



**SAMPLE PAPER 3 2024-25**

**Class 12 - Chemistry**

**Time Allowed: 3 hours**

**Maximum Marks: 70**

**General Instructions:**

Read the following instructions carefully.

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

**Section A**

1. Benzylic halides contains: [1]  
a)  $sp^3$ -hybridized carbon atom, next to an aromatic ring bonded to a halogen.      b)  $sp^2$ -hybridized carbon atom next to an aromatic ring.  
c)  $sp^3$ -hybridized carbon atom next to carbon-carbon double bond.      d) a halogen atom bonded to an alkyl group.
2. The vitamin that cannot be stored in our body is [1]  
a) vitamin E      b) vitamin C  
c) vitamin K      d) vitamin D
3. In the reaction  $R-OH + HCl \xrightarrow{ZnCl_2} RCl + H_2O$ , what is the correct order of reactivity of alcohol? [1]  
a)  $1^\circ > 2^\circ > 3^\circ$       b)  $3^\circ > 1^\circ > 2^\circ$   
c)  $1^\circ < 2^\circ < 3^\circ$       d)  $1^\circ > 3^\circ > 2^\circ$
4. Which of the following is the strongest acid? [1]  
a) Methyl alcohol      b) Acetic acid  
c) Phenol      d) Water
5. Activation energy of a reaction is [1]  
a) The energy released during the reaction      b) Energy evolved when activated complex is formed

- c) The minimum amount of energy required to overcome the barrier      d) The energy absorbed during a reaction

6. Match the items given in column I with that in column II: [1]

Column I	Column II
(a) Hypertonic	(i) NaCl.
(b) Hypotonic	(ii) Solution having higher osmotic pressure than other solution.
(c) Isotonic	(iii) Solution having lower osmotic pressure than other solution.
(d) Electrolyte	(iv) Solutions having same osmotic pressure.

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

7. To prepare alkanes containing odd number of carbon atoms, Wurtz reaction is not preferred because: [1]

- a) a lot of reaction mixture goes wasted.      b) a mixture of three different alkyl halides has to be used.  
 c) a mixture of four different alkyl halides has to be used.      d) a mixture of two different alkyl halides has to be used.

8. Lanthanoid contraction is: [1]

- a) decrease in stability of higher oxidation states of lanthanides.      b) the filling of 4f before 5d orbital resulting in a regular decrease in atomic radii.  
 c) ions of the same charge in a given series showing a progressive decrease in radius with increasing atomic number.      d) the decrease in the ionic character of lanthanides with an increase in the oxidation state.

9. The slope in the  $\log k$  vs.  $\frac{1}{T}$  curve is  $5.42 \times 10^3$ . The value of the activation energy is approximately [1]

- a) 106 J/mol      b) 102 J/mol  
 c) 104 kJ/mol      d) 108 J/mol

10. Acetone is treated with excess of ethanol in the presence of hydrochloric acid. The product obtained is: [1]

- a)  $(CH_3)_2C(OH)(OC_2H_5)$       b)  $(CH_3)_2C(OC_2H_5)(OC_2H_5)$   
 c)  $CH_3COOH$       d)  $(CH_3)_2CH(OH)$

11. Reaction of 1-phenyl-2-chloropropane with alcoholic KOH gives mainly: [1]

- a) 3-phenylpropene      b) 1-phenylpropene  
 c) 1-phenylpropan-2-ol      d) 1-phenylpropan-3-ol

12. The gas evolved when methylamine reacts with nitrous acid is \_\_\_\_\_. [1]

- a)  $H_2$       b)  $N_2$   
 c)  $C_2H_6$       d)  $NH_3$

13. **Assertion (A):** Acid or enzymatic hydrolysis of sucrose to give an equimolar mixture of glucose and fructose is called inversion. [1]

**Reason (R):** Sucrose is the only naturally occurring disaccharide which is reducing.

- 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):** Halogen acids do not add on to carbonyl bond. [1]

