



Class
12
CBSE

Chapterwise Previous Years' Questions

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CHEMISTRY



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- Q.1** An element has a body-centred cubic (*bcc*) structure with a cell edge of 288 pm. The density of the element is 7.2 g/cm^3 . How many atoms are present in 208g of the element ? [CBSE Delhi 2006]
- Q.2** Why is Frenkel defect found in AgCl ? [CBSE 2008]
- Q.3** What is the effect of Schottky defect on the density of crystal? [CBSE (Delhi) 2008]
- Q.4** Why is Frenkel defect not found in the halides of alkali metals ? [CBSE (Delhi) 2008]
- Q.5** What is forbidden zone in Band theory ? Compare its size in conductors, semiconductors and insulators.
Or
Define the 'Forbidden zone' of an insulator.
Or
What is meant by 'forbidden zone' in reference to band theory of solids ? [CBSE (AI) 2008]
- Q.6** Name an element with which silicon may be doped to give a p-type semiconductor. [CBSE(AI) 2008]
- Q.7** What are anti-ferromagnetic substances ? Give one example. [CBSE 2008]
- Q.8** How many atoms are present per unit cell of a simple cubic arrangement? [CBSE 2010]
- Q.9** Silver crystallises in *fcc* lattice. If the edge length of the cell is $4.077 \times 10^{-8} \text{ cm}$ and density is 10.5 g cm^{-3} , calculate the atomic mass of silver. [CBSE (AI) 2010, (F) 2010]
- Q.10** Write a feature which will distinguish a metallic solid from ionic solid. [CBSE Delhi 2010(F) 2010]
- Q.11** What type of interaction hold the molecules together in polar molecular solid ? [CBSE 2010]
- Q.12** The density of copper metal is 8.95 g cm^{-3} . If the radius of copper atom is 127.8 pm, is the copper unit cell a simple cubic, a body-centred cubic or a face-centred cubic structure ?
(Give : At. mass of $\text{Cu} = 63.54 \text{ g mol}^{-1}$ and $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$) [CBSE Delhi 2010; (AI) 2010]
- Q.13** What is anisotropy ?
Or
Crystalline solids are anisotropic in nature.' What does this statement mean ? [CBSE Delhi (F) 2011]
- Q.14** What type of interaction holds the molecules together in a non polar molecular solid ? [CBSE (AI) 2011]
- Q.15** Define unit cell. [CBSE 2011]
- Q.16** What is meant by intrinsic semiconductor ? [CBSE (F) 2011]
- Q.17** Tungsten crystallises in body centred cubic unit cell. If the edge of the unit cell is 316.5 pm, what is the radius of tungsten atom ? [CBSE Delhi 2012]
- Q.18** Which point defect in the crystal system increases the density of the solid ? [CBSE 2009, 2011, 2012]
- Q.19** What is meant by 'doping' in a semiconductor ? [CBSE Delhi 2012]
- Q.20** Aluminium crystallizes in an *fcc* structure. Atomic radius of the metal is 125 pm. What is the length of the side of the unit cell of the metal ? [CBSE 2013]
- Q.21** What change occur when AgCl is doped with CdCl_2 ? [CBSE 2013]
- Q.22** What type of stoichiometric defect is shown by AgCl ? [CBSE Delhi 2013]
- Q.23** The density of lead is 11.35 g cm^{-3} the metal crystallise with *fcc* cell. Estimate the radius of lead atom. [CBSE Delhi 2013]
- Q.24** An element with molar mass 27 g mol^{-1} forms a cubic unit cell with edge length $4.05 \times 10^{-8} \text{ cm}$. If its density is 2.7 g cm^{-3} , what is the nature of cubic unit cell. [CBSE 2013]
- Q.25** What is the two-dimensional coordination number of a molecule in a square close-packed layer ? [CBSE(F) 2013]
- Q.26** What type of stoichiometric defect is shown by AgCl ? [CBSE 2013]
- Q.27** An element with density 11.2 g cm^{-3} forms a *fcc* lattice with edge length of $4 \times 10^{-8} \text{ cm}$. Calculate the atomic mass of the element.
(Given $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$) [CBSE Delhi 2014]
- Q.28** i) What type of non-stoichiometric point defect is responsible for the pink colour of LiCl ?
ii) What type of stoichiometric defect is shown by NaCl ? [CBSE(AI) 2014]
- Q.29** i) What type of stoichiometric defect is shown by KCl and why ?
ii) What type of semiconductor is formed when silicon is doped with As ?
iii) Which one of the following is an example of molecular solid : CO_2 or SiO_2 ?
iv) What type of substances would make better magnets, ferromagnetic or ferrimagnetic ? [CBSE(F) 2014]

- Q.30** How will you distinguish between the following pairs of terms : [CBSE (AI) 2014]
- Hexagonal close packing and cubic close packing
 - Crystal lattice and unit cell
 - Tetrahedral void and octahedral void.
- Q.31** What is the coordination number of
- zinc in zinc blende (ZnS) ?
 - sodium in sodium oxide (Na₂O) ?
 - oxide ion in sodium oxide (Na₂O) ?
 - calcium in calcium fluoride (CaF₂) ?
- [CBSE (AI) 2014]
- Q.32** What is the formula of a compound in which the element Y forms ccp lattice and atoms of X occupy 2/3rd of tetrahedral voids ? [CBSE Allahabad 2015]
- Q.33** What is the formula of a compound in which the element Y forms hcp lattice and atoms of X occupy $\frac{1}{3}$ rd of octahedral voids? [CBSE Bhubneshwar 2015]
- Q.34** What is the formula of a compound in which the element Y forms hcp lattice and atoms of X occupy $\frac{2}{3}$ rd of tetrahedral voids ? [CBSE Panchkula 2015]
- Q.35** An element with molar mass 27 g mol⁻¹ forms a cubic unit cell with edge length 4.05×10^{-8} cm. If its density is 2.7 g cm⁻³, what is the nature of the cubic unit cell? [CBSE Delhi 2015]
- Q.36** An element crystallises in a *fcc* lattice with cell edge of 400 pm. The density of the element is 7 g cm⁻³. How many atoms are present in 280 g of the element? [CBSE 2016]
- Q.37** An element crystallises in a *bcc* lattice with cell edge of 400 pm. Calculate the density if 250 g of this element contains 2.5×10^{24} atoms. [CBSE 2016]
- Q.38** Why ZnO turns yellow on heating ? [CBSE 2016]
- Q.39** Explain 12 – 16 and 13 – 15 compounds with suitable example ? [CBSE 2017]
- Q.40** An element 'X' (At. mass = 40 g mol⁻¹) having fcc structure, has unit cell edge length of 400 pm. Calculate the density of 'X' and the number of unit cells in 4 g of 'X'. ($N_A = 6.022 \times 10^{23}$ mol⁻¹) [CBSE 2018]
- Q.41** Analysis shows that FeO has a non-stoichiometric composition with formula Fe_{0.95}O. Give reason. [CBSE 2018]

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- Q.1** What is the value of van't Hoff factor for a compound which undergo dimerisation in an organic solvent ?
[CBSE Delhi 2002]
- Q.2** Give an example of solution containing a solid solute in a solid solvent.
[CBSE(AI) 2003]
- Q.3** What is K_H in Henry's law equation and what is its significance ?
[CBSE (AI) 2005]
- Q.4** A solution is made by dissolving 30 g of non-volatile solute in 90 g of water. If has a vapour pressure of 2.8 KPa at 298 K. At 298 K, the vapour pressure of pure water is 3.64 KPa. Calculate the molar mass of solute.
[CBSE Delhi 2005]
- Q.5** An antifreeze solution is prepared from 222.6 g of ethylene glycol, $C_2H_4(OH)_2$ and 200 g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g ml^{-1} , then what shall be the molarity of the solution ?
[CBSE (AI) 2007]
- Q.6** Derive an equation to express that relative lowering of vapour pressure for a solution is equal to the mole fraction of the solute in it when the solvent alone is volatile.
[CBSE 2008]
- Q.7** What is the effect of temperature on molality of a solution ?
[CBSE Board 2011]
- Q.8** Calculate the freezing point of an aqueous solution containing 10.50 g of $MgBr_2$ in 200 g of water. (Molar mass of $MgBr_2 = 184 \text{ g}$)
(K_f for water = $1.86 \text{ K kg mol}^{-1}$)
[CBSE Delhi 2009,2011]
- Q.9** Why do we get sometimes abnormal molecular masses of the substance by using colligative properties of the solution ? State the factors with examples which produce abnormality in the result.
[CBSE (F) 2011]
- Q.10** Define the following terms :
[CBSE 2009,2010,2012]
i) Mole fraction ii) Molality iii) Molarity
- Q.11** Illustrate elevation in boiling point with the help of vapour pressure temperature curve of a solution. Show that elevation in boiling point is a colligative property.
[CBSE 2012]
- Q.12** What is reverse osmosis ?
[CBSE 2008, 2012]
- Q.13** Define Van't Hoff's factor.
[CBSE Delhi 2012]
- Q.14** What is the Raoult's law for volatile solute ?
[CBSE 2013]
- Q.15** What are azeotropes ?
[CBSE 2013]
- Q.16** i) Why is an increase in temperature observed on mixing chloroform and acetone ?
ii) Why does sodium chloride solution freeze at a lower temperature than water ?
[CBSE(F) 2013]
- Q.17** 18 g of glucose, $C_6H_{12}O_6$ (Molar Mass = 180 g mol^{-1}) is dissolved in 1 kg of water in a sauce pan. At what temperature will this solution boil?
(K_b for water = $0.52 \text{ K kg mol}^{-1}$, boiling point of pure water = 373.15 K)
[CBSE Delhi 2013]
- Q.18** 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. Find the molar mass of the solute. (K_f for benzene = $5.12 \text{ K kg mol}^{-1}$)
[CBSE (AI)2013]
- Q.19** Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litre of water at 25°C , assuming that it is completely dissociated.
[CBSE Delhi 2013]
- Q.20** What is the effect of temperature on the solubility of a gas in a liquid ?
[CBSE 2014]
- Q.21** State Henry's law and mention some important applications.
[CBSE 2012,2014]
- Q.22** What is an ideal solution ?
[CBSE Delhi 2014]
- Q.23** a) What type of deviation is shown by a mixture of ethanol and acetone ? Give reason.
b) A solution of glucose (molar mass = 108 g mol^{-1}) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution = 1.2 g mL^{-1}) [CBSE(AI) 2014]

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Q.24 What are maximum boiling azeotropes ? Give an example. [CBSE 2015]

Q.25 Calculate the mass of NaCl (molar mass = 58.5 g mol^{-1}) to be dissolved in 37.2 g of water to lower the freezing point by 2°C , assuming that NaCl undergoes complete dissociation. [CBSE (F) 2015]

Q.26 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated).
(Given : Molar mass of benzoic acid = 122 g mol^{-1} , K_f for benzene = $4.9 \text{ K kg mol}^{-1}$)

[CBSE Delhi 2015]

Q.27 What are minimum boiling azeotropes ? Give an example. [CBSE 2016]

Q.28 What is osmotic pressure ? [CBSE Delhi 2016]

Q.29 Out of different colligative properties which one is the best for determining the molecular masses of the polymers ? [CBSE 2008, 2016]

Q.30 Calculate the freezing point of a solution containing 60 g of glucose (Molar mass = 180 g mol^{-1}) in 250 g of water.

