell electrons in BrO_3^-?

A. 20 C. 32

B. 26 D. 36

23. What is the total number of lone pairs in CO_2? (${}_6^{12}C$, ${}_8^{16}O$)?

A. 1 C. 3

B. 2 D. 4

24. Which bond between the following groups of elements will be the most polar?

A. S-I C. S-F

B. S-Cl D. S-Br

25. Which one of the following is the geometry of ICl_4^-?

A. Octahedral C. Tetrahedral

B. Trigonal planar D. Square planar

26. Which one of the following is non-polar molecule with individual bonds are Polar?

A. O_2 C. Cl_2

B. CO_2 D. SO_2

27. Which one of the following is NOT true of metallic bonding?

A. It gives rise to excellent electrical conductivity

B. Electrons are free to move throughout the structure

C. The strength of metallic bonds increases down a group

D. The strength of metallic bonding affects the boiling points of metals

28. Which molecule listed below has two sigma (δ) and two pi (π) bonds?

A. HCN C. N_2F_2

B. C_2H_4 D. N_2

29. What type of hybridization is used by carbon in C_2H_2(acetylene)?

A. sp

B. sp^3

C. sp^2

D. sp^2d

30. The bond orders of H_2, H_2^+, and H_2^- are ____, respectively.($_1^1H$)

A.1, 0 and 0

B. 1, ½ and 0

C. 1, 0 and ½

D. 1, ½ and ½

31. Which one of the following solids is NOT amorphous solid?

A. Glass

B. Plastics

C. Sodium chloride

D. Rubber

32. The rate of a reaction in which there are no gases involved is least dependent upon:

A. Temperature

B. Pressure

C. Concentration

D. Surface area

33. For a certain reaction, rate = k $[A]^{3/2}$ if the rate is 0.020M/s when [A] = 1.0M. What is the rate when $[A] = 0.64M$?

A. 0.0033M/s

B. 0.04M/s

C. 0.033M/s

D. 0.01024 M/s

34. Substances that inhibit a reaction are:

A. promoters

B. negative Catalysts

C. positive Catalysts

D. enzymes

35. If we increase the concentration of a reactant, what happens to the collisions between particles?

A. There are fewer collisions.
B. There are the same numbers of collisions but they have less energy.
C. There are more collisions.
D. There are the same numbers of collisions but they have more energy.

36. For the reaction 2A + B →2C, the following data were obtained:

Experiment	Initial conc.of A (mol/L)	Initial conc.of B (mol/L)	Initial rate (mol/L.s)
1	0.5	0.5	10
2	0.5	1.0	20
3	0.5	1.5	30
4	1.0	0.5	40

What is the rate law?

A. Rate=K$[A]^2$[B].

B. Rate=K$[A]^2$.

C. Rate=K[A][B]

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

37. Which of the following rate law is third order overall?

A. Rate=K[A][B]^3

B. Rate=K[A][B]^2

C. Rate=K[A]^3[B]^3

D. Rate=K[A]^5[B]^2

38. The reaction between NO and I_2 is second order in NO and first order in I_2.

What change occurs in the rate of reaction if the concentration of each reactant is tripled?

A.18 fold increase

B. 9 fold increase

C.27 fold increase

D.3 fold increase

39. Ozone (O3) is depleted from tropospheric atmosphere by the following cycle

Step1:-$NO + O_3 \rightarrow NO_2 + O_2$ Net:- $O_3 + O \rightarrow 2O_2$

Step2:-$NO_2 + 2O \rightarrow 2O_2$

What observation could you make about the cycle?

A. NO_2 is a catalyst

B. O is an intermediate

C. O is a catalyst

D. NO_2 is an intermediate

40. Suppose reactions A→B and B→A are both elementary processes with rate constants of 800 S^{-1} and 4000 S^{-1} respectively. What is the value of the equilibrium constant for A⇌ B?

A. 0.2

B. 20

C. 0.02

D. 2

41. Considering the reaction $N_2 (g) + O_2 (g) \rightleftharpoons 2NO (g)$, $\Delta H=+180\frac{KJ}{mol}$

the production of NO is increased by:-

A. increasing temperature

B. increasing pressure

C. decreasing temperature

D. decreasing pressure

42. In the reaction $2SO_2 (g) + O_2 (g) \rightleftharpoons 2SO_3 (g)$ K=100

What is the $[O_2]$, if the $[SO_2] = [SO_3]$?