**Reason (R):** Addition depends upon the polarisation of HX and carbonyl bond.

- 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):** 3° halide on reaction with Na in dry ether give alkene as major product. [1]

**Reason (R):** 3° radicals do not combine together to avoid steric hindrance.

- 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):** Methyl alcohol is more volatile than H<sub>2</sub>O. [1]

**Reason (R):** The oxygen containing angle is maximum in H<sub>2</sub>O than methanol.

- 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. Explain the following: [Fe(CN)<sub>6</sub>]<sup>4-</sup> and [Fe(H<sub>2</sub>O)]<sup>2+</sup> are of different colours in dilute solutions. [2]

18. Why do transition elements show variable oxidation states? [2]

19. **Answer the following:** [2]

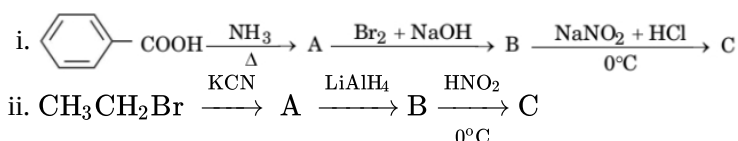
- (a) What is the unit of rate of reaction? [1]  
(b) A first order reaction is found to have a rate constant  $k = 5.5 \times 10^{-14} \text{ s}^{-1}$ . Find the half-life of reaction. [1]

20. State Henry's law. Calculate the solubility of CO<sub>2</sub> in water at 298 K under 760 mm Hg. (K<sub>H</sub> for CO<sub>2</sub> in water at 298 K is  $1.25 \times 10^6 \text{ mm Hg}$ ) [2]

OR

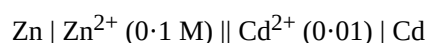
4% solution of sucrose is isotonic with 3% solution of an unknown organic substance. Calculate the molecular mass of unknown substance.

21. Write the structures of A, B and C in the following reactions: [2]



### Section C

22. Write the Nernst equation and calculate the emf of the following cell at 298 K: [3]



Given :  $E_{\text{Zn}^{2+}/\text{Zn}}^{\ominus} = -0.76 \text{ V}$

$E_{\text{Cd}^{2+}/\text{Cd}}^{\ominus} = -0.40 \text{ V}$

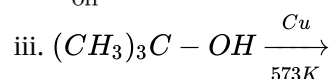
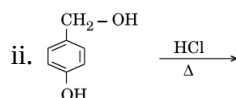
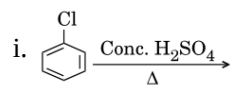
(log 10 = 1)

23. The rate constant for the first order decomposition of  $\text{N}_2\text{O}_5$  is given by the following equation: [3]

$$k = (2.5 \times 10^{14} \text{ s}^{-1}) e^{(-25000\text{K})/T}$$

Calculate  $E_a$  for this reaction and rate constant if its half-life period be 300 minutes.

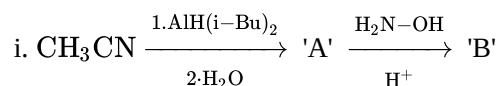
24. Write the major product(s) of the following reactions: [3]



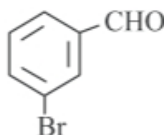
OR

Why -OH group in phenols is more strongly held as compared to -OH group in alcohol?

25. Complete the following: [3]



- ii. Write IUPAC name of the following compound:



- iii. Write chemical test to distinguish between the following compounds: Phenol and Benzoic acid

26. Calculate the emf of the following cell: [3]



Given :  $E_{\text{Zn}^{2+}/\text{Zn}}^{\ominus} = -0.76 \text{ V}$  and

$E_{\text{Ag}^+/\text{Ag}}^{\ominus} = +0.80 \text{ V}$

[log 2 = 0.3010, log 3 = 0.4771, log 10 = 1]

27. How can you convert the following? [3]

i. But-1-ene to 1-iodobutane

ii. Benzene to acetophenone

iii. Ethanol to propanenitrile

28. Mention the reactions occurring at [3]

i. anode

ii. cathode, during working of a mercury cell.