(K_f of water = $1.86 \text{ K kg mol}^{-1}$) [CBSE 2018] [2]

Q.31 Give reasons for the following :

- Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.
- Aquatic animals are more comfortable in cold water than in warm water.
- Elevation of boiling point of 1 M KCl solution is nearly double that of 1 M sugar solution.

[CBSE 2018]

Q.32 Calculate the depression in the freezing point of water 10g of $\text{CH}_3\text{CH}_2\text{CHClCOOH}$ is added to 250 g of water; $K_a = 1.4 \times 10^{-3}$, $K_f = 1.86 \text{ K kg mol}^{-1}$. [CBSE 2018]

Q.33 For questions number two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given

- Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- Assertion (A) is correct, but Reason (R) is incorrect statement.
- Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Osmotic pressure is a colligative property.

Reason (R) : Osmotic pressure is directly proportional to molarity. [CBSE 2020]

Q.34 a) A solution contains 5.85 g NaCl (Molar mass = 58.5 g mol^{-1}) per litre of solution. It has an osmotic pressure of 4.75 atm at 37°C . Calculate the degree of dissociation of NaCl in this solution.

b) State Henry's law. Why is air diluted with helium in the tanks used by scuba divers ? [CBSE 2020]

Or

a) When 19.5 g of $\text{F}-\text{CH}_2-\text{COOH}$ (Molar mass = 78 g mol^{-1}) is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C . Calculate the degree of dissociation of $\text{F}-\text{CH}_2-\text{COOH}$.

[Given : K_f for water = $1.86 \text{ K kg mol}^{-1}$]

b) Given reasons :

- 0.1 M KCl has higher boiling point than 0.1 M Glucose.
- Meat is preserved for a longer time by salting.

[CBSE 2020]

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- Q.1** What is Nernst's equation? Write the mathematical relation. [CBSE 2002]
- Q.2** Account for the following
i) Alkaline medium inhibits the rusting of iron.
ii) Iron does not rust even if the zinc coating is broken in a galvanized iron pipe. [CBSE Delhi 2006]
- Q.3** Predict the products of electrolysis of the following:
i) An aqueous solution of AgNO_3 with silver electrodes.
ii) An aqueous solution of AgNO_3 with platinum electrodes.
iii) A dilute solution of H_2SO_4 with platinum electrodes.
iv) An aqueous solution of CuCl_2 with platinum electrodes. [CBSE (AI) 2007]
- Q.4** In the button cell widely used in watches and other devices, the following reaction takes place :
 $\text{Zn(s)} + \text{Ag}_2\text{O(l)} \longrightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)} + 2\text{OH}^-(\text{aq})$
 Determine E° and $\Delta_r G^\circ$ for the reaction.
 Given, $\text{Zn} \longrightarrow \text{Zn}^{2+} + 2e^-$, $E^\circ = -0.76 \text{ V}$;
 $\text{Ag}_2\text{O} + \text{H}_2\text{O} + 2e^- \longrightarrow 2\text{Ag} + 2\text{OH}^-$, $E^\circ = 0.344 \text{ V}$
 [CBSE (AI) 2008]
- Q.5** Why molar conductivity increases with decrease in concentration of electrolyte ? [CBSE (AI) 2008]
- Q.6** The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1} . Calculate its molar conductivity. [CBSE Delhi 2008]
- Q.7** The resistance of a conductivity cell containing 0.01M KCl solution at 298 K is 1500Ω . What is the cell constant if conductivity of 0.001 M KCl solution at 298 K is $0.146 \times 10^{-3} \text{ S cm}^{-1}$? [CBSE Delhi 2008]
- Q.8** Define Faraday's 1st law of electrolysis. [CBSE Delhi 2008]
- Q.9** One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. The other half-cell consists of a zinc electrode in a 0.10 M solution of $\text{Zn}(\text{NO}_3)_2$. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver ions in the solution. [CBSE (F) 2010]
- Q.10** Write the anode and cathode reaction occurring in a commonly used mercury cell. How is the overall reaction represented? [CBSE (F) 2010]
- Q.11** Write the anode and cathode reactions occurring in a commonly used mercury cell. How is the overall reaction represented ? [CBSE (F) 2010]
- Q.12** How are specific conductance, cell constant and resistance related with each other? [CBSE Delhi 2011]
- Q.13** Two half-reactions of an electrochemical cell are given below :
 $\text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) + 5e^- \longrightarrow \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O(l)}$, $E^\circ = +1.51 \text{ V}$
 $\text{Sn}^{2+}(\text{aq}) \longrightarrow \text{Sn}^{4+}(\text{aq}) + 2e^-$, $E^\circ = +0.15 \text{ V}$
 Construct the redox equation from the standard potential of the cell and predict if the reaction is reactant favoured or product favoured. [CBSE Delhi 2011]
- Q.14** The chemistry of corrosion of iron is essentially an electrochemical phenomenon. Explain the reaction occurring during the corrosion of iron in the atmosphere. [CBSE Delhi 2011]
- Q.15** A voltaic cell is set up at 25°C with the following half cells :
 $\text{Al}/\text{Al}^{3+} (0.001 \text{ M})$ and $\text{Ni}/\text{Ni}^{2+} (0.50 \text{ M})$
 Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.
 $E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}$; $E^\circ_{\text{Al}^{3+}/\text{Al}} = -1.66 \text{ V}$
 $(\log 8 \times 10^{-6} = -0.54)$ [CBSE (AI) 2012]
- Q.16** Express the relation among cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solution related to its conductivity? [CBSE Delhi (AI) 2012]
- Q.17** What is cell constant ? Explain. [CBSE (AI) 2014]
- Q.18** *a)* Calculate $\Delta_r G^\circ$ for the reaction
 $\text{Mg(s)} + \text{Cu}^{2+}(\text{aq}) \longrightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cu(s)}$
 Given : $E^\circ_{\text{cell}} = +2.71 \text{ V}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$
b) Name the type of cell which was used in Apollo space programme for providing electrical power. [CBSE (AI) 2014]
- Q.19** *i)* Write two advantages of fuel cell.
ii) Equilibrium constant (K_c) for the given cell reaction is 10. Calculate E°_{cell} .
 $\text{A(s)} + \text{B}^{2+}(\text{aq}) \rightleftharpoons \text{A}^{2+}(\text{aq}) + \text{B(s)}$
 [CBSE (F) 2014]
- Q.20** What is meant by limiting molar conductivity ? [CBSE(AI)2014]
- Q.21** *a)* State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu ?

b) Calculate emf of the following cell at 298 K :
 $\text{Mg(s)} \mid \text{Mg}^{2+}(0.1 \text{ M}) \parallel \text{Cu}^{2+}(0.01 \text{ M}) \mid \text{Cu(s)}$
 [Given $E^\circ_{\text{cell}} = +2.71 \text{ V}$, $1 \text{ F} = 96500 \text{ C mol}^{-1}$]
 [CBSE Delhi 2014]

Q.22 Why cell potential of mercury cell remains constant during its life?
 [CBSE 2015]

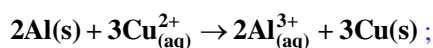
Q.23 Calculate the time for depositing 1.17 g of Ni at cathode when a current of 5A was passed through the solution of $\text{Ni(NO}_3)_2$.
 (Molar mass of Ni = 58.5 g mol⁻¹,
 $1 \text{ F} = 96500 \text{ C mol}^{-1}$) [CBSE Bhubaneswar 2015]

Q.24 A zinc rod is dipped in 0.1 M solution of ZnSO_4 . The salt is 95% dissociated at this dilution at 29°C for coating the surface of iron [$E^\circ_{\text{Fe}^{2+}/\text{Fe}} = 0.44 \text{ V}$] to prevent corrosion and why?

Given : [$E^\circ_{\text{A}^{2+}/\text{A}} = -2.37 \text{ V}$, $E^\circ_{\text{B}^{2+}/\text{B}} = -0.14$]

Given $E^\circ_{\text{cell}} = 0.30 \text{ V}$ [CBSE 2016]

Q.25 i) Calculate ΔG° and $\log K_c$ for the following reaction at 298 K



Given $E^\circ_{\text{cell}} = 2.02 \text{ V}$

ii) What type of battery is dry cell? Write the overall reaction occurring in dry cell.
 [CBSE 2016]

Q.26 i) The conductivity of 0.001 mol L⁻¹ solution of CH_3COOH is 3.905×10^{-5} conductivity and degree of dissociation (α).

Given $\lambda^\circ(\text{H}^+) = 349.6 \text{ Scm}^2\text{mol}^{-1}$

$\lambda^\circ(\text{CH}_3\text{COO}^-) = 40.9 \text{ Scm}^2\text{mol}^{-1}$

ii) Define electrochemical cell. What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?
 [CBSE 2016]

Q.27 What are fuel cells? [CBSE (AI) 2014, 2018]

Or

Define fuel cells. [CBSE 2018]

Q.28 What are the advantages of $\text{H}_2 - \text{O}_2$ fuel cell? Following are the important advantages of $\text{H}_2 - \text{O}_2$ fuel cell:
 [CBSE 2018]

Q.29 a) Write the cell reaction and calculate the e.m.f. of the following cell at 298 K:

$\text{Sn(s)} \mid \text{Sn}^{2+}(0.004 \text{ M}) \parallel \text{H}^+(0.020 \text{ M}) \mid \text{H}_2(\text{g}) (1 \text{ bar}) \mid \text{Pt (s)}$

(Given : $E^\circ_{\text{Sn}^{2+}/\text{Sn}} = -0.14 \text{ V}$)

b) Give reasons :

i) On the basis of E° values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl.

ii) Conductivity of CH_3COOH decreases on dilution.
 [CBSE 2018]

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Q.30 a) For the reaction
 $2\text{AgCl(s)} + \text{H}_2\text{(g)} (1 \text{ atm}) \longrightarrow 2\text{Ag (s)} + 2\text{H}^+$
 $(0.1 \text{ M}) + 2\text{Cl}^- (0.1 \text{ M}), \Delta G^\circ$
 $= -43600 \text{ J at } 25^\circ\text{C}.$
 Calculate the e.m.f. of the cell.
 $[\log 10^{-n} = -n]$

b) Define fuel cell and write its two advantages.

[CBSE 2018]

Q.31 Write the product obtained at cathode on electrolysis of aqueous solution of NaCl. [CBSE 2020]

Q.32 Which of the following solutions of KCl will have the highest value of specific conductance ?

