

Chemistry, 2005 EC, entrance exam

Grade 12 · Chemistry · 2005 E.C.

Time allowed: 120 minutes

Questions: 74

Total marks: 74

Name _____ Grade _____ ID No. _____ Date _____

1. Which of the following is NOT a basic SI unit? (1)
A. Candela
B. Gram
C. Mole
D. Second
2. Which of the following statements is TRUE? (1)
A. Ultraviolet light has longer wavelength than visible light.
B. The energy of radiation decreases as the wavelength decreases.
C. The frequency of radiation increases as the wavelength decreases.
D. Wave number of an electromagnetic radiation increases as wavelength increases.
3. Which of the following ionic compounds is formed from the reaction between magnesium and nitrogen? (1)
A. MgN_2
B. Mg_2N_2
C. Mg_3N_2
D. Mg_2N_3
4. Which of the following molecules represents a non-polar covalent bond? (1)
A. B-Cl
B. C-Cl
C. Cl-Cl
D. Mg-Cl
5. Which of the following groups in the periodic table has paramagnetic atoms? (1)
A. Group zero
B. Group IIA
C. Group IIB
D. Group IVA
6. How many types of cubic unit cells are known? (1)
A. 2
B. 3
C. 4
D. 5
7. What is the process that converts liquid vegetable oils to solid fats? (1)
A. Hydration
B. Hydrogenation
C. Hydrolysis
D. Saponification
8. What would be the solubility of $\text{HOCH}_2(\text{CH}_2)_6\text{CH}_2\text{OH}$ compared to $\text{CH}_3(\text{CH}_2)_6\text{CH}_2\text{OH}$? (1)
A. Less soluble in water
B. More soluble in water
C. The same solubility in water.
D. More soluble in a non-polar solvent such as dichloroethane.
9. Which of the following gases is manufactured using the Haber process? (1)
A. Ammonia
B. Nitric oxide
C. Nitrogen
D. Nitrogen dioxide

-
10. Which one of the mixture of the following pairs will NOT give a buffer solution? (1)
- A. HCN and NaCN
B. NH_3 and NH_4Cl
C. H_3PO_4 and KH_2PO_4
D. HNO_3 and NaNO_3
-
11. Which one of the following is TRUE for salts formed from strong acids and strong bases? (1)
- A. No hydrolysis takes place.
B. Produces ions that are proton donors.
C. Produces ions which are proton acceptors.
D. Depends on the pK_a and pK_b of the parent acids and bases, respectively.
-
12. Which of the following metals is NOT obtained by commercial electrolytic process? (1)
- A. Ag
B. Al
C. Cu
D. Na
-
13. Which of the following metals has the highest electrical and thermal conductivities? (1)
- A. Ag
B. Co
C. Cu
D. Ni
-
14. Enthalpy is defined as the heat content of the system at constant: (1)
- A. Heat
B. Moles
C. Pressure
D. Volume
-
15. Which of the following elements is the second most abundant element in the earth's crust? (1)
- A. Aluminium
B. Iron
C. Oxygen
D. Silicon
-
16. What is the number of significant figures in 0.0030050? (1)
- A. 4
B. 5
C. 7
D. 8
-
17. Which of the following properties of a substance does NOT represent an intensive physical property? (1)
- A. Boiling point
B. Colour
C. Density
D. Volume
-
18. What is the mass of one molecule of water? (1)
- A. $3.0 \times 10^{-23} \text{ g}$
B. $1.8 \times 10^{-23} \text{ g}$
C. 0.0003g
D. 18.0g
-
19. Which of the following quantum number (s) is (are) related to the size and energy of an electron in a hydrogen atom? (1)
- A. n
B. n, l
C. n, l, m
D. n, l, m, s
-
20. An electron has a spin quantum number, $s = +1/2$ and a magnetic quantum number, $m_l = +1$. In which of the following orbital will it NOT be present? (1)
- A. S-orbital
B. P-orbital
C. d-orbital
D. f-orbital

21. Which of the following molecules has a trigonal bi pyramidal structure? (1)

- A. PCl_5
C. ICl_4^-
- B. IF_5
D. BrF_5

22. Which of the following represents the general configuration of the transition elements? (1)

- A. ns^2np^6 B. $ns(n-1)d$
C. $ns(n-2)f$ D. $ns^2np^6(n-1)d^{10}$

23. The total number of electrons participating in the bond formation of carbonate anion, CO_3^{2-} in the molecule of carbonic acid are: (1)

