

Registration No:

--	--	--	--	--	--

SET 3

ALL KERALA COMMON MODEL EXAMINATION

CHEMISTRY (043)

CLASS 12 (2023-'24)

Time: 3 Hours

Max. Marks: 70

General Instructions:

Read the following instructions carefully.

- i. There are **33** questions in this question paper with internal choice.
- ii. SECTION A consists of 16 multiple - choice questions carrying 1 mark each.
- iii. SECTION B consists of 5 very short answer questions carrying 2 marks each.
- iv. SECTION C consists of 7 short answer questions carrying 3 marks each.
- v. SECTION D consists of 2 case - based questions carrying 4 marks each.
- vi. SECTION E consists of 3 long answer questions carrying 5 marks each.
- vii. **All questions are compulsory.**
- viii. **Use of log tables and calculators is not allowed.**

SECTION A

- 1 Methyl bromide is converted into ethane by heating it in ether medium with: **[1]**
 - a) Na
 - b) Cu
 - c) Al
 - d) Zn

- 2 Which of the following is a fibrous protein? **[1]**
 - a) Glycoprotein
 - b) Keratin
 - c) Proteoses
 - d) Prolamine

- 3 Which branched chain isomer of the hydrocarbon with molecular mass 72u gives only one isomer of monosubstituted alkyl halide? **[1]**
 - a) Tertiary butyl chloride
 - b) Neohexane
 - c) Isohexane
 - d) Neopentane

- 4 The most stable ion is **[1]**
 - a) Fe^{2+}
 - b) Mn^{2+}
 - c) Cr^{2+}
 - d) All are equally stable

- 5 The molecular formula of ethyl acetate is: **[1]**
 - a) $\text{C}_4\text{H}_8\text{O}$
 - b) $\text{C}_4\text{H}_8\text{O}_2$
 - c) $\text{C}_5\text{H}_{10}\text{O}_2$
 - d) $\text{C}_5\text{H}_8\text{O}_2$

6 Which is the correct increasing order of boiling points of the following compounds: I [1]
1-iodobutane, 1-bromobutane, 1-chlorobutane, butane

- a) butane < 1-iodobutane < 1-bromobutane < 1-chlorobutane
b) butane < 1-chlorobutane < 1-iodobutane < 1-bromobutane
c) butane < 1-chlorobutane < 1-bromobutane < 1-iodobutane
d) 1-iodobutane < 1-bromobutane < 1-chlorobutane < butane

7 If 75% of a first order reaction was completed in 32 min, then 50% of the reaction was completed in _____. [1]

- a) 24 min
b) 4 min
c) 16 min
d) 8 min

8 Match the column and choose correct option [1]

Vant'Hoff factor	Behaviour of compound
(a) $i = 1$	(i) Impossible
(b) $i > 1$	(ii) Association in the solution
(c) $i < 1$	(iii) Dissociation in the solution
(d) $i = 0$	(iv) No dissociation or association

- a) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
b) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
c) (a) - (iv), (b) - (iv), (c) - (iii), (d) - (ii)
d) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

9 Which of the following expressions is correct for the rate of reaction given below? [1]
 $5\text{Br}^- (\text{aq}) + \text{BrO}_3^- (\text{aq}) + 6\text{H}^+ (\text{aq}) \rightarrow 3\text{Br}_2 (\text{aq}) + 3\text{H}_2\text{O} (\text{l})$

- a) $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{5}{6} \frac{\Delta[\text{H}^+]}{\Delta t}$
b) $\frac{\Delta[\text{Br}^-]}{\Delta t} = 6 \frac{\Delta[\text{H}^+]}{\Delta t}$
c) $\frac{\Delta[\text{Br}^-]}{\Delta t} = 5 \frac{\Delta[\text{H}^+]}{\Delta t}$
d) $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{6}{5} \frac{\Delta[\text{H}^+]}{\Delta t}$

10 Grignard reagent (CH_3MgBr) on reaction CH_3OH will give: [1]

- a) Aldehyde
b) Ethane
c) Ester
d) Methane

11 The correct IUPAC name for $\text{CH}_2=\text{CHCH}_2\text{NHCH}_3$ is [1]

- a) Allylmethylamine
b) 4-aminopent-1-ene
c) N-methylprop-2-en-1-amine
d) 2-amino-4-pentene

12 Which of the following does not give silver mirror test? [1]

- a) $\text{CH}_3\text{CH}_2\text{CHO}$
b) HCOOH
c) CH_3CHO
d) CH_3COCH_3

13 **Assertion (A):** D (+) – Glucose is dextrorotatory in nature. [1]

Reason (R): 'D' represents its dextrorotatory nature.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

14 **Assertion (A):** The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses. [1]

Reason (R): There is a weak molecular association in aldehydes and ketones arising out of the dipole - dipole interactions.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

15 **Assertion (A):** 1-Iodopropane and 2-iodopropane are chain isomers. [1]

Reason (R): These differ in the position of I in the carbon chains.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

16 **Assertion (A):** Phenol forms 2,4,6 - tribromophenol on treatment with Br₂ in carbon disulphide at 273K. [1]

Reason (R): Bromine does not polarise in carbon disulphide.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

SECTION B

17 To what extent does the electronic configurations decide the stability of oxidation states in the first series of the transition elements? Illustrate your answer with two examples. [2]

18 **Answer the following:** [2]

- i. Why does the rate of a reaction increase with rise in temperature?
- ii. The rate constant of a reactant is $2 \times 10^{-2} L mol^{-1} s^{-1}$. What is the order of the reaction.