(A) 0.5 M (B) 0.01 M (C) 0.1 M (D) 1.0 M

[CBSE 2020]

Q.33 For questions number two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given

i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

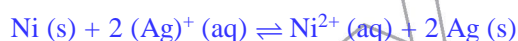
iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Conductivity of an electrolyte decreases with decrease in concentration.

Reason (R) : Number of ions per unit volume increases on dilution. [CBSE 2020]

Q.34 Calculate the maximum work and $\log K_c$ for the given reaction at 298 K :



Given :

$$E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}, E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$$

$$1 \text{ F} = 96500 \text{ C mol}^{-1}$$

[CBSE 2020]

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- Q.1** A certain reaction is 50% complete in 20 minutes at 300K and same reaction is again 50% complete in 5 minutes at 350K. Calculate the activation energy if it is a first order reaction. [CBSE(AI) 2006]
- Q.2** Discuss the various factors affecting the rates of chemical reactions. [CBSE 2008]
- Q.3** What is order of reaction? Explain. [CBSE 2008]
- Q.4** A reaction is first order in A and second order in B. [CBSE 2008]
- Write the differential rate equation.
 - How is the rate affected on increasing the concentration of B three times?
 - How is the rate affected when the concentrations of both A and B are doubled?
- Q.5** A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$. [CBSE Delhi 2008]
- Q.6** The half-life for radioactive ^{14}C is 5730 years. The wooden part of an archaeological artefact has only 80% of the ^{14}C activity found in fresh wood. Calculate the age of the artefact. [CBSE 2008]
- Q.7** What is the rate of a reaction? Explain. [CBSE 2009]
- Q.8** What are elementary reactions? Give an example. [CBSE 2009]
- Or*
- What is meant by an elementary reaction? [CBSE 2009]
- Q.9** Define the following :
 - Elementary reaction
 - Rate of a reaction [CBSE(AI) 2009, (F) 2010]
- Q.10** Hydrogen peroxide, H_2O_2 (aq) decomposes to H_2O (l) and O_2 (g) in a reaction that is of first order in H_2O_2 and has rate constant, $k = 1.06 \times 10^{-3} \text{min}^{-1}$.
 - How long will it take 15% of sample of H_2O_2 to decompose.
 - How long will it take 85% of sample of H_2O_2 to decompose. [CBSE(F) 2009]
- Q.11** A reaction is of second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is reduced to half? What is the unit of rate constant for such a reaction? [CBSE(AI) 2011]
- Q.12** A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is
 - doubled
 - reduced to half? [CBSE 2012]
- Q.13** What do you understand by the 'order of a reaction'? Identify the reaction order from each of the following units of reaction rate constant :
 - $\text{L}^{-1} \text{mol s}^{-1}$
 - $\text{L mol}^{-1} \text{s}^{-1}$. [CBSE Delhi 2012]
- Q.14** *a)* A reaction is second order in A and first order in B.
 - Write the differential rate equation.
 - How is the rate affected on increasing the concentration of A three times?
 - How is the rate affected when the concentrations of both A and B are double? [CBSE Delhi 2013]
 - A first order reaction takes 40 minutes for 30% decomposition. Calculate $t_{1/2}$ for this reaction. (Given $\log 1.428 = 0.1548$) [CBSE Delhi 2013]
- Q.15** *a)* For a reaction $\text{A} + \text{B} \rightarrow \text{P}$, the rate law is given by, $r = k [\text{A}]^{1/2} [\text{B}]^2$.
 What is the order of this reaction?
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 the reaction. [CBSE (AI) 2013]
- Q.16** Derive integrated rate expression for a zero order reaction. [CBSE(F) 2014][2]
- Q.17** What are pseudochemical reactions? Give an example. [CBSE 2014]
- Q.18** The rate constant for a first order reaction is 60s^{-1} . How much time will it take to reduce the initial concentration of the reactant to its 1/16th value? [CBSE 2015]
- Q.19** The thermal decomposition of HCO_2H is a first order reaction with a rate constant of $2.4 \times 10^{-3} \text{s}^{-1}$ at a certain temperature. Calculate how long will it take for three-fourths of initial quantity of HCOOH to decompose. ($\log 0.25 = -0.6021$) [CBSE(AI) 2015]
- Q.20** For the hydrolysis of methyl acetate in aqueous solution, the following results were obtained :
- | t (s) | 0 | 30 | 60 |
|---|------|------|------|
| $[\text{CH}_3\text{COOCH}_3]/(\text{mol L}^{-1})$ | 0.60 | 0.30 | 0.15 |
- Show that it follows pseudo first order reaction, as the concentration of water remains constant.
 - Calculate the average rate of reaction between the

time interval 30 to 60 seconds.

(Give $\log 2 = 0.3010$, $\log 4 = 0.6021$)

[CBSE Delhi 2015]

Q.21 A first order reaction is 50% completed in 40 minutes at 300 K and in 20 minutes at 320 K. Calculate the activation energy of the reaction.

(Given : $\log 2 = 0.3010$, $\log 4 = 0.6021$, $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) [CBSE 2018]

Q.22 The unit of the rate of reaction is the same as that of the rate constant for a

- (A) first order reaction
- (B) zero order reaction
- (C) second order reaction
- (D) half-order reaction

[CBSE 2020]

Q.23 In the given reaction



the rate of formation of C is $2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$.

Calculate the

i) rate of reaction, and

ii) rate of disappearance of B.

[CBSE 2020]

Q.24 A first order reaction is 40% complete in 80 minutes. Calculate the value of rate constant (k). In what time will the reaction be 90% completed ?

[Given : $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6771$, $\log 6 = 0.7782$]

[CBSE 2020]

5

CHAPTER

Surface Chemistry

Q.1 Why lyophilic colloid is more stable than lyophobic colloid ? [CBSE Delhi 2006]

Q.2 Bi (V) is a stronger oxidising agent than Sb (V). Why ? [CBSE 2008]

Q.3 NH_3 is a stronger Lewis base than other hydrides of this family. Why ? [CBSE 2008, 2009]

Q.4 What is coagulation ? [CBSE 2009]

Q.5 Explain the structure of nitric acid. [CBSE 2009]

Q.6 In the structure of HNO_3 molecule, the N—O bond (121 pm) is shorter than N—OH bond (140 pm). [CBSE Delhi 2009]

[CBSE Delhi 2009]

Q.7 Why is red phosphorus less reactive than white phosphorus ? [CBSE 2009]

Q.8 Discuss the structure of PCl_5 . [CBSE 2009]

Q.9 Why all bonds in PCl_5 are not identical ? [CBSE 2009]

[CBSE 2009]

Q.10 i) $\text{PCl}_5 + \text{H}_2\text{O}(\text{excess}) \longrightarrow$

ii) $\text{F}_2 + \text{H}_2\text{O} \longrightarrow$ [CBSE(F) 2009]

b) Explain the following observation :

i) Phosphorus have a greater tendency for catenation than nitrogen.

ii) In solutions of H_2SO_4 in water, the second dissociation constant K_{a_2} , is less than the first dissociation constant K_{a_1} .

Q.11 Explain what is observed when

i) a beam of light is passed through a colloidal solution.

ii) an electrolyte NaCl is added to hydrated ferric oxide sol.

iii) an electric current is passed through a colloidal sol? [CBSE 2008, 2009, 2011]

Q.12 Complete the following chemical equations :

i) $\text{PH}_3 + \text{HBr} \longrightarrow$

ii) $\text{PH}_3 + \text{CuSO}_4 \longrightarrow$

iii) $\text{PH}_3 + \text{HgCl}_2 \longrightarrow$

[CBSE 2011]

Q.13 Define micelles. [CBSE 2012]

Q.14 What is peptization ? What are different methods of peptization ?

Or

Define 'peptization'.

[CBSE 2012]

Q.15 Explain the term Emulsion giving a suitable example. [CBSE 2012]

Q.16 Classify colloids where the dispersion medium is water. State their characteristics and write an example of each of these classes. [CBSE(AI) 2011, (F) 2012]

Q.17 What is the basicity of H_3PO_2 acid why ?

[CBSE (AI) 2012]

Q.18 Which is a stronger reducing agent, SbH_3 or BiH_3 , and why ? [CBSE 2012]

Q.19 $\text{P}_{4(s)} + \text{NaOH}_{(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow$ [CBSE 2012]

Q.20 Why NCl_5 is not known while PCl_5 is known ? [CBSE 2013]

[CBSE 2013]

Or

Though nitrogen exhibit + 5 oxidation state, it does not form pentahalides. [CBSE 2013]

Q.21 Give reasons for the following :

$\text{R}_3\text{P} = \text{O}$ exists but $\text{R}_3\text{N} = \text{O}$ does not, R is an alkyl group. [CBSE (AI) 2013]

[CBSE (AI) 2013]

- Q.22** Account for the following : [CBSE 2013]
 a) Chlorine water has both oxidising and bleaching properties.
 b) H_3PO_2 and H_3PO_3 acts as good reducing agent while H_3PO_4 does not
 c) On addition of ozone gas to KI solution, violet vapours are obtained.
- Q.23** What is Tyndall effect ? [CBSE 2013]
- Q.24** Based on the type of dispersed phase, what type of colloid is micelles ? [CBSE(F) 2014]
- Q.25** Complete the following equations :
 i) $\text{P}_4 + \text{H}_2\text{O} \longrightarrow$
 ii) $\text{XeF}_4 + \text{O}_2\text{F}_2 \longrightarrow$ [CBSE (AI) 2014]
- Q.26** Complete the following chemical equations :
 i) $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \longrightarrow$
 ii) $\text{Cu} + \text{H}_2\text{SO}_4(\text{conc.}) \longrightarrow$ [CBSE Delhi 2014]
- Q.27** Give one example each of sol and gel. [CBSE Delhi 2014]
- Q.28** Which bond is stronger, N - N or P - P and why ? [CBSE 2014]
- Q.29** Account for the following :
 The molecules NH_3 and NF_3 have dipole moments which are of opposite directions. [CBSE (F) 2014]
- Q.30** What is meant by coagulation of a colloidal solution? Describe briefly any three methods by which coagulation of lyophobic sols can be carried out. [CBSE 2015]
- Q.31** N_2 is less reactive at room temperature explain. [CBSE 2013, 2015]
- Q.32** What happens when H_3PO_3 is heated? [CBSE 2015]
- Q.33** What is electrokinetic potential or zeta potential? [CBSE 2016]
- Q.34** Define the following terms :
 i) O/W Emulsion
 ii) Zeta potential
 iii) Multimolecular colloids [CBSE 2016]
- Q.35** Define the following terms :
 i) Lyophilic colloid
 ii) Zeta potential
 iii) Associated colloids [CBSE 2016]
- Q.36** i) Differentiate between adsorption and absorption.
 ii) Out of MgCl_2 and AlCl_3 , which one is more effective in causing coagulation of negatively charged sol and why? [CBSE 2016]
- Q.37** i) Out of silica gel and anhydrous CaCl_2 , which will adsorb the water vapours?
 ii) Out of H_2SO_4 and H_3PO_4 , which one is more effective in causing coagulation of positively charged sol? Give reason.
 iii) Out of sulphur sol and proteins, which one forms macromolecular colloids? [CBSE 2016]
- Q.38** Account for the following :
 i) PCl_5 is more covalent than PCl_3 . [CBSE 2016]
 ii) Iron on reaction with HCl forms FeCl_2 and not FeCl_3 .
- Q.39** What is the difference between multimolecular and macromolecular colloids ? Give one example of each. How are associated colloids different from these two types of colloids ? [CBSE 2016,2017]
- Q.40** $\text{CO}(\text{g})$ and $\text{H}_2(\text{g})$ react to give different products in the presence of different catalysts. Which ability of the catalyst is shown by these reactions? [CBSE 2018]
- Q.41** What happens when
 a) a freshly prepared precipitate of $\text{Fe}(\text{OH})_3$ is shaken with a small amount of FeCl_3 solution?
 b) persistent dialysis of a colloidal solution is carried out?
 c) an emulsion is centrifuged? [CBSE 2018]
- Q.42** Write two differences between physisorption and chemisorption. [CBSE 2020]
- Or
- Define the following terms with a suitable example of each :
 i) Associated colloids
 ii) O/W emulsion [CBSE 2020]
- Q.43** Define Lyophobic and Lyophilic sol. with a suitable example of each. Why is coagulation of Lyophilic sol difficult as compared to Lyophobic sol ? [CBSE 2020]
- Or
- Define the following terms :
 i) Shape-selective catalysis
 ii) Kraft temperature
 iii) Peptization [CBSE 2020]

