Model Question Papers for Practice

Based on the Latest Guidelines Issued by CBSE

MODEL QUESTION PAPER-1

Time Allowed : 3 Hours   **Maximum Marks : 70**

General Instructions :
1. *All questions are compulsory.*
2. *Marks for each question are indicated against it.*
3. *Question number **1** to **5** are Very Short Answer Questions of **1** mark each. Answer them in one word or about a sentence each.*
4. *Question number **6** to **10** are Short Answer Questions of **2** marks each. Answer them in **30** words each.*
5. *Question number **11** to **22** are Short Answer Questions of **3** marks each. Answer them in **40** words each.*
6. *Question number **23** is value based question and carries **4** marks.*
7. *Question number **24** to **26** are Long Answer Questions of **5** marks each. Answer them in **70** words.*
8. *Use log tables if necessary. Calculators are not permitted.*

1. What product is obtained by Hoffmann degradation of *m*-bromobenzamide ?   1
2. Write the formula of the complex potassium trioxalatechromate(III).   1
3. Give one reaction of D-glucose which cannot be explained by its open chain structure.   1
4. Why is *ortho* nitrophenol more acidic than *ortho*-methoxy phenol ?   1
5. Give the IUPAC name of   1

$$CH_3 — CH_2 — CH = CH — \overset{\displaystyle O}{\overset{\|}{C}} —H$$
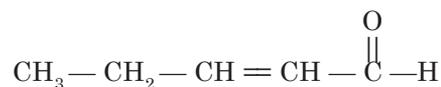
6. What are proteins ? What are ultimate products of digestion of proteins ?   2
7. Vapour pressure of water at 293 K is 17.535 mm Hg. Calculate the vapour pressure of water at 293 K when 25 g of glucose is dissolved in 458 g of water.   2
8. List main differences between order and molecularity of a reaction.   2
9. Define and explain Hardy Schulze law with examples.   2
10. Explain, the nucleophilic reaction of alkyl halide is S_N1 for $(CH_3)_3$ C—Cl and S_N2 for CH_3CH_2Br.   2
11. (*a*) How will you distinguish between step growth and chain growth polymerisation ? How is bakelite synthesised ?
    (*b*) Give monomers of teflon.   3
12. How will you differentiate between DNA and RNA ? Discuss the denaturation of proteins.   3
13. Describe the reactions occurring in blast furnace during the extraction of iron from haematite ore.   3
14. Give one chemical test to distinguish between :
    (*a*) Acetophenone and benzophenone
    (*b*) Formic acid and acetic acid
    (*c*) Acetaldehyde and acetone   3

15. (*a*) Why do we need to classify drugs in different ways ?

(*b*) Explain the following with one example each :

(*i*) Antihistamines   (*ii*) Antibiotics   3

16. Explain the following :

(*a*) Hydroboration reaction

(*b*) Libermann nitroso reaction

(*c*) Reimer-Tiemann reaction.   3

17. (*a*) How is the stability of the co-ordination complexes compared ?

(*b*) What are homogeneous catalysts ? Give one example.

(*c*) Discuss bonding in $[Ni(CO)_4]$.   3

18. Answer the following :

(*i*) Why do noble gases have very low boiling points ?

(*ii*) PCl_5 is known but PI_5 is not known.

(*iii*) H_3PO_3 is a diprotic acid.   3

19. (*a*) Complete the following reactions :

(*i*) $XeF_6 + H_2O \longrightarrow$

(*ii*) $HgCl_2 + PH_3 \longrightarrow$

(*b*) Draw the structure of BrF_3.   3

20. Explain elevation in boiling point of a solution with the help of vapour pressure temperature diagram. How will you determine the molecular mass of solute from it ?   3

21. A certain first order reaction is 50% complete in 20 minutes at 300 K and the same reaction is 50% complete in 5 minutes at 350 K. Calculate the activation energy of the reaction.   3

22. How will you convert the following :

(*i*) acetophenone to 2-phenylbutan-2-ol

(*ii*) acetaldehyde to crotonaldehyde

(*iii*) propene to acetone.   3

23. Raman went to a hospital with his father to see his uncle who was admitted there because of some health problems. The doctor asked Raman to bring a particular injection to be given to his uncle. When Raman brought the injection, the doctor asked him to get the injection changed from the chemist. Raman insisted that it was the same injection as prescribed by him and its expiry date is also next year. But the doctor explained Raman that the injection has not been expired but it was not of compatible concentration as prescribed by him. Raman felt satisfied and got the injection changed.

