

**ETHIOPIAN SECONDARY SCHOOL LEAVING CERTIFICATE EXAMINATIONS (ESSLCE)
ENTRANCE TRICKS FIRST ROUND CHEMISTRY MODEL EXAMINATION
MIYAZYA 2017 (APRIL 2025)**

ENTRANCE TRICKS FIRST ROUND UNIVERSITY ENTRANCE (UEE) MODEL EXAMINATION
CHEMISTRY MIYAZYA 2017/ APRIL 2025

BOOKLET CODE: 05

SUBJECT CODE: 05

Time Allowed: 02:30 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS CHEMISTRY EXAMINATION. THE CODE FOR THIS EXAMINATION IS **04** AND THE CODE FOR THIS PARTICULAR BOOKLET IS **07**.

IN THIS EXAMINATION, THERE ARE A TOTAL OF 80 **QUESTIONS** .EACH SECTION CONTAINS **MULTIPLE CHOICE QUESTIONS** CONSISTING IF FOUR POSSIBLE ANSWERS. CAREFULLY SELECT THE BEST ANSWER. YOU ARE ALLOWED TO WORK ON THE EXAM FOR 02:30 **HOURS**.BEFORE TIME IS CALLED; YOU MUST SUBMIT YOUR RESPONSES.

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

DO NOT FORGET SUBMIT YOUR ANSWERS BEFORE THE GIVEN TIME IS FINISHED

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DIRECTIONS:

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

You may refer to the information given below when you work on some of the questions.

Constants you may need:

1. In the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$, the rate of formation of NH_3 will be

- A. Same as the rate of disappearance of H_2
- B. Half the rate of disappearance of H_2
- C. Same as the rate of disappearance of N_2
- D. Twice the rate of disappearance of N_2

2. Which of the following rate equations represents a second order reaction?

- A. $\text{Rate} = k[\text{A}]^2$
- B. $\text{Rate} = k[2\text{A}]$
- C. $\text{Rate} = k[\text{A}][\text{B}]$
- D. A&C

3. The reaction $2x + y \rightarrow Z$ was studied and the following rate were obtained.

Excp	[x]	[y]	Rate($\text{mol.L}^{-1}.\text{S}^{-1}$)
1	3.0	3.0	1.8
2	3.0	1.5	0.45
3	1.5	1.5	0.45

Based on the above data, what is the proper rate expression.

- A. $R = k[x]$ B. $R = k[x]^2$ C. $R = k[y]^2$ D. $R = k[x]^2[y]$

4. In the reaction $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$, $K_{eq} = 100$ what will be the concentration of O_2 , if the concentration of SO_2 is the same as that of SO_3 ?

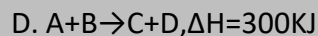
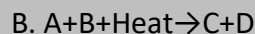
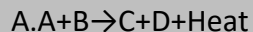
- A. $[\text{O}_2] = [\text{SO}_2]$
- B. $[\text{O}_2] = 0.01\text{M}$
- C. $[\text{O}_2] = 100\text{M}$
- D. $[\text{O}_2] = 0.1\text{M}$

5. The conventional equilibrium constant expression (K_c) for the system $2\text{ICl}(\text{s}) \rightleftharpoons \text{I}_2(\text{s}) + \text{Cl}_2(\text{g})$ is

- A. $[\text{I}_2][\text{Cl}_2]/[\text{ICl}]^2$
- B. $[\text{I}_2][\text{Cl}_2]/2[\text{ICl}]$
- C. $[\text{Cl}_2]$

