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SET 2

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 Hydrocarbons having double the number of carbon atoms than present in the original alkyl halide are produced by using: **[1]**
- a) Sandmeyer' reaction
b) Williamson's synthesis
c) Fittig reaction
d) Wurtz reaction
- 2 Glucose is: **[1]**
- a) Aldopentose
b) Ketopentose
c) Aldohexose
d) Ketohehexose
- 3 Which of the following compounds will give butanone on oxidation? **[1]**
- a) Butan- 2- ol
b) Both Butan-2- ol and Butan-1- ol
c) Butan-1-ol
d) None of these
- 4 $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ on heating with CHCl_3 and alcoholic KOH gives foul smell of **[1]**
- a) $\text{C}_6\text{H}_5\text{CH}_2\text{NC}$
b) $\text{C}_6\text{H}_5\text{CH}_2\text{CN}$
c) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
d) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$

5 The rate constant of a reaction is 0.0693 min^{-1} . Starting with 10 mol L^{-1} , the rate of reaction after 10 min will be: [1]

- a) $0.1733 \text{ mol L}^{-1} \text{ min}^{-1}$ b) $0.3465 \text{ mol L}^{-1} \text{ min}^{-1}$
 c) $0.0693 \text{ mol L}^{-1} \text{ min}^{-1}$ d) $0.693 \text{ mol L}^{-1} \text{ min}^{-1}$

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

- 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 The most stable ion is [1]

- a) Fe^{2+} b) Mn^{2+}
 c) Cr^{2+} d) All are equally stable

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?
 $5\text{Br}^{-}(\text{aq}) + \text{BrO}_3^{-}(\text{aq}) + 6\text{H}^{+}(\text{aq}) \rightarrow 3\text{Br}_2(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$ [1]

- 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 with CH_3OH will give: [1]

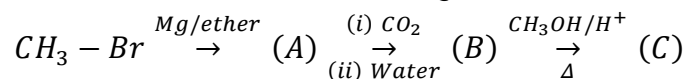
- a) Aldehyde b) Ethane
 c) Ester d) Methane

11 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

- 20 **Answer the following:** [2]
- Identify the order of reaction from the following rate constant: $k = 2.3 \times 10^{-5} \text{ L mol}^{-1} \text{ s}^{-1}$
 - How will you prove that a chemical reaction is of first order?

- 21 Identify the compounds A, B and C in the following reaction. [2]



SECTION C

- 22 For a decomposition reaction the values of rate constant K at two different temperatures are given below: $K_1 = 2.15 \times 10^{-8} \text{ L mol}^{-1} \text{ s}^{-1}$ at 650 K $K_2 = 2.39 \times 10^{-7} \text{ L mol}^{-1} \text{ s}^{-1}$ at 700 K Calculate the value of activation energy for this reaction. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) [3]
- 23 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: $\text{Cu} = 63.5 \text{ g mol}^{-1}$, $\text{Ag} = 108 \text{ g mol}^{-1}$ and $\text{Zn} = 65.3 \text{ g mol}^{-1}$)
- 24 How the following conversions can be carried out? [3]
- Propene to propan-1-ol
 - Ethanol to Ethanoyl chloride
 - 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 Describe the following: [3]
- Cannizzaro reaction
 - Cross aldol condensation
 - Decarboxylation
- 27 Haloalkanes react with KCN to form alkyl cyanides as the main product while AgCN forms isocyanides as the chief product. Explain. [3]

- 28 Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging. [3]

SECTION D

- 29 **Read the text carefully and answer the questions:** The f - block consists of elements in which 4f and 5f orbitals are progressively filled. They are placed in a separate panel at the bottom of the periodic table. The names transition metals and inner transition metals are often used to refer to the elements of d - and f - blocks respectively. The d-block occupies the large middle section of the periodic table flanked between s and p blocks in the periodic table. In general, the electronic configuration of the outer orbitals of these elements is $(n - 1)d^{1-10} ns^{1-2}$. The electronic configurations of outer orbitals of Zn, Cd and Hg are represented by the general formula $(n - 1)d^{10} ns^2$. The transition metals and their compounds also exhibit catalytic property and paramagnetic behaviour. Transition metal also forms an alloy. An alloy is a blend of metals prepared by mixing the components. Alloys may be homogeneous solid solutions in which the atoms of one metal are distributed randomly among the atoms of the other. [4]
- i. Transition metals form alloys. Justify.

OR

Transition metals and their many compounds act as good catalyst. Give reason.

- ii. Why do transition elements exhibit higher enthalpies of atomization?
- iii. a. Which of the following forms coloured compounds, Sc^{3+} or Ti^{2+} ?
b. Transition metals and many of their compounds show paramagnetic behaviour. Give reason.
- 30 **Read the text carefully and answer the questions:** [4]
- The boiling point elevation and the freezing point depression of solutions have a number of practical applications. Ethylene glycol (CH_2OH-CH_2OH) 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 $65^\circ C$ is sometimes used as antifreeze in automobile radiators.
- i. Out of the CH_3OH and $C_6H_{12}O_6$, which is a better reagent for depression in freezing point but not for elevation in boiling point?
- ii. 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?

- iii. 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

- iv. Write the formula of Glycerol. Why is it more viscous than ethanol and propanol?

SECTION E

31 Attempt any five of the following:

[5]

- i. Amino acids show amphoteric behaviour. Why?
- ii. Give two examples of reducing sugars.
- iii. Name the deficiency disease resulting from lack of vitamin A and E in the diet.
- iv. What is denaturation of protein?
- 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. α - Helix is a secondary structure of proteins formed by twisting of the polypeptide chain into right - handed screw like structures. Which type of interactions is responsible for making the α - helix structure stable?

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

[5]

- a. Coupling reaction
 - b. Acetylation of amines
- 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 $[Ni(NH_3)_6]^{2+}$. Also, write the IUPAC name of this ion