(*a*) (*i*) What was the reason for asking Raman to get the injection of compatible concentration ?

(*ii*) What human values are associated with the doctor's action ?

(*b*) Name the vitamins whose deficiency causes

(*i*) rickets   (*ii*) scurvy   4

24. (*a*) What is a fuel cell ? Give one example.

(*b*) Calculate the standard free energy change and maximum work available for a reaction occurring in the cell : $Zn\,|\,Zn^{2+}$ (1M) (*aq*) $||\ Cu^{2+}$ (1M) $|\ Cu$ (*s*).

Given $E°_{Zn^{2+}/Zn} = -0.76$ V, $E°_{Cu^{2+}/Cu} = +0.34$V, F = 96500 C mol^{-1}.

Or

(*a*) Define conductivity and molar conductivity. How are these related ?

(*b*) What is the electrochemical theory of rusting ?

(*c*) Give the reactions occurring during charging and discharging of lead storage cell.   5

25. (*a*) Explain the following about transition metals :

    (*i*) There is a very little change in the atomic radii along a transition series.

    (*ii*) They have very high enthalpy of atomisation.

    (*iii*) They have tendency to form alloys.

    (*iv*) They have more variable oxidation states than the lanthanides.

  (*b*) Write chemical reactions for the preparation of $KMnO_4$ from pyrolusite.

<div align="center">*Or*</div>

(*a*) What is lanthanide contraction ? Give its cause and consequences.

(*b*) Explain:

    (*i*) The highest oxidation state in transition metals is exhibited by oxoanions of metals.

    (*ii*) Cu^+ is not stable in aqueous solution.

  (*c*) Compare the chemistry of lanthanoids and actinoids with reference to tendency to form complexes.   5

26. (*a*) Give the chemistry of Tollen's reagent test for aldehydes.

  (*b*) What is diazotisation reaction ?

  (*c*) Give a test to distinguish between ethyl amine and diethyl amine.

  (*d*) Why are acid chlorides maximum reactive among acid derivatives while acid amides are least reactive in nature ?

  (*e*) How will you show that acid amides are amphoteric in nature ?

<div align="center">*Or*</div>

(*a*) RX gives different products with AgCN and KCN, why ?

(*b*) Distinguish between alkyl cyanides and isocyanides.

(*c*) How will you convert aniline into *p*-amino azobenzene ?   5

MODEL QUESTION PAPER-2

Time Allowed : 3 Hours   **Maximum Marks : 70**

General Instructions :
Same as given in model question paper-1

1. How does the electrical resistivity of semiconductors vary with temperature ?   1

2. Arrange the following compounds in an increasing order of their solubility in water.

    $C_2H_5NH_2$, $C_6H_5NH_2$, $(C_2H_5)_2NH$ 1

3. Name the major product formed in the reaction :

       1

4. Write the structure of   1

    1-Bromo-4-sec-butyl-2-methyl benzene

5. In the following pair of halogen compounds, which would undergo S_{N^2} reaction faster ?   1
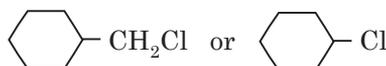
6. Λ_m° for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate Λ° HAc.   2

7. A first order reaction has a rate constant 1.15×10^{-3} s^{-1}. How long will 5 g of this reactant take to reduce to 3 g ?   2

8. Differentiate between coagulation and peptization.   2

9. (*i*) The reaction :

    $$Cr_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Cr \qquad \Delta G^\circ = -421 \text{ kJ}$$
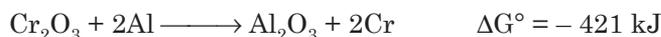
    is thermodynamically feasible. Why do it not take place at room temperature ?

    (*ii*) State the role of silica in the metallurgy of copper.   2

10. *Ortho* and *para* nitrophenols are more acidic than phenol. Draw the resonance structure of the corresponding phenoxide ion.   2

11. (*a*) How would you explain the increasing oxidising power in the series :

    $$VO_2^+ \ < \ Cr_2O_7^{2-} \ < \ MnO_4^- \ ?$$
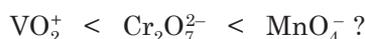
    (*b*) Calculate the magnetic moment of a divalent ion in aqueous solution if its atomic number is 25.