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6

CHAPTER

General Principles and Processes of Isolation of Elements

- Q.1** Name the chief ore of silver. Describe with chemical equations the extraction of silver from the ore.
[CBSE Delhi 2006]
- Q.2** Write the chemical reactions which take place in the following operations :
i) Electrolytic reduction of Al_2O_3 .
ii) Mond's process for refining nickel
[CBSE (AI)2008]
- Q.3** What is meant by the term pyrometallurgy ?
[CBSE 2009]
- Q.4** Preparation of pure alumina (Al_2O_3) from bauxite ore. Explain.
[CBSE 2011]
- Q.5** Explain the role of each of the following in the extraction of metals from their ores :
i) CO in the extraction of nickel.
ii) Zinc in the extraction of silver. [CBSE Delhi 2011]
- Q.6** Write the chemical reactions involved in the process of extraction of Gold. Explain the role of dilute NaCN and Zn in this process.
[CBSE 2012]
- Q.7** Write one ore of aluminium with formula. [CBSE 2013]
- Q.8** Which reducing agent is employed to get copper from the leached low grade copper ore ?
[CBSE Delhi 2014]
- Q.9** i) Indicate the principle behind the method used for the refining of zinc.
ii) Which form of the iron is the purest form of commercial iron ?
[CBSE Delhi (AI)2014]
- Q.10** Name the method that is used for refining of nickel.
[CBSE(AI) 2014]
- Q.11** Name the method used for refining of copper metal.
[CBSE(AI) 2014]
- Q.12** What is the role of depressant in froth floatation process.
[CBSE 2016]
- Or
- Explain the method of froth floatation process of concentrating sulphide ore.
- Or
- Write a short note on froth floatation. [CBSE 2008]
- Q.13** Describe the role of
i) Iodine in the refining of zirconium
ii) NaCN in the extraction of gold from gold ore.
[CBSE(F) 2014, CBSE 2018]
- Q.14** By which of the following reactions is blister copper obtained ?
(A) $\text{Cu}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Cu}$
(B) $\text{Cu}_2\text{S} + \text{FeS} \rightarrow 2 \text{Cu} + \text{FeS}_2$
(C) $\text{Cu}_2\text{S} + 2 \text{Cu}_2\text{O} \rightarrow 6 \text{Cu} + \text{SO}_2$
(D) $\text{Cu}_2\text{O} + \text{C} \rightarrow 2 \text{Cu} + \text{CO}$ [CBSE 2020]
- Q.15** Write the role of the following : [CBSE 2020]
i) NaAlF_4 in the extraction of Aluminium
ii) CO in the refining of Ni
- Or
- Write the chemical equations involved in the leaching of bauxite ore to prepare pure alumina. [CBSE 2020]

7

CHAPTER

The p-Block Elements

- Q.1** Bi (V) is a stronger oxidising agent than Sb (V). Why ?
[CBSE 2008]
- Q.2** Complete the following reaction
 $\text{I}^-_{(aq)} + \text{H}_2\text{O}_{(l)} + \text{O}_2_{(g)} \rightarrow$ [CBSE Delhi 2008]
- Q.3** Mention all the oxidation states exhibited by chlorine in its compounds.
[CBSE 2008]
- Q.4** Boiling point of HCl is lower than that of HF . Explain.
[CBSE 2008, 2009]
- Q.5** NH_3 is a stronger Lewis base than other hydrides of this family. Why ?
[CBSE 2008, 2009]
- Q.6** Explain the structure of nitric acid. [CBSE 2009]
- Q.7** In the structure of HNO_3 molecule, the N—O bond (121 pm) is shorter than N—OH bond (140 pm).
[CBSE Delhi 2009]
- Q.8** Why is red phosphorus less reactive than white phosphorus ?
[CBSE 2009]
- Q.9** Discuss the structure of PCl_5 . [CBSE 2009]
- Q.10** Why all bonds in PCl_5 are not identical ? [CBSE 2009]
- Q.11** a) Complete the following reaction equations:
i) $\text{PCl}_5 + \text{H}_2\text{O} (\text{excess}) \longrightarrow$
ii) $\text{F}_2 + \text{H}_2\text{O} \longrightarrow$ [CBSE(F) 2009]
b) Explain the following observation :
i) Phosphorus has a greater tendency for catenation than nitrogen.

- ii) In solutions of H_2SO_4 in water, the second dissociation constant K_{a_2} , is less than the first dissociation constant K_{a_1} .
- Q.12** Sulphur has a greater tendency for catenation than oxygen. [CBSE (AI) 2009]
- Q.13** SF_4 is easily hydrolysed whereas SF_6 is not easily hydrolysed. Explain. [CBSE Delhi 2009]
- Q.14** ICl is more reactive than I_2 . Why? [CBSE 2009]
- Q.15** What are oxoacids? Discuss the structure of different oxoacids of sulphur. [CBSE 2009]
- Q.16** Give equations for the following: [CBSE 2009]
- i) $\text{XeF}_2 + \text{H}_2\text{O} \longrightarrow ?$ ii) $\text{XeF}_6 + \text{H}_2\text{O} \longrightarrow ?$
 iii) $\text{XeF}_6 + \text{PF}_5 \longrightarrow ?$ iv) $\text{XeF}_6 + \text{NaF} \longrightarrow ?$
- Q.17** Complete the following chemical equations:
 i) $\text{PH}_3 + \text{HBr} \longrightarrow$
 ii) $\text{PH}_3 + \text{CuSO}_4 \longrightarrow$
 iii) $\text{PH}_3 + \text{HgCl}_2 \longrightarrow$ [CBSE 2011]
- Q.18** a) Explain the following:
 F_2 is most reactive of all the four common halogens.
 b) Complete the following chemical equation:
 $\text{C} + \text{H}_2\text{SO}_4 (\text{conc.}) \longrightarrow$ [CBSE Delhi 2011]
- Q.19** Why are interhalogen compounds more reactive than halogens? [CBSE 2009, 2011]
- Q.20** By using VSEPR theory, predict the probable structure of XeF_2 . [CBSE 2008, 2009, 2011]
- Q.21** Complete the following chemical equations:
 i) $\text{P}_4 + \text{SO}_2\text{Cl}_2 \longrightarrow$ ii) $\text{Fe}^{3+} + \text{SO}_2 + \text{H}_2\text{O} \longrightarrow$
 iii) $\text{XeF}_6 + \text{H}_2\text{O} \longrightarrow$ [CBSE (F) 2011]
 (excess)
- Q.22** How would you account for the following:
 i) NF_3 is an exothermic compound but NCl_3 is not.
 ii) The acidic strength of compounds increases in the order: $\text{PH}_3 < \text{H}_2\text{S} < \text{HCl}$.
 iii) SF_6 is kinetically inert. [CBSE 2011]
- Q.23** How would you account for the following:
 Both O_2 and F_2 stabilise higher oxidation states but the ability of oxygen to stabilise the higher oxidation state exceeds that of fluorine. [CBSE (AI) 2011]
- Q.24** $\text{P}_{4(s)} + \text{NaOH}_{(aq)} + \text{H}_2\text{O}_{(l)} \longrightarrow$ [CBSE 2012]
- Q.25** What is the basicity of H_3PO_2 acid why? [CBSE (AI) 2012]
- Q.26** Which is a stronger reducing agent, SbH_3 or BiH_3 , and why? [CBSE 2012] [1]
- Q.27** Why is oxygen a gas while sulphur a solid at room temperature? [CBSE 2012]
- Q.28** Which is more acidic and why, H_2O or H_2S ? [CBSE (F) 2011, 2012]
- Q.29** Explain the following observations:
 Despite having greater polarity, hydrogen fluoride boils at a lower temperature than water. [CBSE (AI) 2012]
- Q.30** Why are halogens coloured? [CBSE 2012]
- Q.31** Explain why there is no distinct chemical compound of helium? [CBSE (F) 2012]
- Q.32** Electron gain enthalpy of fluorine is less than that of chlorine but it is still a more powerful oxidising agent than chlorine. Explain it with the help of suitable example. [CBSE 2009, 2012]
- Q.33** Why NCl_5 is not known while PCl_5 is known? [CBSE 2013]
- Or
- Though nitrogen exhibit + 5 oxidation state, it does not form pentahalides. [CBSE 2013]
- Q.34** Give reasons for the following:
 $\text{R}_3\text{P} = \text{O}$ exists but $\text{R}_3\text{N} = \text{O}$ does not, R is an alkyl group. [CBSE (AI) 2013]
- Q.35** PbCl_4 is more covalent than PbCl_2 . [CBSE (AI) 2013]
- Q.36** What are interhalogen compounds? Give a few examples. [CBSE 2013]
- Q.37** Why electron affinity of F is less than that of Cl? Explain. [CBSE 2013]
- Q.38** Account for the following:
 The molecules NH_3 and NF_3 have dipole moments which are of opposite directions. [CBSE (F) 2014]

