CBSE Board
Class XII Chemistry – Set 3
Board Paper - 2012

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 numbers 1 to 8 are very short- answer questions carrying 1 mark each. Answer these in one word or about one sentence each.
4. Question numbers 9 to 18 are short-answer questions, carrying 2 marks each. Answer these in about 30 words each.
5. Question numbers 19 to 27 are short answer questions, carrying 3 marks each. Answer these in about 40 words each.
6. Question numbers 28 to 30 are long answer questions of carrying 5 marks each. Answer these in about 70 words each.
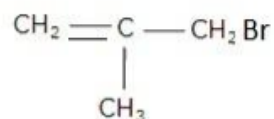7. Use Log Tables, if necessary. Use of calculators is not permitted.

Questions:

Q. 1 What is meant by 'doping' in a semiconductor?   [1]

Q. 2 What is the role of graphite in the electrometallurgy of aluminium?   [1]

Q. 3 PH_3, and H_2S which is more acidic and why?   [1]

Q. 4 Give the IUPAC name of the following compound.   [1]

$$CH_2 = \underset{\underset{CH_3}{|}}{C} - CH_2\,Br$$

Q. 5 Draw the structure of hex-1-en-3-ol compound.   [1]

Q. 6 Define the term, homopolymerisation giving an example.   [1]

Q. 7 Arrange the following in the decreasing order of their basic strength in aqueous solutions: [1]
$CH_3\,NH_2$, $(CH_3)_2\,NH$, $(CH_3)_3\,N$ and NH_3

Q. 8 Arrange the following compounds in an increasing order of the reactivity in nucleophillic addition reactions: ethanol, propanal, propanone, butanone.   [1]

Q. 9 A 1.00 molal aqueous solution of trichloroacetic acid (CCl$_3$COOH) is heated to its boiling point. The solution has the boiling point of 100.18 °C. Determine the van't Hoff factor for trichloroacetic acid. (K$_b$ for water = 0.512 K kg mol^{-1})

OR

Define the following terms: [2]
(i)   Mole fraction
(ii) Isotonic solutions
(iii) Van't Hoff factor
(iv) Ideal solution

Q. 10 Name the two groups into which phenomenon of catalysis can be divided. Given an example of each group with the chemical equation involved.   [2]

Q. 11 What do you understand by the 'order of a reaction'? Identify the reaction order from each of the following units of reaction rate constant: [2]
(i) L^{-1} mol s^{-1}
(ii) L mol^1 s^{-1}

Q. 12 Explain the following terms giving one example for each: [2]
(i) Micelles
(ii) Aerosol

Q. 13 Explain the following giving an appropriate reason in each case.
(i) O$_2$ and F$_2$ both stabilize higher oxidation states of metals but O$_2$ exceeds F$_2$ in doing so.
(ii) Structures of Xenon fluorides cannot be explained by Valence Bond approach. [2]

Q. 14 Describe the principle involved in each of the following processes.
(i) Mond process for refining of Nickel.
(ii) Column Chromatography for purification of rare elements.   [2]

Q. 15 What is meant by (i) peptide linkage (ii) biocatalysts?   [2]

Q. 16 (i)$Cr_2O_7^{2-} + H^+ + I^- \rightarrow$
(ii)$MnO_4^- + NO_2 + H^+ \rightarrow$ [2]

Q. 17 Draw the structure of the monomer for each of the following polymers: [2]
(i) Nylon 6
(ii) Polypropene

Q. 18 Write any two reactions of glucose which cannot be explained by the open chain structure of glucose molecule. [2]

Q. 19 Tungsten crystallizes in body centered cubic unit cell. If the edge of the unit cell is 316.5pm, what is the radius of tungsten atom?

OR

Iron has a body centered cubic unit cell with a cell dimension of 286.65 pm. The [3] density of iron is 7.874 g cm^{-3}. Use this information to calculate Avogadro's number. (At. Mass of Fe = 55.845 µ)

Q. 20 150 g of an unknown molecular material was dissolved in 450g of water. The resulting solution was found to freeze at -0.64 °c. What is the molar mass of this material? (K_f for water =1.86 gmol^{-1}) [3]

Q. 21 For the reaction

$2NO_{(g)}+Cl_{2(g)} \rightarrow 2NOCl_{(g)}$
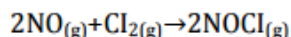
The following data were collected. All the measurements were taken at 263 K:

Experiment No	Initial [NO] (M)	Initial [Cl$_2$] (M)	Initial rate of disappearance of Cl$_2$ (M/min)
1	0.15	0.15	0.60
2	0.15	0.30	1.20
3	0.30	0.15	2.40
4	0.25	0.25	?