    (*c*) Of the d^4 species Cr (II) is strongly reducing, but Mn (III) is strongly oxidizing. Explain.   3

12. (*a*) Write IUPAC name of $K_3[Al(C_2O_4)_3]$.

    (*b*) $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless. Explain.   3

13. The first order rate constant for the decomposition of ethyl iodide by the reaction :

    $$C_2H_5I(g) \longrightarrow C_2H_4(g) + HI \ (g)$$
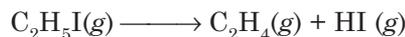
    at 600 K is 1.60×10^{-5} s^{-1}. Its activation energy is 209 kJ mol^{-1}. Calculate the rate constant at 700 K. 3

14. An organic compound (A) of molecular formula $C_8H_{10}O_2$ was hydrolysed with dil. H_2SO_4 to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.   3

15. Explain the following terms with suitable examples

    (*i*) Schottky defect

    (*ii*) Ferromagnetism

    (*iii*) Interstitials   3

16. (*a*) Write the names and structures of the monomers of the following polymers :

    (*i*) Buna-N

    (*ii*) Neoprene

  (*b*) Discuss the main purpose of vulcanisation of rubber.   3

17. A voltaic cell is set up at 25°C with the following half cells :

Al|Al^{3+} (0.0010 M) and Ni|Ni^{2+} (0.50 M)

Write the equation for the cell reaction that occurs when the cell generates an electric current and determine the cell potential.   3

18. Define each of the following term :

  (*i*) Micelles

  (*ii*) Tyndall effect

  (*iii*) Shape selective catalysts   3

Or

Explain how the phenomenon of adsorption find applications in each of the following processes :

  (*i*) Heterogeneous catalysis

  (*ii*) Production of vacuum

  (*iii*) Froth floatation process   3

19. How would you account for the following :

  (*i*) Cr^{2+} is stronger reducing agent than Fe^{2+}.

  (*ii*) Cu^{+} is unstable in aqueous solution.

  (*iii*) although Co^{2+} ion appears to be stable it is easily oxidised to Co^{3+} in the presence of a strong ligand.   3

20. Write short notes on

  (*i*) Carbylamine reaction

  (*ii*) Hoffmann bromamide reaction

  (*iii*) Coupling reaction   3

21. Explain the following

  (*i*) Denaturation of proteins

  (*ii*) Mutation of DNA

  (*iii*) Peptide bond.   3

22. (*a*) How will you bring about the following conversions ?

    (*i*) Methyl alcohol into ethyl alcohol.

    (*ii*) Ethanol to acetaldehyde

  (*b*) Give one test to distinguish between 1°, 2° and 3° alcohols ?   3

23. Savita's gardener was facing some health problems for a long time and has been trying medicines of his own. One day, he went to a chemist shop and explained his problem to the person there. The chemist gave him four doses of some medicines. When he came home, he showed those medicines to Savita. Savita was a science student. She asked her gardener not to take a combination of different medicines. She took him to a doctor and narrated his problem. The doctor told Savita that she has brought him in time otherwise he would have suffered a serious problem. He gave him proper medicines and the gardener recovered in 3–4 days.

  (*a*) Why should medicines not be taken without consulting the doctor ?

  (*b*) What values do you attach to Savita's behaviour ?

  (*c*) What are antibiotics ? Give one example.   4

24. (*a*) The boiling point of aldehydes and ketones are lower than the corresponding alcohols and carboxylic acids. Why ?

(*b*) Justify : chloroacetic acid is stronger acid than acetic acid.

(*c*) Account for : Haloalkanes are most reactive than haloarenes.

Or

(*a*) Aldehydes are more reactive than ketones towards nucleophilic addition reactions, why ?

(*b*) How will you convert acetone into :

(*i*) Chloretone   (*ii*) Phorone   (*iii*) Mesitylene.

(*c*) Give the chemistry of Fehling's solution test for aldehydes.   5

25. (*a*) Write conditions to maximise the yield of H_2SO_4 by Contact process.

(*b*) Give two examples to show anomalous behaviour of fluorine.

(*c*) Write hydrolysis reactions of XeF_4 and XeF_6.

(*d*) Why is helium used in diving apparatus ?