A. 0.001

B. 0.1

C. 100

D. 0.01

43. The relation between the equilibrium constant in terms of concentration and pressure for the equilibrium reaction is

$$2NaHCO_3(s) \rightleftharpoons Na_2CO_3(s) + H_2O\ (g) + CO_2\ (g)$$

A. $K_P=KCRT$

B. $Kc=Kp(RT)^2$

C. $Kp=Kc(RT)^2$

D. $Kc=KpRT$

44. Which one of the following indicates the correct expression for the equilibrium constant (K)?

$$PCl_5\ (s) \rightleftharpoons PCl_3\ (l) + Cl_2\ (g)$$

A. $[PCl_3][Cl_2]/[PCl_5]$

B. $[Cl_2]$

C. $[PCl_3][Cl_2]$

D. $[PCl_5]/[PCl_3][Cl_2]$

45. Which of the following statement correctly describes a chemical reaction at equilibrium?

A. The concentrations of the products and reactants are equal
B. The rate of the forward reaction is less than the reverse reaction
C. The rate of the forward reaction is equal the reverse reaction
D. The rate of the forward reaction is greater than the reverse reaction

46. The number of phase in a mixture of sodium chloride and water is

A.1

B.2

C.3

D.4

47. What is the chemical name for Aspirin?

A. Sodium salicylate

B. Salicylic acid

C. Methyl salicylate

D. Acetyl salicylic acid

48. Which compound is a carboxylic acid?

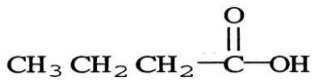
A. $CH_3CH_2COOCH_2CH_3$

B. CH_3CH_2COOH

C. CH_3CH_2CHO

D. $CH_3CH_2COCH_2CH_3$

49. What is the common name of the following structure?



A. Formic acid C. Lactic acid

B. Oxalic acid D. Butyric acid

50. What is the IUPAC name of $CH_3COOCH_2CH_3$?

A. Ethylbutanoate C. Ethylpropanoate

B. Ethylethanoate D. Ethylmethanoate

51. Hydrolysis of propyl butanoate produces _____

A. Propanol and butanoic acid C. Butanol and propanoic acid

B. Butanol and Propanoic acid D. Ethanol and Butanoic acid

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

A. Hydration C. Hydrogenation

B. Hydrolysis D. Saponification

53. Which of the following statements concerning fats and oils is incorrect?

A. They are also called triacyl glycerols

B. They are also called triglycerides

C. They are fatty acid salts

D. They are glycerol triesters

54. Which of the following types of compounds are expected products from the saponification of a fat?

A. Glycerol ,fatty acids and fatty acid salts

B. Fatty acid salts and fatty acid

C. Glycerol and fatty acids

D. Glycerol and fatty acid salts

55. Which of the following is NOT a solution?

A. Milk C. Whisky

B. Brass D.Coca cola drink

56. The process of solute particles being surrounded by solvent molecules is

A. saturation
C. dehydration
B. solvation
D. suspension

57. One of the following does not speed up the rate of dissolution?

A. Increasing temperature
C. Increasing surface area
B. Increasing pressure of gas
D. Decreasing surface area

58. When a crystal solute is added to its supersaturated solution, the solute crystal will

A. slightly dissolve
C. grow bigger
B. remain unchanged
D. dissolve completely

59. The solubility of oxygen gas in water at 25°c and 1atm pressure of oxygen is 0.041g/L.What is the solubility of oxygen in water at 25°c and 3atm?

A. 0.123
C. 0.041
B. 0.31
D. 0.014

60. Calculate the mole fraction of H_2O and CH_3CH_2OH in a mixture of equal masses of H_2O &CH_3CH_2OH.($^{2}_{1}H, ^{16}_{8}O$).

