CBSE Sample Paper 2
Class XII 2022-23
Chemistry

Time: 3 Hours   **Max. Marks: 70**

General Instructions:
1. There are 35 questions in this question paper with internal choice.
2. SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 7 very short answer questions carrying 2 marks each.
4. SECTION C consists of 5 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

Directions (Q. No. 1-18) : The following questions are multiple-choice questions with one correct answer. Each Question carries 1 mark. There is no internal choice in this Section.

1. Osmotic pressure of a solution is 0.0821 atm at a temperature of 300 K. The Concentration in moles/lit. will be:
   (a) $0.3 \# 10^{-2}$ (b) 3
   (c) 0.33   (d) 0.666

2. Phenol does not undergo nucleophilic substitution reaction easily due to:
   (a) instability of phenoxide ion
   (b) acidic nature of phenol
   (c) partial double bond character of C—OH bond
   (d) partial double bond character of C—C bond

3. Acetic acid reacts with hydrazoic acid at 0° in the presence of conc. H_2SO_4 to give:
   (a) methyl amine   (b) methyl cyanide
   (c) ethylamine   (d) methane

4. In which of the following ions, number of unpaired electron is zero?

(a) $Fe^{++}(Z=26)$

(b) $Cr^{++}(Z=24)$

(c) $Zn^{++}(Z=30)$

(d) $Cu^{++}(Z=29)$

5. The rate constant for the reaction, $A + 2B \rightleftharpoons$ product is expressed by $R = k[A][B]$ The order of reaction will be:

(a) 6

(b) 5

(c) 2

(d) 3

**6.** Consider the following graph between molar conductivity (Λ_m) and c
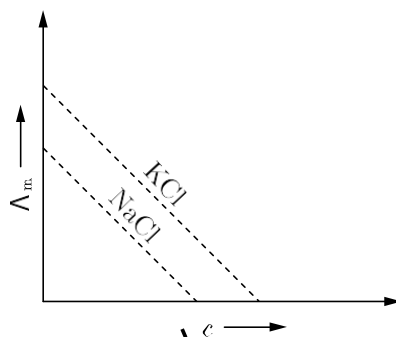
What do you infer about NaCl and KCl from the graph?

(a) NaCI and KCl are strong electrolytes

(b) Na^+ (aq.) has less conductance than K^+ (aq) due to less hydration

(c) NaCl and KCl are weak electrolytes

(d) Na^+ (aq.) has more conductance than K^+ (aq)

7. The time required for the half-completion ($t_{1/2}$) of a first order reaction is:
(a) independent of its initial concentration
(b) dependent on square root of its initial concentration
(c) dependent on its initial concentration
(d) inversely proportional to its initial concentration

8. Which one of the following is formed by Gabriel phthalimide reaction?

(a) Tertiary amine

(b) Primary aromatic amine

(c) Primary aliphatic amine

(d) Secondary amine

9. Why is $[Ni(CN)_4]^{2-}$ diamagnetic while $[NiCl_4]^{2-}$ is paramagnetic in nature:

   (a)   In $[Ni(CN)_4]^{2-}$, no unpaired electrons are present while in $[NiCl_4]^{2-}$ two unpaired electrons are present.

   (b) $[NiCl_4]^{2-}$ shows sp^2 hybridisation, hence it is paramagnetic.

   (c) $[Ni(CN_4)]^{2-}$ shows sp^3 hybridisation, hence it is diamagnetic.

   (d)   In $[NiCl_4]^{2-}$, no unpaired electrons are present while in $[Ni(CN)_4]^{2-}$ two unpaired electrons are present.