Or

(*a*) Why are halogens strong oxidising agents ?

(*b*) Give the disproportionation reaction of H_3PO_3.

(c) How are XeO_3 and $XeOF_4$ prepared ?

(*d*) Why are halogens coloured ?   5

26. (*a*) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property ? Explain.

(*b*) Calculate the boiling point of a solution prepared by adding 15.0 g of NaCl to 250.0 g of water. (K_b for water = 0.512 K kg mol^{-1}, molar mass of NaCl = 58.44 g mol^{-1})

Or

(*a*) State the following :

(*i*) Henry's law about partial pressure of a gas in a mixture.

(*ii*) Raoult's law in its general form in reference to solutions.

(*b*) A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25° C. Assuming the gene fragment is non-electrolyte, determine its molar mass.   5

MODEL QUESTION PAPER-3

Time Allowed : 3 Hours   **Maximum Marks : 70**

General Instructions :

Same as given in model question paper-1

1. What type of defect is shown by AgBr ?   1

2. Write IUPAC name of

$$CH_3 - \overset{\underset{\displaystyle |}{(p-ClC_6H_4)_2}}{\underset{}{C}} - \overset{\underset{\displaystyle Br}{|}}{CH} - CH_3$$

   1
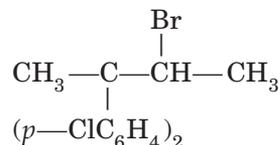
3. How does the electrical conductivity of metallic conductors vary with temperature ?   1

4. What happens, when persistent dialysis of a colloidal solution is carried out ?   1

5. Why is sulphuric acid not used during the reaction of alcohols with KI ?   1

6. Why does Mn(II) ion show maximum magnetic character amongst the bivalent ions of first transition series ?   2

7. Write two differences between globular protein and fibrous protein.   2

8. Describe antiseptics and antibiotics with suitable examples.   2

9. (*a*) Why iodine is more soluble in an aqueous solution of KI than in pure water ?

   (*b*) Why Fe^{3+} is more stable than Fe^{2+} ?   2

10. Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method. Give reason.

Or

Give mechanism of the reaction of HI with methoxymethane.   2

11. The rate of a particular reaction quadruples, when the temperature changes from 293 K to 313 K. Calculate the energy of activation for the reaction.   3

12. Give a brief account of the following reactions :

   (*a*) Claisen condensation

   (*b*)   Hoffman bromamide reaction

   (*c*) Friedel-Craft's acylation.   3

13. (*a*) An aromatic compound on treatment with aqueous ammonia and heating form compound B which on heating with Br_2 and KOH forms a compound C of molecular formula C_6H_7N. Write the structures and IUPAC names of A, B and C.

   (*b*) Why have primary amines higher boiling point than tertiary amines?   3

14. (*a*) How can you separate alumina from bauxite ore associated with silica ? Give equations.

   (*b*) Describe a method for reducing nickel.   3

15. Copper crystallizes in a *fcc* lattice with edge length 3.61×10^{-8} cm. Show that the calculated density is in agreement with its measured value of 8.29 g cm^{-3}.

Or

Explain :

   (*a*) Ge doped with ln semiconductor

   (*b*) Ferrimagnetism

   (*c*) Antiferromagnetism.   3

16. (*a*) Explain the reactions with one example in each case :

      (*i*) HVZ reaction   (*ii*) Reimer-Tiemann reaction

      (*iii*) Aldol condensation   3

17. Write the chemical equations, when :

    (*i*) Phenetole reacts with HI at 375 K.

    (*ii*) Acetone reacts with HCN.

    (*iii*) Acetic acid reacts with Cl_2 in the presence of phosphorus.   3

18. Explain the following terms :

    (*i*) Tyndall effect

    (*ii*) Dialysis

    (*iii*) Coagulation   3

19. (*i*) Indicate the steps involved in the preparation of $K_2Cr_2O_7$ from chromite ore

    (*ii*) Complete the reactions :

      (*a*) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$

   (*b*) $KMnO_4 \xrightarrow{\text{heat}}$ 3

20. Explain the following :

    (*i*) Ce(III) can be easily oxidised to Ce(IV)

    (*ii*) Europium (II) is more stable than cerium (II).