- D. $[\text{ICl}]^2$
6. Consider the hypothetical reaction below. In which of the following will the effect of concentration and temperature simultaneously cause an increase in the rate at which products are formed?
 $2\text{A}(\text{g}) + \text{B}(\text{g}) \rightleftharpoons 3\text{C}(\text{g}) + \text{Heat}$
- A. Decrease $[\text{B}]$ and Decrease temperature
 - B. Increase $[\text{B}]$ and decrease temperature
 - C. Increase $[\text{B}]$ and decrease temperature
 - D. Liquefy A and decrease temperature
7. Which change will increase the amount of $\text{SO}_3(\text{g})$ at equilibrium
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g}), \Delta H = -197 \text{ kJ/mol}$
- I. Increasing the temperature
 - II. Decreasing volume
 - III. Adding a catalyst
- A. I only B. II only C. I and II only D. II and III only
8. The hydrogen used in the Haber process is made by the following reactions.
 $\text{CH}_4(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{CO}(\text{g}) + 3\text{H}_2(\text{g}), \Delta H = 205 \text{ kJ}$. Which of the following sets of conditions will favor the formation of H_2 ?
- A. Low pressure and High temperature
 - B. Low pressure and low temperature
 - C. High pressure and low temperature
 - D. High pressure and high temperature
9. For a reaction to shift towards the reactant direction which of the following condition holds TRUE?
- A. $Q_c < K_c$ B. $Q_c > K_c$ C. $Q_c = K_c = 0$ D. $Q_c = K_c$
10. Which of the following explains, why at room temperature, I_2 is solid, Br_2 is liquid and Cl_2 is a gas?
- A. Ionic bonding
 - B. Hybridization
 - C. Hydrogen bonding
 - D. London Dispersion force
11. What is the bond order of O_2^-
- A. 1 B. 1.5 C. 2 D. 2.5
12. What is the hybridization scheme of the species indicated in (question, 11) above
- A. sp^3d^2 B. sp^3d C. sp^3 D. sp^2
13. Which molecule has Lewis structure that does not obey the octet rule?
- A. CCl_4 B. PF_3 C. NO D. CS_2
14. All of the following are Isoelectronic except

- A. K^+ B. Ar C. Al^{3+} D. S^{2-}
15. Which of the following should have the largest atomic radius?
A. F^- B. Na^+ C. Mg^{2+} D. Al^{3+}
16. The number of electrons of an atom ($Z=47$) that enters to the 4d orbital's are
A. 4 B. 5 C. 9 D. 10
17. For the reaction, $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$, the production of NO will be favored by
A. High pressure
B. Low pressure
C. presence of Catalyst
D. High concentration of N_2
18. The unit of equilibrium constant for the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3 + \text{Heat}$ will be
A. $\text{mol}^{-2} \cdot \text{L}^2$ B. $\text{mol} \cdot \text{L}^{-1}$ C. $\text{mol}^2 \cdot \text{L}^{-2}$ D. $\text{mol}^{-1} \cdot \text{L}$
19. If the gas mixture for the following reaction $N_2O_4 \rightleftharpoons 2NO_2(g)$ is compressed, then
A. Products are favored
B. Reactants are favored
C. products concentration equals reactants concentration
D. No Change
20. Which of the following equilibrium will have the same value of K_p & K_c ?
A. $N_2O_4(g) \rightleftharpoons 2NO_2(g)$
B. $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
C. $H_2(g) + Cl_2(g) \rightleftharpoons 2HCl(g)$
D. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
21. Which of the following reactions is not affected by increase in pressure?
A. $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$
B. $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
C. $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
D. $PCl_5(g) \rightleftharpoons PCl_3(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
22. An increase in temperature for a reaction at equilibrium will favor.
A. The forward direction
B. The exothermic direction
C. the reverse direction
D. the endothermic direction
23. The rate of a reaction is primarily determined by the slowest step. This step is called.
A. Activation step
B. Elementary reaction
C. the rate determine
D. the reaction mechanism
24. Which of the following reaction is exothermic?



25. All of the following are preconditions for a reaction to occur according to collision theory EXCEPT

A. The particles of the reacting substance must collide

B. The particles of the reacting species must have proper orientation.

C. Ineffective collision results desired products

D. The particles of the reactants must collide with energy greater than or equal to the energy of activation.

26. Which of the following disaccharides is prepared by two different monosaccharide units ?

A. Fructose B. cellulose C. maltose D. Fructose

27. Which polymer is commonly used for making Automobile tires?

A. Butyl rubber B. SBR C. Nature rubber D. Neoprene

28. Which one of the following polymers is synthesized by condensation polymerization.

A. Nylon-66 B. Teflon C. PMMA D. PVC

29. Which polymer is made from the monomers :1,3-butadiene and styrene?

A. Butyl rubber B. neoprene C. Teflon D. SBR

30. What kind of energy is converted in galvanic cell? chemical energy

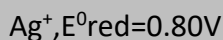
A. Is converted in to Electrical energy

B. Is converted in to Heat energy

C. Is obtained in to Heat

D. Is obtained in to Electrical energy

31. A solution in an electrolytic cell contains



If the voltage is initially very low and slowly increased, in which order will the metals be plated out on to the cathode?