10. When nitrobenzene is reduced in neutral medium, the product is:

   (a) C_6H_5NHOH (b) C_6H_5NH2

   (c)   *p*-aminophenol   (d) azobenzene

11. Which of the following isomer has the highest melting point?

   (a)   1, 4-dichlorobenzene

   (b)   1, 2-dichlorobenzene

   (c)   1, 3-dichlorobenzene

   (d)   All isomers have same melting points

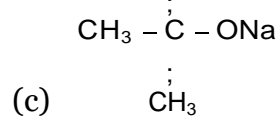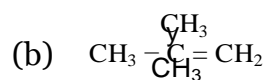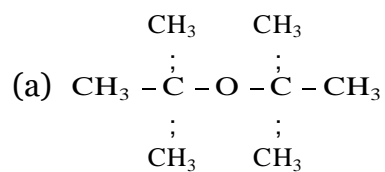**12.** Which of the following graphs represents exothermic reaction?

   (i)

(ii)

(iii)
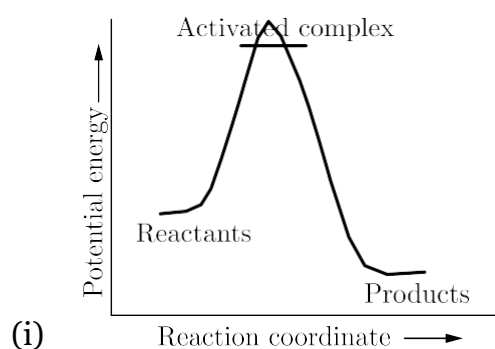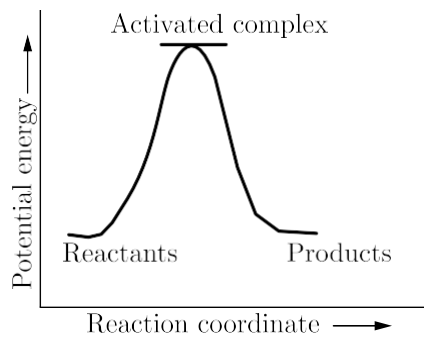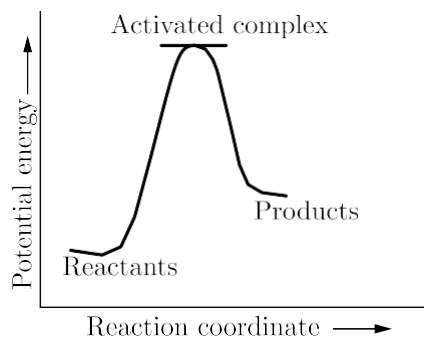
(a) (ii) only   (b) (i) only

(c) (iii) only   (d) (i) and (ii)

13. Major product formed in the following reaction is:

$$CH_3$$

$$CH_3 - C - Br + NaOCH_3 \rightleftharpoons$$

$$CH_3$$

(a) $$CH_3 - \overset{CH_3}{\underset{CH_3}{C}} - O - \overset{CH_3}{\underset{CH_3}{C}} - CH_3$$

(b) $$CH_3 - \overset{CH_3}{\underset{CH_3}{C}} = CH_2$$

(c) $$CH_3 - \overset{CH_3}{\underset{CH_3}{C}} - ONa$$

        CH_3

(d) $CH_3 - \overset{\overset{\displaystyle |}{}}{\underset{\underset{\displaystyle |}{CH_3}}{C}} - OCH_3$
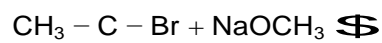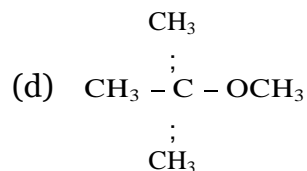
14. What would be the reactant and reagent used to obtain 2, 4-dimethyl pentan-3-ot?

    (a)   2-dimethytpropanone and methyl magnesium iodide

    (b)   2-methylpropanal and isopropyl magnesium iodide

    (c)   Propanal and propel magnesium bromide

    (d)   3-methytbutanal and 2-methyt magnesium

Directions (Q. No. 15-18): Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer:

15. **Assertion :** Separation of Zr and Hf is difficult.
Reason : Because Zr and Hf lie in the same group of the periodic table.