    (*iii*) Cr^{2+} is reducing while Mn^{3+} is oxidising though both have d^4 configuration.   3

21. (*a*) What is crystal field splitting energy ? How does the magnitude of Δ_0 decide the actual configuration of *d*-orbitals in a co-ordination entity ?

    (*b*) Explain the bonding in $[Ni(CO)_4]$.   3

22. Write the structures of monomers of

    (*i*) neoprene

    (*ii*) terylene

    (*iii*) bakelite   3

23. Many food products are available in the market in tin cans. Rakesh went to the market to buy tinned cans of a food product. The shopkeeper gave him a can which had scratches, though it had been recently packed. Rakesh did not buy that can.

    (*a*) How do you agree with Rakesh's decision ?

    (*b*) Rusting of iron is quicker in saline water than in ordinary water. Explain.

    (*c*) Explain one method for protection of corrosion.   4

24. (*a*) Define molality and molarity. How do these differ ?

    (*b*) The vapour pressure of pure water at 30°C is 31.80 mm of Hg. How many grams of urea (molar mass 60) should be dissolved in 100 g of water to lower the vapour pressure by 0.25 mm of Hg ?

<div align="center">*Or*</div>

    (*a*) Why do we get abnormal molar masses of solutes during the measurement of colligative properties ?

    (*b*) Calculate the freezing point of an aqueous solution containing 10.5 g of $MgBr_2$ in 200 g of water. (K_f = 1.86 Km^{-1})   5

25. (*a*) Ethanal is more reactive towards nucleophilic addition reactions than propanone. Why?

    (*b*) Justify : Trichloroacetic acid is stronger acid than dichloroacetic acid.

    (*c*) Account for : Acid anhydrides have higher boiling points than the corresponding carboxylic acids.

Or

(*a*) Describe the structure and acidic nature of phenol.

(*b*) How will you convert phenol into

   (*i*) aspirin   (*ii*) phenolphthalein

   (*iii*) picric acid ?   5

26. (*a*) Write balanced equations for the manufacture of nitric acid by the oxidation of ammonia.

(*b*) Write balanced equation for the reactions :

   (*i*) $XeF_6 + H_2O \longrightarrow$ (*ii*) $IO_3^- + I^- + H^+ \longrightarrow$

   (*iii*) $SbCl_3 + H_2O \longrightarrow$

(*c*) Draw the structure of H_3PO_4.

Or

(*a*) Name two oxides of phosphorus. Draw their structures.

(*b*) OF_6 is not known whereas SF_6 is known. Explain.

(*c*) Write equation to show that conc. H_2SO_4 can be an oxidising agent.

(*d*) Draw the structure of IF_5.   5

MODEL QUESTION PAPER-4

Time Allowed : 3 Hours   **Maximum Marks : 70**

General Instructions :

Same as given in model question paper-1

1. What is the number of atoms in a face centred cubic unit cell of an elementary crystal ?   1

2. Why does NO dimerise?   1

3. Write the structure of :

   4-Methylpent-3-en-2-one   1

4. Arrange the following in the increasing order of their basic strength in aqueous solution :   1

   $$CH_3NH_2, (CH_3)_2NH, (CH_3)_3N, C_6H_5NH_2$$

5. Why does physisorption decrease with the increase in temperature ?   1

6. Calculate the molality of KCl solution in water given that depression in freezing point is 2 K. [K_f for water = 1·86 K kg mol⁻¹]   2

7. How will you bring about the following conversions :

   (*i*) Ethanal to 3-hydroxybutanal

   (*ii*) Ethanol to methanol   2

8. How are antiseptics different from disinfectants ? Give the name of a substance which can act both as antiseptic and disinfectant.   2

9. The decomposition of NH_3 on platinum surface is zero order reaction. What are the rates of production of N_2 and H_2 if $k = 2.5 \times 10^{-4}$ mol L⁻¹s⁻¹   2

10. A galvanic cell consists of metallic lead plate immersed in 0.02 M lead nitrate solution and a zinc plate immersed in 0.1 M zinc nitrate solution. Calculate e.m.f. of the cell at 25°C. Write the chemical equations for the electrode reactions. Given that :   2

    $$E_{Zn^{2+}|Zn} = -0.76V; \; E_{Pb^{2+}|Pb} = -0.13 \text{ V}.$$

11. Explain the following terms :

    (*i*) Aerosol

    (*ii*) Zeolites

    (*iii*) peptisation   3

12. (*a*) How many geometrical isomers are possible for the following coordination compounds:

    (*i*) $[Co(NH_3)_3Cl_3]$

    (*ii*) $[Cr(C_2O_4)_3]^{3-}$

    (*b*) Discuss the nature of bonding in FeF_6^{3-} ion.   3

13. Explain the following with examples :

    (*i*) Non-ionic detergents

    (*ii*) Antifertility drugs

    (*iii*) Antacids   3

14. (*a*) Give chemical tests to distinguish between the following compounds (one test each) :

    (*i*) Methylamine and dimethylamine

    (*ii*) Aniline and ethylamine

    (*b*) How will you convert aniline to sulphanilic acid ?   3

15. A compound A with molecular formula $C_5H_{10}O$ gave positive 2, 4-DNP test but a negative Tollen's test. It was oxidised to carboxylic acid B with molecular formula $C_3H_6O_2$ when treated with alkaline $KMnO_4$

under vigorous conditions. Sodium salt of B gave a hydrocarbon C on Kolbe's electrolytic reaction. Identify A, B and C and write the chemical equations. 3

16. What happens when D-glucose reacts with

  (*i*) hydroxylamine

  (*ii*) Br_2 water.

  (*iii*) HI 3

17. (*a*) Define the following :

  (*i*) Order of reaction

  (*ii*) Activation energy

  (*b*) A first order reaction takes 40 min. for 30% decomposition. Calculate its half life period.

18. (*i*) Write the chemistry of recharging of lead storage battery highlighting all the materials that are involved during recharging.

  (*ii*) How much electricity is required in coulombs for the oxidation of 3 mol of H_2O to O_2? 3

19. Explain the following :

  (*i*) Nitrogen exists as diatomic molecule while phosphorus as P_4.

  (*ii*) Fluorine forms only one oxo acid.

  (*iii*) PCl_5 acts as an oxidising as well as a reducing agent. 3

20. Complete the following reactions :

  (*i*) $XeF_2 + H_2O \longrightarrow$

  (*ii*) $Cl_2 + NaOH$ (hot & conc.) $\longrightarrow$

  (*iii*) $I^- + O_3 + H_2O \longrightarrow$ 3

21. Explain the role of

  (*i*) graphite rod in the electrometallurgy of Al.

  (*ii*) silica in the metallurgy of Cu.

  (*iii*) depressant in froth floatation process. 3

22. How will you convert :

  (*i*) Benzene to diphenyl

  (*ii*) Ethanol to but-1-yne

  (*iii*) But-1-ene to but-2-ene3

23. The polymers are finding extensive use in our daily life. Natural polymers are biodegradable but most of the synthetic polymers are non-biodegradable. This is causing a serious environmental problem for waste disposal. With the increasing use of polymers, the problem of disposal of waste is causing alarming curse.

  Answer the following questions :

  (*i*) In view of the waste disposal problem, should the manufacture and use of synthetic polymers be banned?

  (*ii*) Name two natural and two synthetic polymers which are used as fibres.

  (*iii*) Name one synthetic biodegradable polymer. 4

24. (*a*) Define molality and molarity of solution with suitable examples. Why is molality preferred in expressing the concentration of a solution?

  (*b*) Osmotic pressure of 100 cm^3 of a solution containing 3.002 g of an unidentified solute is 2.55 atmospheres at 298 K. What is the molecular mass of the solute ($R = 0.821$ L atm K^{-1} mol^{-1}) ? 5

Or

    (*a*) What is Van't Hoff equation for a dilute solution ? How does it help to calculate molecular mass of a non-volatile solute ?

    (*b*) How is degree of association (α) related to Van't Hoff factor (*i*) ?