Why does the voltage of a mercury cell remain constant during its operation?

#### Section D

29. Read the following text carefully and answer the questions that follow: [4]

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, Hg and Cn 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.

- i. Transition metals form alloys. Justify? (1)
- ii. Why do transition elements exhibit higher enthalpies of atomization? (1)
- iii. Transition metals and many of their compounds show paramagnetic behaviour. Give reason. (2)

**OR**

Transition metals and their many compounds act as good catalyst. Give reason. (2)

30. **Read the following text carefully and answer the questions that follow:** [4]

The solutions which boil at a constant temperature like a pure liquid and possess the same composition in liquid, as well as vapour state are called azeotropes. The components of azeotropes cannot be separated by fractional distillation. Only non-ideal solutions form azeotropes. Solutions with negative deviation form maximum boiling azeotrope and the solutions with positive deviation form minimum boiling azeotrope. The boiling point of azeotrope is never equal to the boiling points of any of the components of the azeotrope.

- i. The azeotropic solutions of two miscible liquids show what type of deviation from Raoult's law? (1)
- ii. The azeotropic mixture of water & HCl boils at  $108.5^{\circ}C$ . What type of deviation is shown by the solution?  
Does this solution behave as ideal or non-ideal? (1)
- iii. Do ideal solutions form azeotropes? (2)

**OR**

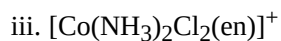
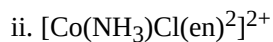
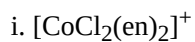
Out of pure liquid and azeotrope showing positive deviation, Which one has a higher boiling point? (2)

#### Section E

31. **Attempt any five of the following:** [5]

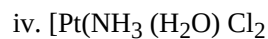
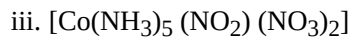
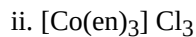
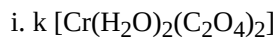
- (a) Give the reaction of glucose with acetic anhydride. Presence of which group is confirmed by this reaction? [1]
- (b) What happens when D-glucose is treated with the following reagents? [1]
  - a.  $H_2N-OH$
  - b.  $(CH_3CO)_2O$
- (c) Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain. [1]
- (d) Name the vitamin whose deficiency causes convulsions. [1]
- (e) Define the following term: Anomers. [1]
- (f) Write the reactions showing the presence of following in the open structure of glucose: [1]
  - i. a carbonyl group
  - ii. chain with six carbon atoms
- (g) i. Name any two bases which are common to both DNA and RNA. [1]
  - ii. Which vitamin deficiency causes:
    1. Bone deformities in children?
    2. Pernicious anaemia?

32. Draw all the isomers of: (geometrical and optical) [5]

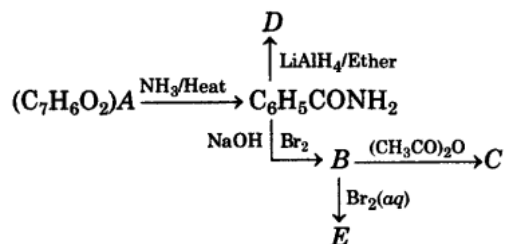


OR

Indicate the types of isomerism exhibited by the following complexes and draw the structures for these isomers:

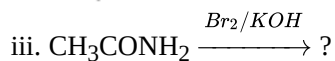
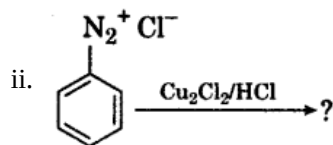
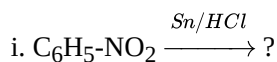


33. An aromatic compound 'A' of molecular formula  $\text{C}_7\text{H}_6\text{O}_2$  undergoes a series of reactions as shown below. Write the structures of A, B, C, D and E in the following reactions. [5]



OR

Write major product(s) in the following reactions:



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