    (a)   Both Assertion and Reason are true but Reason not the correct explanation of Assertion.

    (b)   Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

    (c)   Assertion is false but Reason is true.

    (d)   Assertion is true but Reason is false.

16. **Assertion :** All naturally occurring a-amino acids except glycine are optically active.
Reason : Most naturally occurring amino acids have L-configuration.

    (a)   Both Assertion and Reason are true but Reason not the correct explanation of Assertion.

    (b)   Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

    (c)   Assertion is false but Reason is true.

    (d)   Assertion is true but Reason is false.

17. **Assertion :** N, N-Diethylbenzene sulphonamide is insoluble in alkali.
    Reason: Sulphonyl group attached to nitrogen atom is strong electron withdrawing group.
    (a) Both Assertion and Reason are true but Reason not the correct explanation of Assertion.

    (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

    (c) Assertion is false but Reason is true.

    (d) Assertion is true but Reason is false.

18. **Assertion :** Alcohols have higher boiling Points than ethers of comparable molecular masses
    Reason: Alcohols and ethers are isomeric in nature
    (a) Both Assertion and Reason are true but Reason not the correct explanation of Assertion.

    (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

    (c) Assertion is false but Reason is true.

    (d) Assertion is true but Reason is false.

SECTION-B

Directions (Q. No. 19-25) : This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. Define molar conductivity for the solution of an electrolyte. How does it vary with concentration?

20. Arrange each set of compounds in order of increasing boiling points:
    (i)   Bromomethane, bromoform, chloromethane, dibromomethane

    (ii) 1-Chloropropane, isopropylchloride,
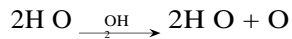   1-chlorobutane.

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    Benzylic halides show high reactivity towards S_N1 reactions. Why?

21. Glucose and sucrose are soluble in water but cyclohexane and benzene (simple six membered ring compounds) are insoluble in water. Explain.
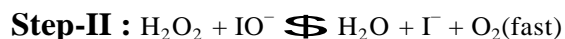
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   What type of bonding helps in stabilising the a -helix structure of proteins? Explain

22. Consider the decomposition of hydrogen peroxide in alkaline medium which is catalysed by iodide ions.

$$2H_2O_2 \xrightarrow{\text{OH}^-} 2H_2O + O_2$$

This reaction takes place in two steps as given below :

Step-I : $H_2O_2 + I^- \rightleftharpoons H_2O + IO^-$ (Show)

Step-II : $H_2O_2 + IO^- \rightleftharpoons H_2O + I^- + O_2$ (fast)

(i) Write the rate law expression and determine the order of reaction w.r.t. H_2O_2

(ii) What is the molecularity of each individual step?

23. CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN. Why?

24. Write the IUPAC name and geometrical isomer of $[Pt(NH_3)_2Cl_2]$.

25. Analyse the given graph, drawn between concentration of reactant *vs* time.
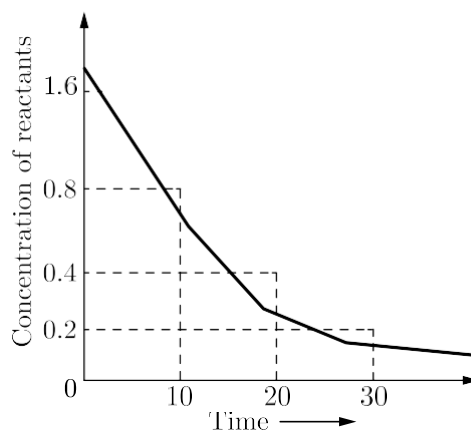
(i) Predict the order of reaction.

(ii) Theoretically, can the concentration of the reactant reduce to zero after infinite time? Explain.