A. $\text{Zn}^{2+} > \text{Cu}^{2+} > \text{Ag}^{+}$

B. $\text{Cu}^{2+} > \text{Zn}^{2+} > \text{Ag}^{+}$

C. $\text{Ag}^{+} > \text{Zn}^{2+} > \text{Cu}^{2+}$

D. $\text{Ag}^{+} > \text{Cu}^{2+} > \text{Zn}^{2+}$

32. Electrolysis of dilute aqueous solution was carried out by passing 10 milliamperes current.

The time required to liberate 0.01 mole of H_2 gas at the cathode is

A. $9.65 \times 10^4 \text{s}$

- B. $19.3 \times 10^4 \text{s}$
C. $28.95 \times 10^4 \text{s}$
D. $38.6 \times 10^4 \text{s}$
33. Standard electrode potential for $\text{Sn}^{4+}/\text{Sn}^{2+}$ couple is +0.15v and that for the Cr^{3+}/Cr couple is -0.74V. These two couples in their standard state are connected to make a spontaneous electrochemical Reaction. The cell potential will be.
A+1.83V B+1.19v C+0.89v D+0.18
34. What is the balanced equation for the cell notation of the following galvanic cell?
 $\text{Pb(s)}/\text{Pb}_2\text{(aq)}$
A. $\text{Pb(s)} + 2\text{Cl}^-(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + \text{Cl}_2(\text{g})$
B. $\text{Pb(s)} + \text{Cl}_2(\text{g}) \rightarrow \text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq})$
C. $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{Pb(s)} + \text{Cl}_2(\text{g})$
D. $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
35. What mass of Aluminum is produced in one hour by the electrolysis of molten AlCl_3 with a current of 10A?
A. 1.16g
B. 2.26g
C. 3.36g
D. 4.46g
36. Which substance is reduced in the reaction.
 $\text{C(s)} + 2\text{N}_2\text{O(g)} \rightarrow \text{CO}_2(\text{g}) + 2\text{N}_2(\text{g})$
A. C
B. N_2O
C. CO_2
D. N_2
37. The standard reduction potential of Zn^{2+}/Zn is -0.76V and that of Cu^{2+}/Cu is +0.34V. What would be the emf of the cell constructed between these two electrodes?
A. 0.42V
B. 1.1V
C. -1.1V
D. 1.42V
38. Which metal can be found as the free element?
A. Cr
B. Fe
C. Mn
D. Pt
39. If a mineral is denser than its gangue, the appropriate method of Separation is
A. Magnetic Separation

- B. Froth floatation
C. Leaching
D. Gravity separation
40. Which of the following (Element-Ore) Combination is correct?
A. lead - Galena
B. chromium-Hematite
C. Zinc-Cassiterite
D. Calcium -Borax
41. A substance which must be kept under water is
A. Sodium metal
B. white Phosphorous
C. Red Phosphorous
D. Cesium metal
42. In Down's process for the manufacture of sodium metal, CaCl_2 is added to NaCl in order to
A. Increase the Ionization of Na metal
B. Increase the melting point of NaCl
C. Increases the conductivity of the electrolyte
D. Decrease the melting point of NaCl.
43. Three oxides of the same element have different colors, where the lower oxide is yellow, the higher oxide is red, and the intermediate oxide is Dark-brown. The yellow oxide would be
A. N_2O
B. P_2O_5
C. CaO
D. Pb_3O_4
44. Which among the others has a different method of extraction from its ore?
A. Calcium
B. Magnesium
C. Aluminum
D. Lead
45. Which one of the following atomic models was developed with a preposition that electrons can be described only in terms of the probability of their location?
A) Rutherford model
B) Quantum mechanical model
C) Dalton's model
D) Bohr model
46. In the Lewis formula for PCl_3 , phosphorous is surrounded by _____ bonding and non-bonding electron pairs respectively.

A) 9, 3

B) 1, 3

C) 3, 1

D) 3, 9

47. Gas X diffuses twice as fast as gas Y. Gas Y has a molecular weight of 60g/mol. What is the molar mass of gas X?

A) 12g/mol

B) 15g /mol

C) 30g/mol

D) 90g/mol

48. Vaporization of solids without melting is known as _____.

A) Fusion

B) Sublimation

C) Condensation

D) Boiling

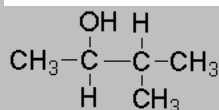
49. What is the IUPAC name of the following organic molecule?