    (*c*) What is an antifreeze ? Give one example.   5

25. (*a*) State tests to distinguish between the following pairs of compounds :

      (*i*) Propanal and propanone

      (*ii*) Phenol and benzoic acid

    (*b*) How will you bring about the following conversions :

      (*i*) Propanone to propene

      (*ii*) Benzaldehyde to benzophenone

      (*iii*) Ethanol to 3-hydroxybutanal   5

<div align="center">Or</div>

    (*a*) Complete the following reaction statements by giving the missing starting material, reagent or product as required :

      (*i*) .... $\xrightarrow[\text{Zn} - \text{H}_2\text{O}]{\text{O}_3}$ 2 $\langle\rangle$=O

      (*ii*) $\langle\rangle$=CH$_2$ ....→ $\langle\rangle$—CHO

      (*iii*) [benzene ring]—CH$_2$CH$_3$ $\xrightarrow[\text{KOH,heat}]{\text{KMnO}_4}$ ....
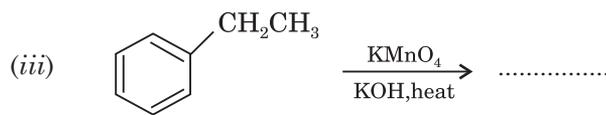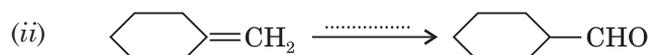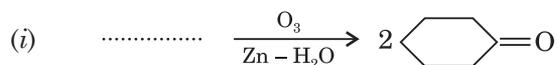
    (*b*) Describe the following reactions :

      (*i*) Cannizaro's reaction

      (*ii*) Cross aldol condensation   5

26. (*a*) Why do transition metals show variable oxidation states and form complex compounds ?

    (*b*) Discuss the preparation of potassium dichromate from chromite ore.

    (*c*) Discuss the chemistry of chromyl chloride test.

    (*d*) Write the structures of the chromate and dichromate ions.   5

<div align="center">*Or*</div>

    (*a*) Give the general outer electronic configuration of lanthanides. What is the common oxidation state of lanthanides ?

    (*b*) Give two oxidising reactions of potassium permanganate.

    (*c*) Give the structure of permanganate ion.   5

MODEL QUESTION PAPER-5

Time Allowed : 3 Hours   **Maximum Marks : 70**

General Instructions :

Same as given in model question paper-1

1. Write the products obtained when benzyl phenyl ether is heated with HI.   1
2. Give the IUPAC name of   1
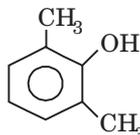
3. Give the equations of reaction for the preparation of phenol from cumene.   1
4. What is the product formed when chloroform is oxidised in the presence of air?   1
5. Give an example of a zero order reaction.   1
6. (*a*) Red phosphorus is less reactive than white phosphorus. Why ?

    (*b*) How can we prepare pure PH_3 ?   2
7. At 300 K, 100 cm^3 of a solution containing 3.00 gm of a solute 'P' exhibits an osmotic pressure of 2.50×10^{-3} atmospheres. What will be molecular mass of 'P' ?   2
8. Prove that for a first order reaction :

$$t_{75\%} = 2 \times t_{50\%}$$

    Or

    Time taken for the completion of any fraction of a first order reaction is independent of initial concentration. Justify.   2
9. Why are vitamins essential for us ? Give roles of vitamins A and C in our body.   2
10. What are the amino acids ? Describe their Zwitter ion structure. What is isoelectronic point of amino acids ?   2
11. (*a*) Why is the reduction of a metal oxide easier if the metal formed is in liquid state at the temperature of reduction ?

    (*b*) Explain zone-refining method.   3
12. (*a*) Why is dioxygen a gas but sulphur is a solid ?

    (*b*) Explain the structures of

        (*i*) $XeOF_2$ (*ii*) ClF_3 3
13. Explain the following with one example :

    (*a*) Kolbe's reaction   (*b*) Friedel Craft's acetylation

    (*c*) Wolf Kishner reduction   3
14. What are (*i*) Brownian movement

    (*ii*) Tyndall effect

    (*iii*) Gold number ?   3
15. (*a*) What are addition and condensation polymers ?

    (*b*) What is copolymerisation ?   3
16. (*a*) State the hybridization and magnetic behaviour of $[Cr(CO)_6]$.

    (*b*) What are the various factors affecting crystal field splitting energy ?

    (*c*) Give one example of linkage isomerism.   3

17. Explain the following terms :

   (*i*) Order of a reaction

   (*ii*) Molecularity of a reaction

   (*iii*) Activation energy of a reaction   3

18. An element occurs in *bcc* structure and its density is 7.2 g cm⁻³. Calculate the atomic mass of the element if edge length of its unit cell is 288 pm.   3

19. Define the following :

   (*i*) Peptization

   (*ii*) Reversible sol

   (*iii*) Shape selective catalysts   3

20. (*a*) Alkyl halides give cyanides with KCN but isocyanides with AgCN as the products. Explain.