SECTION-C

Directions (Q. No 26-30) : This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

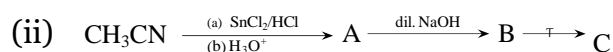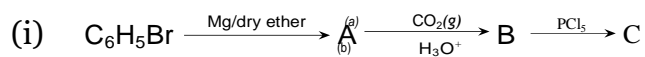26. Answer the following questions:(Any three)
    (i)   Why is the vapour pressure of an aqueous solution of glucose lower than that of water?

    (ii) What is semi-permeable membrane?

    (iii) Why do gases always tend to be less soluble in liquids as the temperature is raised?

    (iv) How does sprinkling of salt help in clearing the snow covered roads in hilly areas? Explain the phenomenon involved in the process.

27. (i) What is diazonium salt?
    (ii) Write the chemical reaction of preparation of chlorobenzene from benzene diazonium chloride.

28. Determine the structure and magnetic behaviour of $[Fe(CN)_6]^{4-}$ ion on the basis of valence bond theory.

29. Write structure of compounds *A, B* and *C* in each of the following reactions:

    (i) $C_6H_5Br \xrightarrow[\text{(b)}]{\text{(a) Mg/dry ether}} A \xrightarrow[H_3O^+]{CO_2(g)} B \xrightarrow{PCl_5} C$

    (ii) $CH_3CN \xrightarrow[\text{(b) } H_3O^+]{\text{(a) } SnCl_2/HCl} A \xrightarrow{dil. NaOH} B \xrightarrow{T} C$

30. (i) Define the following terms:
        (a) Enantiomers
        (b) Racemic mixture
    (ii) Why is chlorobenzene resistant to nucleophilic substitution reaction?

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    Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one which on photochemical chlorination yields.
    (i)   a single monochloride.
    (ii) three isomeric monochlorides.
    (iii) four isomeric monochlorides.

SECTION-D

Directions (Q. No. 31-32) : The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31. The four colligative properties of the dilute solutions help in calculating the molecular mass of the solute which is often called observed molecular mass. It may be same as the theoretical molecular mass (calculated from the molecular formula) if the solute behaves normally in solution. In case, it undergoes association or dissociation, the observed molar mass gives different results. The nature of the solute in solution is expressed in terms of van't Hoff factor (i) which may be 1 (if the solute behaves normally), less than 1 (if the solute associates) and more than 1 (if the solute dissociates). The extent of association or dissociation is represented by cc which is:

$$a = \frac{i-1}{(1/n-1)} \quad \text{or} \quad \frac{i-1}{n-1} \quad \text{(for dissociation)}$$
$$\text{(for association)}$$

Based on the above passage, answer the following questions :
(i) What is common in all the four colligative properties?
(ii) What is the expected value of van't Hoff factor for $K_4[Fe(CN)_6]$ when it completely dissociates in water?
(iii) What is the value of van't Hoff factor for a dilute solution of K_2SO_4 in water?

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(iv) In the determination of molar mass of A^+B^- using colligative property, what will be the van't Hoff factor if the solute is 40% dissociated?

32. Polysaccharides may be very large molecules. Starch, glycogen, cellulose, and chitin are examples of polysaccharides.
Starch is the stored form of sugars in plants and is made up of amylose and amylopectin (both polymers of glucose). Amylose is soluble in water and can be hydrolyzed into glucose units breaking glycosidic bonds, by the enzymes a-amylase and β-amylase. It is straight chain polymer. β-mylopectin is a branched chain polymer of several D-glucose molecules. 80% of amylopectin is present in starch. Plants are able to synthesize glucose, and the excess glucose is stored as starch in different plant parts, including roots and seeds. The starch that is consumed by animals is broken down into smaller molecules, such as glucose.
The cells can then absorb the glucose. Glycogen is the storage form of glucose in humans and other vertebrates, and is made up of monomers of glucose. It is structurally quite similar to amylopectin. Glycogen is the animal equivalent of starch. It is stored in liver and skeletal muscles.