A. 3, 3-dimethyl-2-butanol

C. 2, 2-dimethyl-2-butanol

B. 2-methyl-3-butanol

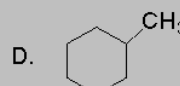
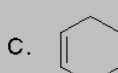
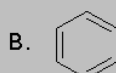
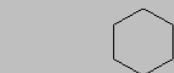
D. 3-methyl-2-butanol



50. What is the molecular formula of open chain alkane with 14 carbon atoms?

A. $\text{C}_{14}\text{H}_{12}$ B. $\text{C}_{14}\text{H}_{16}$ C. $\text{C}_{14}\text{H}_{30}$ D. $\text{C}_{14}\text{H}_{28}$

51. From the following given structures which one represents aromatic hydrocarbon?



52. Amphoteric oxides _____

A. Have both acidic and basic properties

B. Have neither acidic nor basic properties

C. Are all non-metallic oxides

D. Can be represented by CuO , FeO , Fe_2O_3

53. Which of the following substances will release hydrogen gas when it reacts with hydrochloric acid (HCl)?

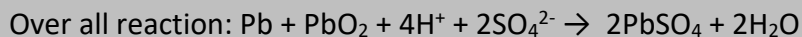
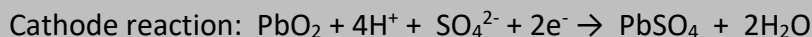
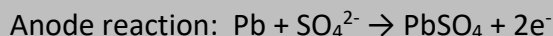
A. Zn

B. NaOH

C. H_2SO_4

D. CaO

54. The following redox reaction shows the **discharging** of Lead storage battery (car battery).



Which one of the following statement is **NOT** true based on the given reaction?

A. The anode of this cell is made of lead metal $|\text{Pb}|$.

B. The cathode of this cell is made of lead (IV) oxide $|\text{PbO}_2|$.

C. About 35% of H_2SO_4 is used as electrolyte in this cell.

D. SO_4^{2-} ions are produced at both electrodes.

55. The following are characteristic of chemical industries except one. Which one is it?

A. They consume relatively small amount of energy

B. They use naturally available raw materials

C. They do not have any negative impact on environment

D. They involve chemical reactions in their production of materials.

56. The maximum number of electrons in an orbital of an atom possessing a quantum number

$n = 4$, $l = 3$, and $m_l = 0$ is: _____

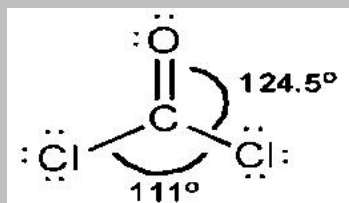
A. 14

B. 2

C. 32

D. 8

57. What is the hybridization of carbon in Cl_2CO having the following structure?

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

58. How many sigma (σ) and pi (π) bonds are there in acetone, CH_3COCH_3 ?

A. 6 σ and 2 π B. 9 σ and 1 π C. 6 σ and 3 π D. 7 σ and 2 π

59. For the step wise dissociation of aqueous H_3PO_4 which of the following is **NOT** a conjugate acid- base pair?

A) $H_3PO_4/H_2PO_4^-$ B) HPO_4^{2-}/PO_4^{3-} C) $H_2PO_4^-/HPO_4^{2-}$ D) $H_2PO_4^{2-}/PO_4^{3-}$

60. A Bronsted-Lowry acid is

A) Release hydronium ions in water

B) An electron pair acceptor

C) A proton acceptor

D) A proton donor

61. Given the reaction: $HC_2O_4^- + NH_3 \longrightarrow NH_4^+ + C_2O_4^{2-}$

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

A) $HC_2O_4^- / NH_4^+$ B) $HC_2O_4^- / C_2O_4^{2-}$ C) $NH_3 / C_2O_4^{2-}$ D) NH_3 / NH_4^+

62. If a solution of acetic acid [CH_3COOH] has a P^H of 3.00. What is it's concentration?

$$(K_a = 1.8 \times 10^{-5})$$

A) 0.0057M

B) 0.057M

C) 0.57M

D) 5.70M

63. What is the P^H and $[H^+]$ of a 0.2M solution of HCN? ($K_a = 4.9 \times 10^{-10}$)A) $P^H = 3$, $[H^+] = 4.9 \times 10^{-6}M$ B) $P^H = 5$, $[H^+] = 9.9 \times 10^{-6}M$ C) $P^H = 3$, $[H^+] = 4.9 \times 10^{-6}M$ D) $P^H = 5$, $[H^+] = 4.9 \times 10^{-10}M$ 64. What is the P^H of a 0.0005M $Ca(OH)_2$? (Assuming the base is completely ionized)