19 What is meant by hexadentate ligand? Give one example. How is such ligand useful for measuring hardness of water. [2]

- 20 Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185,000 in 450 mL of water at 37°C. [2]

OR

45 g of ethylene glycol ($C_2H_6O_2$) is mixed with 600 g of water. Calculate

- the freezing point depression and
 - the freezing point of the solution.
- 21 Give chemical tests to distinguish between the following pairs of compounds. [2]
- Propanoyl chloride and propanoic acid
 - Benzaldehyde and Acetophenone

SECTION C

- 22 Three electrolytic cells A, B and C containing electrolytes of zinc sulphate, silver nitrate and copper sulphate respectively are connected in series. A steady current of 1.50 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What weight of copper and zinc get deposited? [3]
(Atomic weight: Cu=63.5 g mol⁻¹, Ag=108 g mol⁻¹ and Zn=65.3 g mol⁻¹)
- 23 For a decomposition reaction the values of rate constant K at two different temperatures are given below: $K_1 = 2.15 \times 10^{-8} L mol^{-1} s^{-1}$ at 650 K $K_2 = 2.39 \times 10^{-7} L mol^{-1} s^{-1}$ at 700 K Calculate the value of activation energy for this reaction. (R = 8.314 JK⁻¹ mol⁻¹) [3]
- 24 How the following conversions can be carried out? [3]
- Propene to propan-1-ol
 - Ethanol to Ethanoic anhydride
 - 1-Bromopropane to 2-bromopropane

OR

Write the equation of the reaction of hydrogen iodide with:

- 1-propoxypropane
 - Methoxybenzene
 - Benzyl ethyl ether
- 25 State Kohlrausch's law of independent migration of ions. [3]
Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch's law.
How does conductivity vary with dilution?
- 26 Haloalkanes react with KCN to form alkyl cyanides as the main product while AgCN forms isocyanides as the chief product. Explain. [3]
- 27 Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging. [3]

- 28 Write the equations involved in the following reactions: [3]
- Cannizzaro reaction
 - Aldol condensation
 - Hell - Volhard - Zelinsky reaction

SECTION D

- 29 **Read the text carefully and answer the questions:** The d - block of the periodic table contains the elements of the groups 3 to 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d - orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e. 3d, 4d and 5d series. However, Zn, Cd and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions, alloys, catalytic activity etc. Transition metals are hard (except Zn, Cd and Hg) and have a high melting point. [4]
- Why are Zn, Cd and Hg non - transition elements?

OR

Why are melting points of transition metals high?

- Write the electronic configuration of Cr.
 - Which transition metal of 3d series does not show variable oxidation state?
 - a. Why do transition metals and their compounds show catalytic activity?
b. Name a transition metal and its compound which can act as catalysts.
- 30 **Read the text carefully and answer the questions:** The boiling point elevation and the freezing point depression of solutions have a number of practical applications. Ethylene glycol ($\text{CH}_2\text{OH} \cdot \text{CH}_2\text{OH}$) is used in automobile radiators as an antifreeze because it lowers the freezing point of the coolant. The same substance also helps to prevent the radiator coolant from boiling away by elevating the boiling point. Ethylene glycol has a low vapour pressure. We can also use glycerol as an antifreeze. In order for boiling point elevation to occur, the solute must be non - volatile, but no such restriction applies to freezing point depression. For example, methanol (CH_3OH), a fairly volatile liquid that boils only at 65°C is sometimes used as antifreeze in automobile radiators. [4]
- Out of the CH_3OH and $\text{C}_6\text{H}_{12}\text{O}_6$, which is a better reagent for depression in freezing point but not for elevation in boiling point?
 - Will the depression in freezing point be same or different, if 0.1 moles of sugar or 0.1 moles of glucose is dissolved in 1 L of water?
 - 124 g each of the two reagents glycerol and glycol are added in 5 kg water of the radiators in the two cars. Which one is better for a car? Justify your answer.

OR

Which is more viscous, Glycerol or 1-propanol? Why?

SECTION E

31 Attempt any five of the following:

[5]

- i. What is meant by invert sugars?
- ii. Explain denaturation of protein.
- iii. Give two examples of reducing sugars.
- iv. What are biocatalysts? Give an example.
- v. How do you explain the presence of all six carbon atoms in glucose in a straight chain?
- vi. Name any two vitamins which can be stored in our body.
- vii. Write the full forms of DNA and RNA.

32 i. Illustrate the following reactions giving suitable example in each case:

[5]

- a. Ammonolysis
 - b. Coupling reaction
- ii. Describe Hinsberg method for the identification of primary, secondary and tertiary amines. Also, write the chemical equations of the reactions involved.

OR

i. Give plausible explanation for each of the following:

- a. Why are amines less acidic than alcohols of comparable molecular masses?
- b. Why are primary amines highest boiling than tertiary amines?
- c. Why are aliphatic amines stronger bases than aromatic amines?

ii. Complete the following reactions:

- a. $C_6H_5N_2Cl + C_2H_5OH \rightarrow$
- b. $C_6H_5NH_2 + (CH_3CO)_2O \rightarrow$

33 Explain the violet colour of the complex $[Ti(H_2O)_6]^{3+}$ on the basis of crystal field theory.

[5]

OR

Using valence bond approach, explain the hybridization, shape and magnetic behaviour of $[Ni(NH_3)_6]^{2+}$. What is the IUPAC name of this ion?