A. 0.9 & 0.1
C. 0.5 & 0.5
B. 0.72 & 0.28
D. 0.6 & 0.4

61. The molarity of nitrate ion in a solution that contains 0.9M $Al(NO_3)_3$ is

A. 0.3M
C. 0.9M
B. 2.7M
D. 1.8M

62. What is the normality of 0.2M solution of $Ca_3 (PO_4)_2$?

A. 0.2N
C. 1.2N
B. 3N
D. 0.6N

63. What is the volume of water required to dilute 40 mL of 2 M HCl to 0.5 M HCl?

A.80mL
C. 160mL
B. 40mL
D. 120mL

64. What volume of 2M H_2SO_4 is needed to react exactly with 240g of magnesium? ($^{24}_{12}Mg$, $^{32}_{16}S$, $^{1}_{1}H$) ?

A. 5L C. 2.5L

B. 10L D. 2L

65. The spectator ions are:-

$2AgNO_3$ (aq) + Na_2CrO4 (aq) → Ag_2CrO_4 (s) + $2NaNO_3$(aq)

A. Na^+, NO_3^- C. Na^+, CrO_4^{2-}

B. Ag^+, NO_3^- D. Ag^+, CrO_4^{2-}

66. The boiling point of pure ethanol is 78.5^0c .What is the boiling point of a solution when 3.4g of vanillin is dissolved in ethanol?

A. Less than78.5^0c C. Greater than 78.5^0c

B. Equals 78.5^0c D. Equals -78.5^0c

67. A solution is prepared by mixing 1 mole of ethanol and 2mole of water at 25^0C.What is the total vapour pressure above the solution? (at 25^0C the vapour pressure of pure ethanol is 44 torr and pure water is 23.8 torr) ?

A. 33.9 torr C. 45 torr
B. 30.5 torr D. 67.8 torr

68. The conjugate base of H_3O^+ is

A. OH^- C. NH_3

B. H^+ D. H_2O

69. Given the reaction:

$H_2PO_4^- + H_2O \rightleftharpoons H_3O^+ + HPO_4^{2-}$

Which of the following represents a conjugate acid-base pair?

A. $H_2PO_4^-$ and H_2O C. $H_2PO_4^-$and H_3O^+
B. $H_2PO_4^-$ and HPO_4^{2-} D. H_2O and HPO_4^{2-}

70. The P^H value of three acids A, B and C are 1, 2 and 3 respectively, which one of the following represents the correct order of acid strength?

A. C > A > B C. A > B > C

B. B > A > C D. C > B > A

71. The P^{OH} of a 0.0008 M NH_3 aqueous solution is

A. 3.1 C. 5.1
B. 4.1 D. 2.1

72.What is the percent dissociation in 1M solution of HF containing the concentration of $H_3O^+ = 2.7 \times 10^{-2}$M?

A. 37% C. 27%
B. 3.7% D. 2.7%

73. The concentration of H_3O^+ and OH^- respectively with $P^{OH} = 3$ at 25°C are

A. 1.0×10^{-11} and 1.0×10^{-4} M C. 1.0×10^{-3} M and 1.0×10^{-12}M
B. 1.0×10^{-3} and 1.0×10^{-10} M D. 1.0×10^{-11}M and 1.0×10^{-3} M

74. What is the effect if 0.3M 0f CH_3COONa is added into aqueous solution of 0.2M CH_3COOH?

A. CH_3COOH becomes more acidic
B. The concentration H_3O+ will increase
C. The equilibrium shifts to the left
D. P^H value will decrease

75. How is a buffer solution prepared?

A. By mixing a weak acid and a strong acid
B. By mixing a weak acid and its conjugate base.
C. By mixing a strong base and its conjugate acid.
D. By mixing a strong acid and its conjugate base.

76. Which of the following compounds would be the most basic?

A. 0.2 M sodium acetate C. 0.2 M hydrochloric acid
B. 0.2 M acetic acid D. 0.2 M ammonium chloride

77. What volume of 0.2M KOH is required to neutralize completely 50mL of 1.5M H_2SO_4?

A. 750 mL C. 250mL
B. 375mL D. 50mL

78. The P^H of the solution for the titration of 100 mL of 0.3M HNO_3 after addition of 100mL of 0.3MKOH is

A. 12.7 C. 2.7

B. 7 D. 4

79. A system that can exchange matter and energy is

A. closed system C. open system

B. isolated system D. homogeneous system

80. If 1,500J of heat is added to a system while the system does work equivalent to 2,500J by expanding atmosphere, what is the value of ΔE for the system?

A. 4,000J C. -4000J

B. 1000J D. -1000J

_____***end***_____