A) 3

B) 11

C) 10

D) 9

65. What is the % ionization of a 0.5M CH_3COOH ? ($K_a = 1.8 \times 10^{-5}$)

A) 6%

B) 3%

C) 0.6%

D) 2.5%

66. A 0.25M solution of a weak acid HA is 3% ionized at 25°C. What is the K_a value?A) $\frac{(0.00075)(0.00075)}{0.2425}$ B) $\frac{(0.0075)(0.0075)}{0.2425}$ C) $\frac{(0.001)(0.001)}{0.249}$ D) $\frac{(0.01)(0.01)}{0.24}$ 67. Which one of the following is **TRUE** about common-ion effect?

A) It suppresses the ionization of weak acids or bases.

B) It decreases the concentration of weak acids or bases.

C) It increases the concentration of hydrogen ions in acids.

D) All of the above

68. Which one of the following pairs can **NOT** be mixed together to form a buffer solution?A) NH_3/NH_4Cl

B) $\text{NaOH}/\text{H}_2\text{SO}_4$

C) $\text{CH}_3\text{COOH}/\text{CH}_3\text{COONa}$

D) HCN/KCN

69. What is the P^{H} of a solution that is 0.15M in NH_3 solution and 0.075M in $(\text{NH}_4)_2\text{SO}_4$ solution?
($\text{P}^{\text{Kb}} = 4.74$)

A) 4.74

B) 8.57

C) 9.26

D) 5.64

70. 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 acid salts

D. Glycerol and fatty acids

71. What is the IUPAC name of $\text{CH}_3\text{COOCH}_2\text{CH}_3$?

A. Ethylbutanoate

B. Ethylethanoate

C. Ethylpropanoate

D. Ethylmethanoate

72. Hydrolysis of propyl butanoate produces;

A. Propanol and butanoic acid

B. Butanol and Propanoic acid

C. Butanol and propanoic acid

D. Ethanol and Butanoic acid

73. Which of the following postulates of Dalton's atomic theory is disproved by the modern atomic theory?

A. Atoms combine in small whole numbers to form compounds

B. Elements are made up of small particles called atoms

C. Atoms of different elements have different masses and size

D. All atoms of the same elements are identical and have the same mass

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

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

B. the speed of electron

C. the magnitude of charge of electron

D. the mass of electron

75. Pb has an average atomic mass of 207.19 amu. The three major isotopes of Pb-206 (205.98 amu), Pb-207 (206.98 amu) and Pb-208 (207.98 amu). If the isotopes of Pb-207 and Pb-208 are present in equal amounts, what is the percent abundance of Pb-206, Pb-207 and Pb-208 respectively?

- A. 19.34 %, 40.33 % and 40.33 %
- B. 24.16 %, 37.92 % and 37.92 %
- C. 15.22 %, 42.39 % and 42.39 %
- D. 34.08 %, 32.96 % and 32.96 %

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

- A. Orange
- B. Red
- C. Violet
- D. Green

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

- A. 400nm
- B. 589nm
- C. 670nm
- D. 890nm

78. The charge-carriers in metallic conduction are _____.

- A) Anions only
- B) Cations and anions
- C) Delocalized electrons
- D) All of the above

79. Which of the following ions is difficult to oxidized?

- A) Na^+
- B) Ag^{+1}
- C) H^+
- D) Fe^{+3}

80. Which one of the following metals is unreactive with acid or water?

- A) Lead
- B) Zinc

C) Sodium

D) Copper

Answer Key

1. D
2. D
3. C
4. B
5. C
6. B
7. B
8. A
9. B
10. D
11. B
12. D
13. C
14. C
15. A
16. D
17. D
18. A
19. B
20. C
21. C
22. C
23. C
24. A
25. C

26. C

27. B

28. A

29. D

30. D

31. D

32. B

33. C

34. B

35. C

36. B

37. B

38. D

39. D

40. A

41. B

42. D

43. B

44. C

45. B

46. C

47. B

48. B

49. B

50. C

51. A

52. A

53. A

54. D

55. C

- 56. B
- 57. D
- 58. B
- 59. D
- 60. D
- 61. B
- 62. B
- 63. B
- 64. B
- 65. C
- 66. B
- 67. A
- 68. B
- 69. C
- 70. C
- 71. B
- 72. A
- 73. D
- 74. C
- 75. A
- 76. C
- 77. B
- 78. C
- 79. B
- 80. D