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- Q.39** Which bond is stronger, N - N or P - P and why ?
[CBSE 2014]
- Q.40** Complete the following equations :
i) $P_4 + H_2O \longrightarrow$
ii) $XeF_4 + O_2F_2 \longrightarrow$ [CBSE (AI) 2014]
- Q.41** Complete the following chemical equations :
i) $Ca_3P_2 + H_2O \longrightarrow$
ii) $Cu + H_2SO_4(\text{conc.}) \longrightarrow$ [CBSE Delhi 2014]
- Q.42** The two O—O bond lengths in ozone molecule are identical, explain. [CBSE 2014]
- Q.43** Discuss various allotropic forms of sulphur with structure. [CBSE 2010, 2014]
- Q.44** How H_3PO_3 is diprotic acid ? [CBSE 2013, 2014]
- Q.45** What is the oxidation state of S in thiosulphuric acid?
[CBSE 2014]
- Q.46** Account for the following :
i) Sulphur in vapour form exhibits paramagnetic behaviour.
ii) $SnCl_4$ is more covalent than $SnCl_2$.
iii) H_3PO_2 is a stronger reducing agent than H_3PO_3 .
[CBSE Delhi 2014]
- Q.47** What happens when H_3PO_3 is heated? [CBSE 2015]
- Q.48** Which out of H_2O , H_2S , H_2Se or H_2Te have greater bond angle?
[CBSE 2015]
- Q.49** Account for the following
i) Bond angle in NH_4^+ is higher than NH_3 .
ii) Reducing character decreases from SO_2 to TeO_2 .
[CBSE (F) 2015]
- Q.50** Which allotrope of sulphur is thermally stable at room temperature. What happens when it is heated above 370 K ?
[CBSE (F) 2015]
- Q.51** Which noble gas has lowest boiling point.
[CBSE 2015]
- Q.52** N_2 is less reactive at room temperature explain.
[CBSE 2013, 2015]
- Q.53** Draw the structure of $XeOF_2$, IF_5 and $XeOF_4$.
[CBSE 2014, 2015]
- Q.54** Account for the following :
i) PCl_5 is more covalent than PCl_3 . [CBSE 2016]
ii) Iron on reaction with HCl forms $FeCl_2$ and not $FeCl_3$.
- Q.55** How is the presence of SO_2 detected ?
[NCERT, CBSE 2016]
- Q.56** ClF_3 exists but FCl_3 does not. Explain.
[CBSE 2012, 2016]
- Q.57** Among the halogens, F_2 is strongest oxidising agent. Explain why ? [CBSE 2016]
- Q.58** Give the structure of interhalogen compounds on the basis of hybridisation:
a) ClF_3 b) BrF_5
[CBSE 2012, 2016]
- Q.59** HI is stronger acid than HF. Why ?
Or
Arrange HCl , HI, HBr, HF in increasing order of acidic strength. [CBSE 2008]
Or
HI is the stronger reducing agent than HF. Explain.
[CBSE 2016]
- Q.60** Give the structure of various oxoacids of chlorine.
[CBSE 2009, 2016, 2018]
- Q.61** How are xenon fluorides XeF_2 , XeF_4 and XeF_6 prepared? Deduce their structures applying VSEPR theory. [CBSE 2013, 2014, 2018]
- Q.62** Write the products of the following reactions :
 $XeF_6 + 2 H_2O \rightarrow$
Is this reaction a redox reaction ? Draw the structure of XeF_6 [CBSE 2020]
- Q.63** a) Given reasons :
i) Helium does not form compounds like Xenon.
ii) $HClO_4$ is a stronger acid than $HOCl$.
iii) Sulphur is a polyatomic solid whereas Oxygen is a diatomic gas.
b) Write one reaction as an example of each, to show that conc. H_2SO_4 acts as
i) an oxidising agent, and
ii) a dehydrating agent. [CBSE 2020]
Or
a) Account for the following :
i) Hydration enthalpy of F^- ion is more than Cl^- ion.
ii) SO_2 is a reducing agent, whereas TeO_2 is an oxidising agent in group - 16 oxides.
b) Write the reaction of F_2 with water. Why does I_2 not react with water ?
c) Draw the structure of XeF_2 . [CBSE 2020]

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- Q.1** Why do the *d*-block elements exhibit a large number of oxidation states than *f*-block elements?
[CBSE Delhi 2001]
- Q.2** How do the oxides of transition elements in lower oxidation states differ from those in higher oxidation state in the nature of metal-oxygen bonding and why?
[CBSE Delhi 2001]
- Q.3** Assign a reason for the following :
The third ionisation energy of Mn ($Z = 25$) is higher than that of either Cr ($Z = 24$) or Fe ($Z = 26$)
[CBSE (AI) 2008]
- Q.4** Describe the trends in the following properties of the first series of transition elements : [CBSE 2008]
i) Oxidation state
ii) Atomic size
iii) Magnetic behaviour of dipositive gaseous ion M^{2+}
- Q.5** Give similarities and differences between the lanthanoids and actinoids. [CBSE 2008]
- Q.6** There is a greater range of oxidation state among the actinoids than among the lanthanoids.
[CBSE (AI) 2009]
- Q.7** Complete the following chemical reaction equations
[CBSE 2009]
- Q.8** Why the properties of the third transition series are very similar to the second transition series?
[CBSE 2009]
- Q.9** Lanthanum and lutetium do not show colouration in solution. Explain. [CBSE F 2010]
- Q.10** Explain why the metal-metal bonding is more frequent for the *4d* and *5d* series of transition metals than that for the *3d* series. [CBSE 2011]
- Q.11** The chemistry of actinoids is not so smooth as that of lanthanoids. [CBSE 2011]
- Q.12** The second and third rows of transition elements resemble each other much more than they resemble the first row. Explain why?
[CBSE 2009,2012]
- Q.13** Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions or in solid compounds, + 2 and +4 ions are also obtained.
[CBSE 2012]
- Q.14** The $E^\circ_{M^{2+}/M}$ for copper is positive (0.34 V). Copper is the only metal in the first series of transition elements showing this behaviour. [CBSE 2012]
- Q.15** Explain, why d-block elements or their compounds, act as good catalysts. [CBSE 2009,2012]
- Q.16** Which of 3*d*-series of transition elements exhibits the large number of oxidation state and why ?
[CBSE 2013]
- Q.17** What is the action of heat on :
 $K_2Cr_2O_7$ $KMnO_4$? [CBSE 2013]
- Q.18** In alkaline solution we have chromate and in acidic solution we have dichromate. Explain.
[CBSE 2013]
- Q.19** What is Misch metal ? [CBSE 2013]
- Q.20** Why are Mn^{2+} compounds more stable than Fe^{2+} compounds towards oxidation to their +3 states?
[CBSE 2014]
- Q.21** i) With reference to structural variability and chemical reactivity, write the differences between lanthanoids and actinoids.
ii) Name a member of the lanthanoid series which is well known to exhibit + 4 oxidation state.
iii) Out of Mn^{3+} and Cr^{3+} , which is more paramagnetic and why ?
(Atomic nos. : Mn = 25, Cr = 24)
[CBSE (AI) 2014]
- Q.22** Assign reasons for each of the following:
i) Copper (I) ion is not known in aqueous solution.
ii) Actinoids exhibit greater range of oxidation state than lanthanoids. [CBSE Delhi 2011,2016]
- Q.23** Why transition elements have variable oxidation states?
[CBSE 2016]
- Q.24** Give reasons :
a) E^0 value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Fe^{3+}/Fe^{2+} .
b) Iron has higher enthalpy of atomization than that of copper.
c) Sc^{3+} is colourless in aqueous solution whereas Ti^{3+} is coloured. [CBSE 2018]
- Q.25** Complete and balance the following chemical equations:
a) $Fe^{2+} + MnO_4^- + H^+ \longrightarrow$
b) $MnO_4^- + H_2O + I^- \longrightarrow$ [CBSE 2018]
- Q.26** Read the given passage and answer the questions number 1 to 5 that follow :
The d-block of the periodic table contains the elements of the groups 3-12 and are known as transition

elements. In general, the electronic configuration of these elements are $(n - 1) d^{1-10} ns^{1-2}$. 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 and alloys, catalytic activity, etc. Transition metals are hard (except Zn, Cd and Hg) and have a high melting point. [CBSE 2020]

- Why are Zn, Cd and Hg non-transition elements ?
- Which transition metal of 3d series does not show variable oxidation states ?
- Why do transition metals and their compounds show catalytic activity ?
- Why are melting points of transition metals high ?
- Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution ?

Q.27 For questions number two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given

- Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- Assertion (A) is correct, but Reason (R) is incorrect statement.
- Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : $[Pt(en)_2 Cl_2]^{2+}$ complex is less stable than $[Pt(NH_3)_4 Cl_2]^{2+}$ complex.

Reason (R) : $[Pt(en)_2 Cl_2]^{2+}$ complex shows chelate effect. [CBSE 2020]

9

CHAPTER

Coordination Compounds

- What is meant by unidentate, didentate and ambidentate ligands ? Give two examples for each. [CBSE 2009]
- Giving a suitable example for each, explain the following:
 - Crystal field splitting
 - Linkage isomerism
 - Ambidentate ligand [CBSE(AI) 2009]
- How would you account for the fact that $[Ni(CO)_4]$ has tetrahedral geometry ? [CBSE 2009]
- By using valence bond theory discuss the geometry of $[Co(NH_3)_6]^{3+}$ ion. [CBSE 2009]
- Compare the following complexes with respect to structural shapes, magnetic behaviour and hybrid orbitals involved in units: [CBSE (AI) 2009]
- What do you understand by denticity of a ligand? [CBSE (F) 2011]
- Write the state of hybridization, the shape and the magnetic behaviour of the following complex entities :
 - $[Cr (NH_3)_4 Cl_2]Cl$

ii) $[Co(en)_3]Cl_3$

iii) $K_2[Ni(CN)_4]$

[CBSE 2011]

Q.8 Do we call carbonyls as organometallics? Why or why not ? [CBSE (F) 2011]

Q.9 What is crystal field splitting ? [CBSE 2009, 2013]

Q.10 Write the coordination number and oxidation state of Platinum in the complex $[Pt(en)_2 Cl_2]$. [CBSE 2018]

Q.11 EDTA is a [CBSE 2020]

- monodentate ligand
- bidentate ligand
- ambidentate ligand
- hexadentate ligand

Q.12 a) Write the IUPAC name and hybridisation of the complex $[CoF_6]^{3-}$ (Given : Atomic number of Co = 27)

b) What type of isomerism is shown by the complex $[Co(en)_2 Cl_2]^{2+}$? [CBSE 2020]

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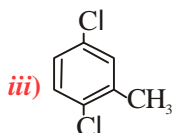
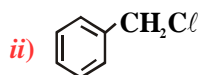
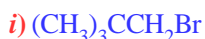
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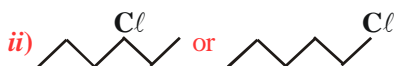
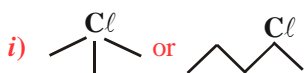
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Q.1 Write the IUPAC names of the following compounds:



[CBSE 2008]

Q.2 Which one in the following pairs undergoes $\text{S}_\text{N}1$ substitution reaction faster and why ?