   (*b*) Complete the reaction :

     (*i*) $\underset{\text{(with Cl)}}{\bigcirc}$ + NH$_3$ + Cu$_2$O $\xrightarrow[\text{60 atm}]{\text{475 K}}$

     (*ii*) $(CH_3)_2CH\overset{\overset{\displaystyle CH}{|}}{Br}\ CH_2CH_3 \xrightarrow[\text{Heat}]{C_2H_5ONa}$ 3
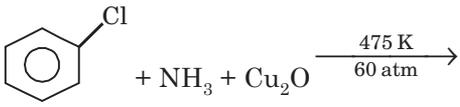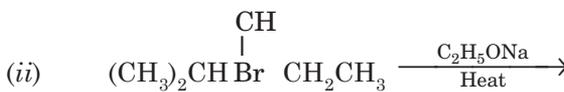
21. (*a*) How will you convert aniline into

     (*i*) Sulphanilic acid

     (*ii*) *p*-bromoaniline

   (*b*) Out of NH$_3$, aminobenzene and EtNH$_2$ which has higher *p*K$_b$ value and why ?   3

22. Calculate the boiling point of a solution containing 15 g of NaCl in 250 g of water. K$_b$ = 0.512 Km⁻¹.   3

23. Sangeeta's grandmother is a diabetic patient. Whenever she takes tea or milk without sugar, she says that it is not tasty and she cannot take these. She is very fond of sweets but her family always avoids giving her these. For this, she remains irritated. Sangeeta being a science student ask her grandmother to use artificial sweetener of low calories. She tried to add these in her tea and milk and started enjoying these.

   (*i*) What artificial sweetener Sangeeta can suggest to her grandmother ?

   (*ii*) Why do these not cause harm to diabetic patients ?

   (*iii*) What values do you observe from the above passage ?

   (*iv*) Name one substance which can act both as

     (*a*) analgesic and antipyretic

     (*b*) antiseptic and disinfectant   4

24. (*a*) Conductivity of 0.00241 M acetic acid is 7.896 × 10⁻⁵ S cm⁻¹. Calculate its molar conductivity. If ∧° for acetic acid is 390.5 S cm² mol⁻¹, calculate its dissociation constant.

   (*b*) What are fuel cells ? State advantages of fuel cells over ordinary cells.

<div align="center">*Or*</div>

   (*a*) State Kohlrausch law and give its one application.

   (*b*) The cell in which the following reaction occurs :

     2Fe³⁺ (*aq*) + 2I⁻ (*aq*) ⟶ 2Fe²⁺ (*aq*) + I$_2$ (*s*)

     has E°$_{cell}$ = 0.236 V. Calculate its Gibbs energy and the equilibrium constant of the cell.   5

25. (*a*) Out of KMnO$_4$ and K$_2$Cr$_2$O$_7$ which is stronger oxidising agent and why ?

   (*b*) Complete the following reactions :

     (*i*) I⁻ + S$_2$O$_8$²⁻ ⟶   (*ii*) Fe²⁺ + Cr$_2$O$_7$²⁻ + H⁺ ⟶

   (*c*) Define lanthanide contraction.

Or

(*a*) Explain the following :

   (*i*) The enthalpies of atomization of the transition metals are high.

  (*ii*) Transition metal compounds are coloured.

 (*iii*) Transition metals form alloys.

(*b*) How does $KMnO_4$ react with :

   (*i*) H_2S (*ii*) KI   5

26. (*a*) Why is bond angle in ethers greater than bond angle in water?

(*b*) Carboxylic acids contain both $-\overset{\overset{\displaystyle O}{\|}}{C}-$ and —OH groups, but give negative tests for these groups. Why ?

(*c*) What is the difference between aldol condensation and crossed aldol condensation ?

(*d*) What happens, when phenol is treated with carbon tetrachloride in the presence of an alkali ?

Or

(*a*) Why trichloroethanoic acid has lower pK_a value than ethanoic acid ?

(*b*) The order of reactivity of halogen acids with ethers is HI > HBr > HCl. Why ?

(*c*) How will you distinguish between propanone-2 and propanone-3 ?

(*d*) What is the importance of Fehling's solution and Fenton's reagent in chemistry ?   5