- A. 16
B. 10
C. 8
D. 5

24. Which of the following crystals possess high electrical and thermal conductivities? (1)

- A.** Ionic crystals **B.** Metallic crystals
- C.** Molecular crystals **D.** Covalent network crystals

25. What is the valid rate expression for the following reaction? $2\text{NO} + 2\text{H}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$ (1)

- A. $1/2 \Delta[\text{H}_2]/\Delta t$
 B. $-1/2 \Delta[\text{H}_2\text{O}]/\Delta t$
 C. $-1/2 \Delta[\text{NO}]/\Delta t$
 D. $\Delta[\text{N}_2]/\Delta t$

26. Which of the following statements is TRUE about equilibrium reaction? (1)

- A. No more reactants are transformed into products.
- B. There are equal amounts of reactants and products.
- C. The rate constant for the forward reactions equals that of the reverse reaction.
- D. The rate for the forward reactions equals that of the reverse reactions.

27. Three gases are in equilibrium in a closed chamber sealed with a piston. The following equilibrium is established: (1)



What will happen if the piston is pushed into the chamber?

- A. The mole fraction of N_2 increases.
- B. The mole of N_2 decreases.
- C. The mole fraction of N_2 remains the same.
- D. The mole fraction of N_2 increases and then decreases.

28. Which of the following reactions will produce an alkyl carboxylic acid? (1)

- A. Heating a methyl ketone with acid and iodine.
- B. Reacting an alkyl halide with hydrogen gas and platinum.
- C. Reacting an alcohol with ozone.
- D. Oxidation of a primary alcohol with hot permanganate or chromate.

29. Which of the following statements is NOT TRUE? (1)

- A.** Naturally derived soaps consists of a soluble salt of a long chain fatty acid.
- B.** Triacylglycerols are esters of glycerol and long chain carboxylic acids.
- C.** Long chain carboxylic acids are also known as fatty acids.
- D.** The major acidic component of vinegar is formic acid.

30. What is the name of triacylglycerol(triglycerides) that is solid at room temperature? (1)

- | | |
|-------------|--------|
| A. Lecithin | B. Fat |
| C. Wax | D. Oil |

31. Which of the following is the most important type of solute-solvent interaction in a solution of n- butanol in water? (1)

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

32. What is the product of the hydrolysis of esters in the presence of a mineral acid catalyst? (1)

- | | |
|------------|-------------------|
| A. Alcohol | B. Carbon dioxide |
| C. Ether | D. Ketones |

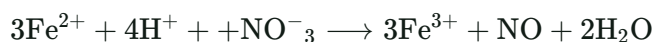
33. To which organic functional group does the following molecular representation, i.e, R_1R_2CHCOH belong? (R_1 and R_2 represent different alkyl chains) (1)

- | | |
|-----------|-----------------|
| A. Amides | B. Aldehyde |
| C. Ethers | D. Organic acid |

34. What is the quantity of water, in mL, required to prepare 0.5 M of HCl from a concentrated solution of 3.5M in 50 mL is? (1)

- | | |
|----------|----------|
| A. 50mL | B. 100mL |
| C. 300mL | D. 350mL |

35. What is the equivalent weight of HNO_3 , as an oxidizing agent, in the following balanced reaction? (1)

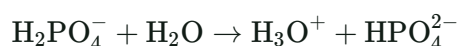


- | | |
|----------|----------|
| A. 10.5 | B. 15.75 |
| C. 21.00 | D. 31.50 |

36. Given the following equilibria and equilibrium constant: (I) $HC_2H_3O_2 + H_2O \rightleftharpoons H_3O^+ + C_2H_3O_2^-$; $K_a = 1.80 \times 10^{-5}$ (II) $H_2CO_3 + H_2O \rightleftharpoons H_3O^+ + HCO_3^-$; $K_a = 4.20 \times 10^{-7}$ (III) $NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$; $K_a = 5.6 \times 10^{-10}$ (IV) $HCOOH + H_2O \rightleftharpoons H_3O^+ + COOH^-$; $K_a = 1.80 \times 10^{-4}$ What is the strength of the acids in DECREASING order? (1)

- | | |
|----------------------|----------------------|
| A. I, IV, II and III | B. II, III, IV and I |
| C. III, II, I and IV | D. IV, I, II and III |

37. Given the reaction: (1)



Which of the following represents a conjugate acid base pair?

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

38. Which of the following statements is TRUE about colligative properties? (1)

- A. Both vapour pressure and freezing point increase when a non-volatile solute is added to a solvent.
B. Both freezing point and boiling point increase when a non-volatile solute is added to a solvent.
C. Both vapour pressure and boiling point decrease when a non-volatile solute is added to a solvent.
D. Colligative properties depend only upon the number of solute particles in a solution and not upon their identity.