[CBSE 2009]

Q.3 Preparation of haloalkane from alcohol with thionyl chloride (SOCl_2) in the presence of pyridine is preferred. Why? [CBSE 2010]

Q.4 Explain, why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

[CBSE 2010]

Q.5 Rearrange the compounds of each of the following sets in order of reactivity towards $\text{S}_\text{N}2$ displacement:

[CBSE 2011]

i) 2-Bromo-2-methylbutane, 1- Bromopentane, 2-Bromopentane

ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2- methylbutane

iii) 1-Bromobutane , 1-Bromo-2, 2-dimethylpropane, 1- Bromo-2-methylbutane

Q.6 Give reasons for the following :

i) Haloalkanes easily dissolve in organic solvents.

ii) Halogen compounds used in industry as solvents are alkyl chlorides rather than bromides and iodides.

[CBSE Delhi 2011]

Q.7 Which one of the following compounds is more easily hydrolyzed by KOH and why ?



Q.8 C-X bond length in halobenzene is smaller than C-X bond length in $\text{CH}_3\text{-X}$ [CBSE 2013]

Q.9 Give reasons :

i) *n*- Butyl bromide has higher boiling point than *t*-butyl bromide.

ii) Racemic mixture is optically inactive.

iii) The presence of nitro group ($-\text{NO}_2$) at o/p positions increases the reactivity of haloarenes towards nucleophilic substitution reactions.

[CBSE Delhi 2015]

Q.10 Why haloarenes are less reactive towards the substitution reaction than haloalkanes ?

[CBSE Allahabad 2015]

Q.11 How do you convert the following :

Chlorobenzene to 2- chlorotoluene

[CBSE Panchkula 2015]

Q.12 How will you bring the following conversions ?

i) But -1-ene to but -2-ene

ii) 1- Chlorobutane to *n* -octane

iii) Benzene to biphenyl

[CBSE 2016]

Q.13 What happens when

i) *n*-butyl chloride is treated with alcoholic KOH

ii) bromobenzene is treated with Mg in the presence of dry ether

iii) Chlorobenzene is subjected to hydrolysis in presence of NaOH

iv) Ethyl chloride is treated with aqueous KOH

v) Methyl bromide is treated with sodium in the presence of dry ether.

vi) Methyl chloride is treated with KCN

[CBSE 2016]

Q.14 Give reasons for the following

i) \pm 2-Butanol is optically inactive

ii) C- X bond length in halobenzene is smaller than C-X bond length in $\text{CH}_3\text{-X}$. [CBSE 2016]

Q.15 Name the reagent used to convert bromoethane to butane. [CBSE 2016]

Q.16 Out of chlorobenzene and benzyl chloride, which one gets easily hydrolysed by aqueous NaOH and why ?

[CBSE 2018]

Q.17 a) Identify the chiral molecule in the following pair:



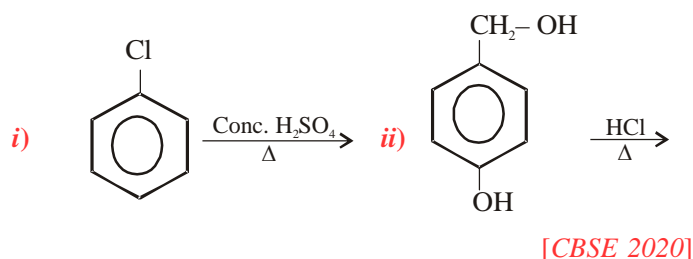
b) Write the structure of the product when chlorobenzene is treated with methyl chloride in the presence of sodium metal and dry ether.

c) Write the structure of the alkene formed by dehydrohalogenation of 1-bromo-1-methylcyclohexane with alcoholic KOH.

[CBSE 2018]

Q.18 Out of *o*-dichlorobenzene and *p*-dichlorobenzene, which has higher melting point? [CBSE 2020]

Q.19 Write the major product(s) of the following reactions :



11

CHAPTER

Alcohols, Phenols and Ethers

Q.1 Name the reagents which are used in following conversions :

i) Primary alcohol to an aldehyde.

ii) Butan-2-one to butan-2-ol

iii) Phenol to 2,4,6-tribromophenol.

[CBSE Delhi 2008]

Q.2 How would you carry out the following conversions?

i) Ethyl magnesium chloride to propyl n-1-ol.

ii) Benzyl chloride to benzyl alcohols.

[CBSE AI 2008]

Q.3 Alcohols react both as nucleophiles as well as electrophiles. Write one reaction of each type and describe its mechanism.

[CBSE (AI) 2008]

Q.4 Give two reactions that show the acidic nature of phenol. Compare acidity of phenol. Compare acidity of phenol with that of ethanol.

[CBSE AI 2009]

Q.5 Give two reactions that show the acidic nature of phenol. Compare acidity of phenol with that of ethanol.

[NCERT, CBSE (AI) 2009]

Q.6 Ortho and para-nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions.

[CBSE (AI) 2009]

Q.7 How would you obtain 2-Methylpropene from 2-Methylpropanol.

[CBSE Delhi 2011]

Q.8 Draw the structure of 2,6-dimethylphenol.

[CBSE (AI) 2011]

Q.9 i) Draw the structural formula of 2-methylpropan-2-ol molecule.

[CBSE Delhi 2012]

ii) Draw the structure of hex-1-en-3-ol compound.

[CBSE Delhi 2012]

Q.10 Explain why ortho nitrophenol is more acidic than ortho methoxyphenol.

[CBSE 2012]

Q.11 Of the two alcohols :

$\text{CH}_2 = \text{CH} - \text{CH}_2\text{OH}$ and

$\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_2\text{OH}$ which one will react more easily with conc. HCl in the presence of ZnCl_2 ?

[CBSE (F) 2012]

Q.12 How would you obtain Picric acid (2,4,6-trinitrophenol) from phenol.

[CBSE Delhi 2012]

Q.13 a) Answer the following questions

i) Among HI, HBr, HCl, HI is most reactive towards alcohols. Why?

ii) Of the two alcohols ; (a) $\text{CH}_2 = \text{CH} - \text{CH}_2\text{OH}$ and (b) $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_2\text{OH}$, which one will react more easily with conc. HCl in the presence of ZnCl_2 ?

[CBSE (F) 2012]

b) Arrange the following compounds in the increasing order of their acid strengths :

4-nitrophenol, Phenol, 2, 4, 6-trinitrophenol

[CBSE (F) 2013]

Q.14 Give reasons for the following :

i) *p*-nitrophenol is more acidic than *o*-nitrophenol.

ii) Bond angle C-O-C in ethers is slightly higher than the tetrahedral angle ($109^\circ 28'$).

iii) $(\text{CH}_3)_3\text{C} - \text{Br}$ on reaction with NaOCH_3 gives an alkene instead of an ether.

[CBSE 2015]

Q.15 Give reasons for the following :

i) Phenol is more acidic than ethanol.

ii) Boiling point of ethanol is higher in comparison to methoxymethane.

[CBSE Patna 2015]

Q.16 $(\text{CH}_3)_3\text{C} - \text{O} - \text{CH}_3$ on reaction with HI gives $(\text{CH}_3)_3\text{C} - \text{I}$ and CH_3OH as the main products and no $(\text{CH}_3)_3\text{C} - \text{OH}$ and $\text{CH}_3 - \text{I}$.

[CBSE 2015]

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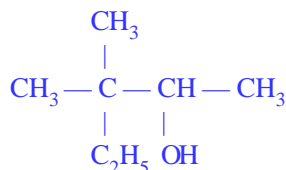
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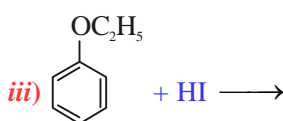
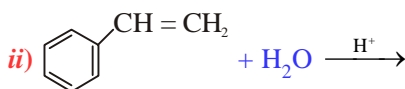
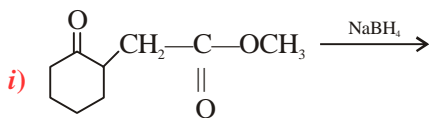
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Q.17 Write the IUPAC name of the following :



[CBSE 2018]

Q.18 Write the structures of the main products in the following reactions :



[CBSE 2018]

Q.19 For questions number two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given

i) Both Assertion (A) and Reason (R) are correct

statements, and Reason (R) is the correct explanation of the Assertion (A).

ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Phenol is more acidic than *p*-methylphenol.

Reason (R) : The presence of an electron releasing group in *p*-methylphenol makes it less acidic.

[CBSE 2020]

Q.20 Write the major product(s) of the following reactions :



Q.21 a) Write the mechanism of the following reaction:



b) Write the preparation of phenol from cumene.

[CBSE 2020]

Or

How can you convert the following :

i) Sodium phenoxide to *o*-hydroxybenzoic acid

ii) Acetone to propene

iii) Phenol to chlorobenzene

[CBSE 2020]

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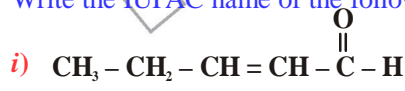
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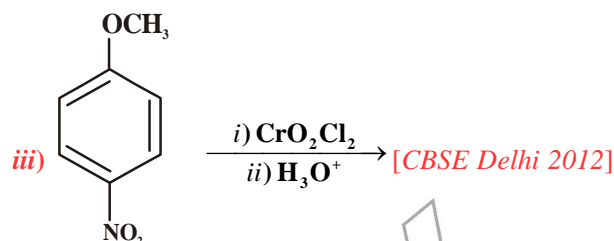
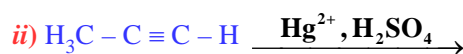
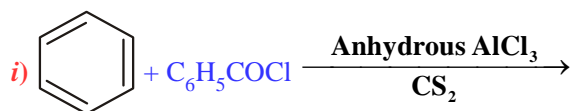
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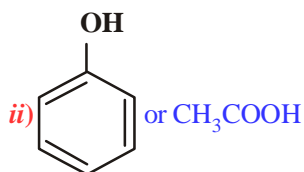
- Q.1** Give chemical tests to distinguish between
i) Acetaldehyde and benzaldehyde
ii) Propanone and propanol [CBSE Delhi 2008]
- Q.2** Arrange the following in order of property indicated for each set
 $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}_2\text{COOH}$
 (increasing order of their acid strengths)
 [CBSE Delhi 2008]
- Q.3** How will you bring about the following conversions?
 [CBSE 2009]
i) Ethanol to 3-hydroxybutanal
ii) Benzaldehyde to Benzophenone
- Q.4** An organic compound contains 69.77% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollens' reagent but forms an additional compound with sodium hydrogensulphite and gives a positive iodoform test. On vigorous oxidation, it gives with ethanoic acid and propanoic acid. Write the possible structure of the compound.
 [CBSE Delhi 2008, 2009, (AI) 2009]
- Q.5** An organic compound (A) molecular formula $\text{C}_8\text{H}_{16}\text{O}_2$ was hydrolysed with dilute sulphuric acid to a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produce (B), (C) on hydration gives but-1-ene. Write equation for the reactions involved. [CBSE (AI) 2009, CBSE Dehli 2010]
- Q.6** Write the structural formula of
i) 3-oxopentanal. [CBSE(F) 2009, 2011]
ii) p-Methylbenzaldehyde.
- Q.7** How would bring about the following conversions? Write the complete equation in each case.
i) Ethan-1 to 3-hydroxybutanal
ii) Benzene to m-nitrobenzyl alcohol.
iii) Benzaldehyde to benzophenone.
 [CBSE(AI)2011]
- Q.8** Write the IUPAC name of the following

i) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \overset{\text{O}}{\parallel}{\text{C}} - \text{H}$
ii) $\text{Ph} - \text{CH} = \text{CH} - \text{CHO}$ [CBSE (AI) 2012]
- Q.9** Draw the structure of 3-Methylbutanal.
 [CBSE Dehli 2012]
- Q.10** Write the structures of the main products of following reactions :