(a) Write the expression for rate law. [3]
(b) Calculate the value of rate constant and specify its units.
(c) What is the initial rate of disappearance of CI, in exp. 4?

Q. 22 Explain the following observations giving an appropriate reason for each. [3]
(i) The enthalpies of atomization of transition elements are quite high.
(ii) There occurs much more frequent metal-metal bonding in compounds of heavy transition metals (i.e. 3rd series).
(iii) Mn^{2+} is much more resistant than Fe^{2+} towards oxidation.

Q. 23 Write the name, the structure and the magnetic behavior of each one of the following complexes: [3]
(i) [Pt (NH$_3$) CI (NO$_2$)]
(ii) [Co(NH$_3$)$_4$Cl$_2$] CI
(iii) Ni (CO)$_4$
        (At. Nos. Co = 27, Ni = 28, Pt = 78)
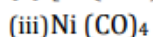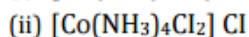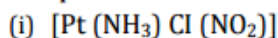
Q. 24 Write chemical equations for the following conversions: [3]
   (i) Nitrobenzene to benzoic acid.
   (ii) Benzyl chloride to 2-phenylethanamine.
   (iii)Aniline to benzyl alcohol.

Q. 25 Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic aromatic substitution reaction. Explain why it is so?

Q. 26 Draw the structure and name the product formed if the following alcohols are oxidised. Assume that an excess of oxidizing agent is used.
   (i) $CH_3CH_2CH_2CH_2OH$
   (ii) 2-butenol
   (iii)2-methyl-1- propanol

Q. 27 Explain the following terms giving one example of each type: [3]
   (i) Antacids,
   (ii) Disinfectants,
   (iii)Enzymes.

Q. 28 (a) What type of a battery is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery when current is drawn from it.
   (b) In the button cell, widely used in watches, the following reaction taken place

   $$Zn_{(s)}+Ag_2O_{(s)}+H_2O_{(l)} \rightarrow Zn^{2+}_{(aq)}+2Ag_{(s)}+2OH^-_{(aq)}$$
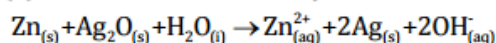
   Determine E^0 and ΔG^o for the reaction.

   $$\left(given: E^{\circ}_{Ag^+/Ag}=+0.8 \text{ V}, E^{\circ}_{Zn^{2+}/Zn}=-0.76V\right)$$ [5]

                              OR
   (a) Define molar conductivity of a solution and explain how molar conductivity changes with change In concentration of solution for a weak and a strong electrolyte.
   (b) The resistance of a conductivity cell containing 0.001 M KCI solution at 298 K is 1500 Ω. What is the cell constant if the conductivity of 0.001 M KCI solution at 298 K is 0.146 x 10^{-3} S cm^{-1}?

Q.29 (a) Illustrate the following name reactions giving suitable example in each case:
   (i) Clemmenson reduction
   (ii) Hell-volhard-Zelinsky reaction
   (b) How are the following conversions carried out?
   (i) Ethylcyanide to ethanoic acid
   (ii) Butan-1-ol to butanoic acid
   (iii) Benzoic acid to m-bromobenzoic acid
                              OR

Q.29 (a) Illustrate the following reactions given a suitable example for each.
   (i) Cross aldol condensation
   (ii) Decarboxylation

   (b) Given simple tests to distinguish between the following pairs of compounds
   (i) Pentan-2-one and Pentan-3-one
   (ii) Benzaldehyde and Acetophenone
   (iii) Phenol and Benzoic acid

Q. 30 (a) Draw the molecular structures of following compounds:
   (i) XeF_6
   (ii) $H_2S_2O_8$
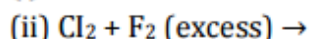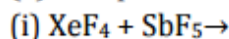   (b) Explain the following observations:
   (i) The molecules NH_3 and NF_3 have dipole moments which are of opposite direction.
   (ii) All the bonds in PCl_5 molecule are not equivalent.
   (iii) Sulphur in vapor state exhibits paramagnetism.

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OR

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(a) Complete the following chemical equations:
(i) $XeF_4 + SbF_5 \rightarrow$
(ii) $Cl_2 + F_2$ (excess) $\rightarrow$
(b) Explain each the following:
(i) Nitrogen is much less reactive than phosphorus.
(ii) The stability of +5 oxidation state decreases down group 15.
(iii) The bond angles (O - N - O) are not of the same value in NO_2^+ and NO_2^-