39. What is the pH of 0.005 M solution of $\text{Ca}(\text{OH})_2$? (1)

- A. 2.3
B. 10
C. 12
D. 14

40. How many kilo joules of heat are absorbed when 20 g of NaCl(s) is decomposed in to Na(s) and $\text{Cl}_2\text{(g)}$ at constant pressure according to the following reaction? (1)



- A. -281.0
B. -140.5
C. +140.5
D. +281.0

41. In the electroplating of nickel from a solution containing Ni^{2+} ion, what will be the weight of the metal deposited on the cathode by a current of 8 A flowing for 500 minutes? (1)

- A. 73g
B. 103g
C. 117.4g
D. 145g

42. A 1M solution of $\text{Cu}(\text{NO}_3)_2$ is placed in a beaker with a strip of Cu metal. A 1M of SnSO_4 is placed in a second beaker with a strip of Sn metal. The two beakers are then connected by a salt bridge and the two metal electrodes are connected by wires to a voltmeter. Which of the following electrodes serves as the anode and which electrode gains mass? Given that $E^0\text{Cu}^{2+}/\text{Cu} = 0.34\text{V}$ and $E^0\text{Sn}^{2+}/\text{Sn} = 0.14\text{V}$ (1)

- A.** Anode, Sn, Sn electrode gains mass. **B.** Anode, Sn, Cu electrode gains mass.
C. Anode, Cu, Sn electrode gains mass. **D.** Anode, Cu, Cu electrode gains mass.

43. Which of the following metal alloys does NOT contain tin? (1)

- A. Brass
B. Bronze
C. Pewter
D. Plumber's solder

44. What structural feature is usually needed to present in order for an addition polymer to be produced? (1)

- A.** A carbon-carbon sigma bond. **B.** A carbon-oxygen pi bond.
C. A carbon-oxygen sigma bond. **D.** A carbon-carbon pi bond.

45. What are the raw materials required to synthesize nylon 6, 6, a specific kind of nylon? (1)

- A.** Diacids
B. Diamines
C. Diacids and diamines
D. Polyethylene

46. Which of the following substances are added to natural rubber to toughen it? (1)

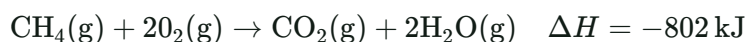
- A. Calcium
B. Carbon
C. Nitrogen
D. Sulphur

47. What is the quantity of heat required to raise the temperature of 80g of ethanol from 25°C to 75°C ? (specific heat of ethanol = $2.46\text{ J g}^{-1}\text{K}^{-1}$) (1)

- A. 2.46kJ
B. 4.0kJ
C. 9.84kJ
D. 18.68kJ

48. Consider the following gaseous reaction at 250C:

(1)



Which energy change would occur if 3.2 moles of CH_4 is completely combusted?

- A. 2.57×10^3 kJ will be released. B. 2.57×10^2 kJ will be absorbed.
C. 6.43×10^3 kJ will be released. D. 6.43×10^3 kJ will be absorbed.

49. What is the number of chloride ions (Cl^-) present in 1.0×10^{-5} mol of AlCl_3 ?

(1)

- A. 1.80×10^9 B. 6.02×10^{18}
C. 6.02×10^{23} D. 6.02×10^{28}

50. Which of the following is the most important ingredients used for production of DAP fertilizer?

(1)

- A. Ammonia and phosphoric acid. B. Nitric acid, urea and phosphoric acid.
C. Phosphoric acid, urea and ammonia. D. Sulphuric acid, ammonia and urea.

51. Which of the following bio molecules forms a zwitterions at higher or lower PH?

(1)

- A. Cellulose B. Glucose
C. Protein D. Starch

52. Which of the following form of synthetic rubbers can be vulcanized to greatly enhance its mechanical strength?

(1)

- A. Neoprene B. Isoprene
C. Styrene-butadiene rubber D. Butyl rubber

53. What is the range in the number of carbon atom of the monosaccharides that are found in nature?

(1)

- A. 3 to 7 B. 4 to 10
C. 4 to 12 D. 5 to 12

54. What are the two principal polysaccharide forms of starch?

(1)

- A. Aldohexose and ketopentose. B. Amylose and amylopectin.
C. Maltose and cellobiose. D. Sucrose and lactose.

55. What is the Kelvin scale (K) corresponding to the temperature readings when the degree Celsius ($^{\circ}\text{C}$) is identical to the degree Fahrenheit ($^{\circ}\text{F}$)?