- Q.11** Arrange the following in order of property indicated for each set ethanal, propanal, propanone, butanone (increasing order of reactivity in nucleophilic addition reactions).
 [CBSE Delhi 2012]
- Q.12** Arrange the following compounds in increasing order of their property as indicated :
i) Benzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (acid strength)
ii) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$, $(\text{CH}_3)_2\text{CHCOOH}$ (acid strength) [CBSE(AI)2012]
- Q.13** Draw the structure of 4-Methylpent-3-ene-2-one.
 [CBSE 2004, (AI) 2005, (F) 2012, 2013]
- Q.14** Write the products of the following reactions :
 $\text{CH}_3 - \overset{\text{O}}{\parallel}{\text{C}} - \text{Cl} + \text{H}_2 \xrightarrow{\text{Pd} - \text{BaSO}_4} ?$
 [CBSE (AI) 2013]
- Q.15** Explain Clemmensen reduction. [CBSE 2011, 2013]
- Q.16** *a)* Give reasons for the following :
i) Ethanal is more reactive than acetone towards nucleophilic addition reaction.
ii) $(\text{CH}_3)_3\text{C} - \text{CHO}$ does not undergo aldol condensation.
iii) Carboxylic acids are higher boiling liquids than alcohols.
b) Give a simple chemical test to distinguish between
i) Acetophenone and Benzophenone
ii) Benzaldehyde and Ethanal [CBSE (F) 2013]
- Q.17** *a)* Although phenoxide ion has more number of resonating structures than carboxylate ion, carboxylic acid is a stronger acid than phenol. Give two reasons ?
b) How will you bring about the following conversions?
i) Propanone to propane
ii) Benzoyl chloride to benzaldehyde
iii) Ethanal to but-2-enal [CBSE Delhi 2013]

Q.18 Which acid of each pair shown here would you expect to be stronger ?

i) $F-CH_2-COOH$ or $Cl-CH_2-COOH$



[CBSE (AI) 2013]

Q.19 Why is acetic acid a stronger acid than phenol ?

[CBSE 2013]

Q.20 Give simple chemical tests to distinguish between the following pairs of compounds :

i) Benzaldehyde and Benzoic acid

ii) Propanal and Propanone [CBSE Delhi 2014]

Q.21 a) Write the products formed when ethanal reacts with the following reagents :

i) CH_3MgBr and then H_3O^+

ii) $Zn-Hg/conc. HCl$

iii) C_6H_5CHO in the presence of dilute $NaOH$

b) Give simple chemical tests to distinguish between the following pairs of compound :

i) Benzoic acid and Ethyl benzoate

ii) Propanal and Butan-2-one [CBSE(F) 2014]

Q.22 Account for the following :

i) $Cl-CH_2COOH$ is a stronger acid than CH_3COOH .

ii) Carboxylic acids do not give reactions of carbonyl group. [CBSE(AI)2014]

Q.23 How do you convert the following Ethyne to Ethanal?

[CBSE(F) 2015]

Q.24 Arrange the following compounds in increasing order of their property as indicated

CH_3COCH_3 , $C_6H_5-CO-C_6H_5$, CH_3CHO (reactivity towards nucleophilic addition reaction)

[CBSEBhubaneswar 2015]

Q.25 a) Write the structures of the main products when acetone ($CH_3-CO-CH_3$) reacts with the following reagents :

i) $Zn-Hg/conc.HCl$ ii) $H_2N-NHCONH_2/H^+$

iii) CH_3MgBr and then H_3O^+

b) Arrange the following in the increasing order of their boiling points :

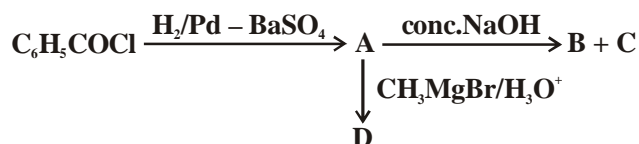
C_2H_5OH , CH_3-CHO , CH_3-COOH

c) Give a simple chemical test to distinguish between the following pair of compound :

CH_3CH_2CHO and $CH_3CH_2COCH_3$

[CBSE Patna 2015]

Q.26 a) Write the structures of A, B, C and D in the following reactions :



b) Distinguish between the following :

i) $C_6H_5-COCH_3$ and $C_6H_5-COCH_2CH_3$

ii) Benzoic acid and Phenol

c) Write the structure of 2-hydroxybenzaldehyde.

[CBSE Chennai 2015]

Q.27 Account for the following :

a) Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.

b) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid. [CBSE 2018]

Q.28 (A), (B) and (C) are three non-cyclic functional isomers of a carbonyl compound with molecular formula C_4H_8O . Isomers (A) and (C) give positive Tollens' test whereas isomer (B) does not give Tollens' test but gives positive Iodoform test. Isomers (A) and (B) on reduction with $Zn(Hg)/conc. HCl$ give the same product (D).

a) Write the structures of (A), (B), (C) and (D).

b) Out of (A), (B) and (C) isomers, which one is least reactive towards addition of HCN ?

[CBSE 2018]

Q.29 For questions number two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given

i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Acetic acid is stronger than formic acid.

Reason (R) : In acetic acid, the electron releasing methyl group makes it difficult to break the $O-H$ bond. [CBSE 2020]

Q.30 Write the products formed when $(CH_3)_3C-CHO$ reacts with the following reagents :

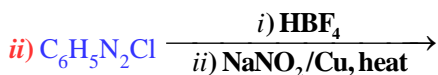
i) CH_3COCH_3 in the presence of dilute $NaOH$

ii) HCN

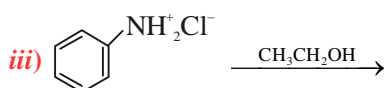
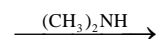
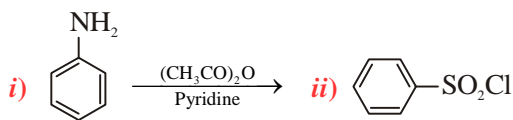
iii) $Conc. NaOH$ [CBSE 2020]

- Q.1** Arrange the following in the decreasing order of their basic strength Ammonia, triethylamine, aniline, ethylamine and diethylamine. [CBSE (AI)2009]
- Q.2** Arrange the following compounds in increasing order of basic strengths in their aqueous solutions:
 NH_3 , CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, $(\text{CH}_3)_3\text{N}$. [CBSE (AI) 2009]
- Q.3** Arrange the following compounds in the order of property indicated for each set :
- i)* NH_3 , RNH_2 , R_2NH , R_3NH (increasing order of their basic strength in aqueous solutions)
- ii)* Methylamine, dimethylamine, aniline, N-methylaniline (increasing order of their acid strength).
- iii)* *p*-toluidine, N,N-dimethyl *p*-toluidine, *p*-nitroaniline, aniline (increasing basicity). [CBSE (AI)2009]
- Q.4** Why have primary amines higher boiling point than tertiary amines ? [CBSE 2011]
- Q.5** Why is ethylamine soluble in H_2O whereas aniline is insoluble? [CBSE 2008,2011]
- Q.6** *a)* Explain why an alkylamine is more basic than ammonia
b) How would you convert
i) Aniline to nitrobenzene ?
ii) Aniline to iodobenzene? [CBSE Delhi 2011]
- Q.7** Rearrange the following in an increasing order of their basic strengths . [CBSE(AI) 2011]
 $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, $(\text{C}_6\text{H}_5)_2\text{NH}$ and CH_3NH_2
- Q.8** Write chemical equations for the following conversions
i) Nitrobenzene to benzoic acid
ii) Benzyl chloride to 2-phenylethanamine
iii) Aniline to benzyl alcohol [CBSE Delhi 2012]
- Q.9** Write the structure of prop-2-en-1 amine. [CBSE 2013]
- Q.10** How will you convert the following
i) Aniline to chlorobenzene
ii) Ethanoic acid to methanamine
iii) Benzene diazonium chloride to phenol [CBSE (F) 2013]
- Q.11** Write short note on carbylamine reaction. [CBSE 2014]
- Q.12** The conversion of primary aromatic amines into diazonium salts is known as [CBSE (AI)2014]
- Q.13** Write the chemical equations involved when aniline is treated with the following reagents
i) Br_2 water *ii)* $\text{CHCl}_3 + \text{KOH}$ *iii)* HCl [CBSE Patna 2015]
- Q.14** *a)* Write the structures of main products when aniline reacts with the following reagents :
i) Br_2 water *ii)* HCl *iii)* $(\text{CH}_3\text{CO})_2\text{O}$ / pyridine
b) Arrange the following in the increasing order of their boiling point :
 $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_2\text{H}_5\text{OH}$, $(\text{CH}_3)_3\text{N}$
c) Give a simple chemical test to distinguish between the following pair of compounds :
 $(\text{CH}_3)_2\text{NH}$ and $(\text{CH}_3)_3\text{N}$ [CBSE Delhi 2015]
- Q.15** *a)* Write the structures of main products when benzene diazonium chloride ($\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^-$) reacts with the following reagents :
i) HBF_4/Δ
ii) Cu/HBr
b) Write the structures of A,B and C in the following reactions :
- i)* $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Sn/HCl}} \text{A} \xrightarrow[273 \text{ K}]{\text{NaNO}_2 + \text{HCl}} \text{B} \xrightarrow[\Delta]{\text{H}_2\text{O}} \text{C}$
- ii)* $\text{CH}_3\text{Cl} \xrightarrow{\text{KCN}} \text{A} \xrightarrow{\text{LiAlH}_4} \text{B} \xrightarrow[273 \text{ K}]{\text{HNO}_2} \text{C}$ [CBSE(F)2015]
- Q.16** An aromatic compound 'A' of molecular formula, $\text{C}_7\text{H}_7\text{ON}$ undergoes a series of reactions as shown below. Write the structures of A,B,C, D and E in the following reactions : [CBSE Delhi 2015]

Q.17 Complete the following reactions : [CBSE 2018]



Q.18 a) Write the structures of the main products of the following reactions :



b) Give a simple chemical test to distinguish between Aniline and N, N-dimethylaniline.