Cellulose is one of the most abundant natural biopolymers. The cell walls of plants are mostly made of cellulose, which provides structural support to the cell. Wood and paper are mostly cellulosic in nature.

Like amylose, cellulose is a linear polymer of glucose. Cellulose is made up of glucose monomers that are linked by bonds between particular carbon atoms in the glucose molecule. Every other glucose monomer in cellulose is flipped over and packed tightly as extended long chains. This gives cellulose its rigidity and high tensile strength—which is so important to plant cells. Cellulose passing through our digestive system is called dietary fiber.

Based on the above passage, answer the following questions:

(i) Glycogen is a kind of polysaccharide and is the storage form of glucose present in humans and other vertebrates. It is the animal equivalent of starch but can you say where is it stored in animals?

(ii) What can you infer about the characteristic of amylose from the passage?

(iii) Whenever glucose levels drop in our body, a bipolymer breaks down to release glucose. Name this bipolymer and it is structurally similar to which polymer?

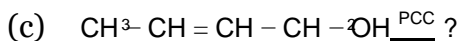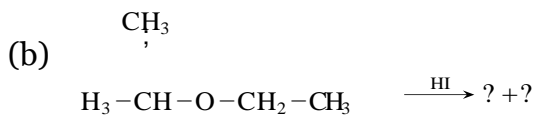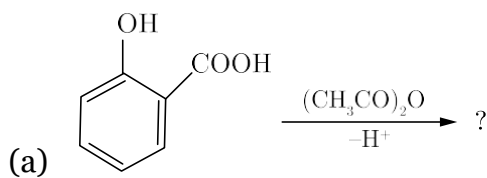**oo**

(iv) Which polymer is important to plant cells? How?

Section-E

Directions (Q. No 33-35) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. (i) Give the mechanism for the formation of ethanol from ethene.

(ii) Predict the reagent for carrying out the following conversions:

    (a) Phenol to benzoquinone.

    (b) Anisole to p-bromoanisole.

    (c) Phenol to 2, 4, 6-tribromophenol.

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(i) Write the product(s) in the following reactions:

(a)

$$\xrightarrow[-H^+]{(CH_3CO)_2O} \ ?$$

(b)

$$CH_3$$

$$H_3-CH-O-CH_2-CH_3 \xrightarrow{HI} ?+?$$

(c) $CH_3-CH=CH-CH-OH \xrightarrow{PCC} ?$

(ii) Give simple chemical tests to distinguish between the following pairs of compounds:

    (a) Ethanol and Phenol.

    (b) Propanol and 2-methylpropan-2-ol.

34. (i)   For the reaction:
$$2AgCl(s) + H_2(g) \text{ (1 atm)} \rightleftharpoons 2Ag(s) + 2H^+$$

$\wedge 0.1M\text{h} + 2Cl^- \wedge 0.1M\text{h}, \tau G° = -43600 \text{ J at } 25°C.$

Calculate the emf of the cell. $\log 10^{-n} = -n$

(ii) Define fuel cell and write its two advantages.

OR

(i)   Out of the following pairs, predict with reason which pair will allow greater conduction of electricity:
(a)   Silver wire at 30°C or silver wire at 60°C.
(b)   0.1 M CH_3COOH solution or 1 M CH_3COOH solution.
(c)   KG solution at 20°C or KCl solution at 50°C.

(ii) Give two points of differences between electrochemical and electrolytic cells.

35. (i)   Write down complete equation for the following reactions:
(a)   Oxidation of Fee' by $0.2O_3-$ in acidic medium.
(b)   Oxidation of 5_2O_3- by $KMnO_4$ (aq) neutral.
(c)   Decomposition of oxalate in the presence of $KMnO_4$ in acidic medium.

(ii) Compare the chemistry of actinoids with that of the lanthanoids with special reference to :
(a)   Electronic configuration.
(b)   Atomic and ionic sizes.
(c)   Oxidation state.
(d)   Chemical reactivity.

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