(1)

- A. 0 k B. 37 k
C. 233 k D. 273 k

56. What is the wavelength associated with an electron of mass, $m = 9.11 \times 10^{-28}$ g, travelling at 40% of the velocity of light?

(1)

- A. 6.06×10^{-15} m B. 2.42×10^{-15}
C. 6.06×10^{-12} m D. 2.42×10^{-11} m

57. The quantum numbers listed below are meant for four different electrons in an atom: I. $n = 4, l = 0, m_l = 0, m_s = +1/2$ II. $n = 3, l = 1, m_l = 1, m_s = +1/2$ III. $n = 4, l = 2, m_l = 0, m_s = +1/2$ IV. $n = 4, l = 1, m_l = 0, m_s = -1/2$ When these sets of quantum numbers are arranged in order of increasing energy, one may get:

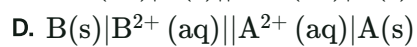
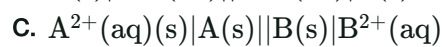
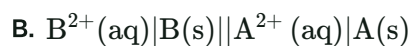
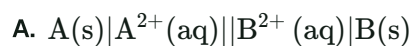
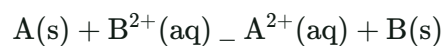
(1)

- A. I < II < III < IV B. I < III < II < IV
C. III < I < IV < II D. IV < III < II < I

58. Which of the following hybrid orbitals is favouring the formation of trigonal bipyramidal? (1)
- A. sp^3d B. sp^3
C. sp^3d^2 D. sp^3d^3
59. Which one of the following molecules/molecular ions is paramagnetic according to the molecular orbital theory? (1)
- A. O_2^{2-} B. O_2
C. F_2 D. O_2^{2+}
60. For the reaction: $2A + B \rightarrow C$ the following experimental results were obtained: What is the value of the rate constant? (1)
- [Figure: A four-column data table sits between the stem and the follow-up question. Column headings, left to right: "Experiment", "[A]", "[B]", "Rate ($mol\ L^{-1}\ s^{-1}$)". Three data rows follow. Row 1: Experiment 1, $[A] = 0.50$, $[B] = 0.50$, Rate = 0.300. Row 2: Experiment 2, $[A] = 0.50$, $[B] = 0.25$, Rate = 0.075. Row 3: Experiment 3, $[A] = 0.25$, $[B] = 0.25$, Rate = 0.075. The table is drawn with plain black rules around every cell; no other marks, axes or arrows appear.]
- A. $0.6\ mol\ L^{-1}\ s^{-1}$ B. $0.6\ L^{-1}\ s^{-1}$
C. $1.2\ L^{-1}\ s^{-1}$ D. $2.4\ mol^{-1}\ s^{-1}$
61. If a piece of aluminium (Al) foil measuring 24 cm by 31 cm has a mass of 10.35 g, (density of Al = $2.70\ gcm^{-3}$). What is the thickness of the foil in millimetres? (1)
- A. 5.15×10^{-3} B. 5.15×10^{-2}
C. 3.833 D. 744
62. Which of the following molecules has a dipole moment? (1)
- A. XeF_4 B. H_2S
C. SO_3 D. CH_4
63. Which of the following reactions will convert carboxylic acids to primary amines? (1)
- A. Decarboxylation with HBr and peroxide, then reaction of the alkyl bromide with ammonia.
B. Reduction of the acid to the alcohol with NaOH/ formaldehyde then reaction with ammonium chloride and heat.
C. A two-step conversion, first to the amide with ammonia and heat, and then by reduction with lithium aluminium hydride or hydrogen plus catalyst.
D. Lactase fermentation in the presence of ammonia atmosphere
64. A solution was prepared by adding 48g of methanol (CH_3OH) in to 81g of water (H_2O). What is the mole fraction of methanol in this solution? (1)
- A. 0.25 B. 0.75
C. 1.5 D. 4.5
65. A solution was prepared by dissolving 3.75 g of pure hydrocarbon in 95.0g of cyclohexane. The boiling point of pure cyclohexane was observed to be $80.70^\circ C$ and that of the solution was $81.45^\circ C$. What is the approximate molecular weight of the hydrocarbon? (K_b for cyclohexane = $2.79^\circ C/m$) (1)
- A. 71.0g/mol B. 105g/mol
C. 147g/mol D. 312g/mol

74. For the following hypothetical equation, in aqueous solution, what is the correct representation of the cell notation?

(1)



— END OF EXAMINATION —

Generated on Nehase 30, 2018 E.C. (September 5, 2026 G.C.) · Temari.et