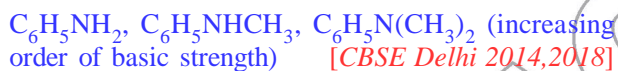
c) Arrange the following in the increasing order of their pK_b values :



[CBSE 2018]

Q.19 Write Gabriel phthalimide reaction for preparation of primary amine. [CBSE 2018]

Q.20 Arrange the following compounds in the order of property indicated for each set :



Q.21 In the following cases rearrange the compounds as directed : [CBSE 2018]

i) In increasing order of basic strength:

a) Aniline, *p*-nitroaniline and *p*-toluidine

b) $C_6H_5NH_2, C_6H_5NHCH_3, C_6H_5CH_2NH_2$

ii) In increasing order of solubility in water



iii) In decreasing order of basic strength in gas phase:



Q.22 Write the product when benzenediazonium chloride reacts with ethanol. [CBSE 2020]

Q.23 Which parts of amino acids molecules are linked through hydrogen bonds in the secondary structure of proteins ?

(A) NH_2 group

(B) $COOH$ group

(C) $-C(=O)-$ and $-NH-$ groups

(D) None of the above

[CBSE 2020]

Q.24 a) Give reasons :

i) Although $-NH_2$ group is *o/p* directing in electrophilic substitution reactions, yet aniline, on nitration gives good yield of *m*-nitroaniline.

ii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

iii) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.

b) Distinguish between the following :

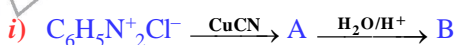
i) $CH_3CH_2NH_2$ and $(CH_3CH_2)_2NH$

ii) Aniline and CH_3NH_2

[CBSE 2020]

Or

a) Write the structures of A and B in the following reactions :



b) Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

c) Arrange the following in the increasing order of their pK_b values :



[CBSE 2020]

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- Q.1** Name the location where protein synthesis occurs.
[CBSE Delhi 2004]
- Q.2** What are enzymes ? How do enzymes differ from chemical catalysts ?
[CBSE 2005]
- Q.3** Describe the mechanism of replication of DNA.
[CBSE (AI)2005]
- Q.4** Comment on the specificity of enzyme action. What is the most important reason for their specificity?
[CBSE (AI) 2005]
- Q.5** Answer the following :
i) What type of linkage is responsible for the primary structure of proteins ?
ii) Name the location where protein synthesis occurs in our body.
[CBSE Delhi 2007]
- Q.6** What are reducing and non-reducing sugars ?
[CBSE 2008]
- Q.7** Explain the invert sugar?
[CBSE (F) 2009]
- Q.8** Classify the vitamins on the basis of their solubility in water or fats.
[CBSE 2009]
- Q.9** Name the four bases present in DNA. Which one of these is not present in RNA ?
[CBSE(AI) 2009]
- Q.10** What are peptides ?
[CBSE 2009, 2011, CBSE Delhi 2011]
- Q.11** What does primary structure of proteins refer to ?
[CBSE (AI) 2011, CBSE Delhi 2011]
- Q.12** What do you mean by secondary structure of protein?
[CBSE Delhi 2011]
- Q.13** Explain what is meant by the following pyranose structure of glucose.
[CBSE (AI) 2011;(F)2011]
- Q.14** Write a reaction which shows that all the carbon atoms in glucose are linked in straight chain.
[CBSE (AI) 2012]
- Q.15** Write three such behaviours of glucose which cannot be explained by an open chain structure of glucose molecule. What alternative structure has been proposed for glucose.
[CBSE (AI) 2012]
- Q.16** What is peptide bond ?
[CBSE 2012]
- Q.17** What is glycogen ? How is it different from starch? How is starch structurally different from cellulose?
[CBSE (F) 2012]
- Q.18** Of the two bases named below, which one is present in RNA and which one is present in DNA ?
Thymine, Uracil
[CBSE(F) 2012]
- Q.19** Name the product obtained when sucrose is hydrolysed in the presence of acid.
[CBSE 2013]
- Q.20** What is the difference between a nucleoside and nucleotide?
[CBSE Delhi 2010, F 2013]
- Q.21** What are functions of different types of RNA.
[CBSE Delhi 2013]
- Q.22** Name the two components of α -glucose which constitute starch.
[CBSE (F) 2014]
- Q.23** Define the following terms Oligosaccharides.
[CBSE(AI)2014]
- Q.24** Write the product formed when glucose is treated with HI.
[CBSE Delhi 2014]
- Q.25** Glucose on reaction with HI gives *n*-hexane. What does it suggest about the structure of glucose ?
[CBSE Delhi 2014]
- Q.26** What type of linkage is responsible for the formation of proteins ?
[CBSE Delhi 2014]
- Q.27** Deficiency of which vitamin causes scurvy ?
[CBSE Delhi 2014]
- Q.28** Deficiency of which vitamin causes rickets?
[CBSE Delhi 2014]
- Q.29** Define : Vitamins
[CBSE (F) 2014]
- Q.30** Write the name of the disease caused by the deficiency of vitamin B₁₂.
[CBSE 2015]
- Q.31** Write the product obtained when D-glucose reacts with H₂N – OH.
[CBSE Patna 2015]
- Q.32** Which one of the following is a polysaccharide ?
Starch, Maltose, Fructose, Glucose. [CBSE 2015]
- Q.33** Why cannot vitamin C be stored in our body ?
[CBSE Patna 2015]
- Q.34** Write the name of the vitamin responsible for the coagulation of blood.
[CBSE 2015]
- Q.35** Define the following with an example of each :
a) Polysaccharides
b) Denatured protein
c) Essential amino acids [CBSE 2018]
- Q.36** a) Amino acid show amphoteric behaviors. Why?
b) Write one difference between α -helix and β -pleated structures of proteins. [CBSE 2018]
- Q.37** What are polysaccharides ? [CBSE 2018]
- Q.38** Name the disaccharide which on hydrolysis gives glucose and galactose. [CBSE 2020]
- Q.39** Define the following terms :
i) Glycosidic linkage
ii) Native protein [CBSE 2020]

Q.1 What is vulcanization of rubber ? What are the advantages of vulcanized rubber ?

[CBSE Delhi 2006]

Q.2 How does vulcanization change the properties of natural rubber ?

[CBSE Delhi 2006]

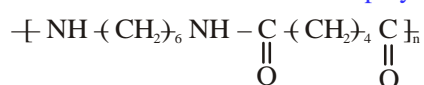
Q.3 Why are the number 6,6 and 6 put in the names of nylon 6, 6 and nylon 6 ?

[CBSE Delhi 2006]

Q.4 Give the preparation and one use of : Neoprene

[CBSE 2011]

Q.5 Write the name of monomers of the polymer.



[CBSE (F) 2013]

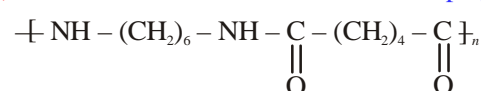
Q.6 In a school, lot of emphasis is given to the 3R principle of Reduce, Reuse and Recycle. The students observe their teachers following it and they have made to follow it in school. Reeta also tries to follow the 3R principle at home and always tries to save paper.

i) Mention the values shown by Reeta.

ii) How do you think Reeta follows 3R principle at home ?

iii) Name the chemical substance present in cotton, just and rayon fibre.

iv) Write the names of monomers of the polymer



[CBSE (F) 2013]

Q.7 Which of the following is a natural polymer ?

Buna -S, Proteins, PVC

[CBSE(AI)2014]

Q.8 Write the names and structures of the monomers of the following polymers :

i) Nylon - 6,6

ii) PHBV

iii) Neoprene

[CBSE Delhi 2015]

Q.9 Low density polythene and high density polythene, both are polymers of ethene but there is marked difference in their properties. Explain.

[CBSE 2018]

Q.10 What are biodegradable polymers ? Give example.

[CBSE 2013, 2018]

Q.11 Write the names and structures of the monomers in the following polymers :

i) Buna - N

ii) Natural rubber

iii) Nylon-6

[CBSE 2020]

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Q.1 Explain the following with suitable examples:

i) Cationic detergents

ii) Anionic detergents and

iii) Non-ionic detergents [CBSE 2009]

Q.2 What are antacids ? Give examples. [CBSE 2011]

Q.3 What are the main constituents of dettol ?

[CBSE Dehli 2011]

Q.4 How do antiseptics differ from disinfectants? Give one example of each. [CBSE 2009,12]

Q.5 What is meant by 'narrow spectrum antibiotics'? [CBSE(F) 2012]

Q.6 What are food preservatives ? Give examples. [CBSE 2009,12]

Q.7 What are biodegradable and non-biodegradable detergents ? Give one example of each.

[CBSE Delhi 2008, (F) 2012]

Q.8 Explain the cleansing action to soaps. Why do soaps not work in hard water ? [CBSE(AI)2012]

Q.9 Name the substance which can be used as an antiseptic as well as disinfectant. [CBSE 2013]

Q.10 Mr. Naresh works in a multi-national company. He is stressed due to his hectic schedule. Mr. Amit his friend, comes to know that he has started taking sleeping pills without consulting the doctor. Mr. Amit requests Naresh to stop this practice and takes him to a Yoga centre. With regular Yoga sessions, Mr. Naresh is now a happy and relaxed man.

After reading the above passage, answer the following questions :

i) Write the values shown by Mr. Amit.

ii) Which class of drugs is used in sleeping pills ?

iii) Why is it not advisable to take sleeping pills without consultation with the doctor ?

iv) Give an example of a drug used for relieving tension.

[CBSE(F) 2013]

Q.10 Which one of the following drugs is an antibiotic : Morphine, Equanil, Chloramphenicol, Aspirin

[CBSE(F) 2014]

Q.11 Give two examples of macromolecules that are chosen as drug targets. [CBSE Delhi 2014]

Q.12 Name the sweetening agent used in the preparation of sweets for a diabetic patient. [CBSE Delhi 2014]

Q.13 Mr. Roy, the principal of one reputed school organised a seminar in which he invited parents and principals to discuss the serious issue of diabetes and depression in students. They all resolved this issue by strictly banning the junk food in schools and to introduce healthy snacks and drinks like soup, lassi, milk etc., in school canteens. They also decided to make compulsory half an hour physical activities for the students in the morning assembly daily. After six months, Mr. Roy conducted the health survey in most of the school and discovered a tremendous improvement in the health of students. After reading the above passage, answer the following:

i) What are the values (at least two) displayed by Mr. Roy ?

ii) As a student, how can you spread awareness about this issue ?

iii) What are tranquilizers ? Give an example.

iv) Why is use of aspartame limited to cold foods and drinks ? [CBSE Delhi 2015]

Q.14 *a)* Why is bithional added to soap?

b) What is tincture of iodine? Write its one use.

c) Among the following, which one acts as a food preservative ? [CBSE 2018]

Aspartame, Aspirin, Sodium Benzoate, Paracetamol

Q.15 What is tincture of iodine ? What is its use ?

[CBSE 2008, 2018]

Q.16 What type of chemical substances are used in sleeping pills ? [CBSE 2020]

Q.17 Give reasons :

i) Unbranched chain detergents are preferred over branched chain detergents.

ii) Aspartame is not used in cooking hot dishes.

[CBSE 2020]

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