CBSE Class 12 Chemistry 2018 - Set 56-3

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

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

General Instructions

(i) This question paper contains 26 questions. All questions are compulsory.
(ii) All questions are compulsory.
(iii) Questions number 1 to 5 are very short answer questions and carry 1 mark each.
(iv) Questions number 6 to 10 are short answer questions and carry 2 marks each.
(v) Questions number 11 to 22 are also short answer questions and carry 3 marks each.
(vi) Question number 23 is a value based question and carries 4 marks.
(vii) Questions number 24 to 26 are long answer questions and carry 5 marks each.
(viii) Use log tables, if necessary. Use of calculators is not allowed.

Questions

1. Write the coordination number and oxidation state of Platinum in the complex $[Pt(en)_2Cl_2]$.

2. Analysis shows that FeO has a non-stoichiometric composition with formula $Fe_{0.95}O$. Give reason.

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

4. Write the IUPAC name of the following:

5. CO (g) and H_2 (g) react to give different products in the presence of different catalysts. Which ability of the catalyst is shown by these reactions?

6. Among the hydrides of Group-15 elements, which have the

(a) lowest boiling point?

(b) maximum basic character?

(c) highest bond angle?

(d) maximum reducing character?

7. 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 K kg mol^{-1})

8(a). How do you convert the following?

(a) Ethanal to Propanone

(b) Toluene to Benzoic acid

OR

8(b). 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.

9. Complete and balance the following chemical equations:

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

(b) $MnO_4^- + H_2O + I^- \longrightarrow$

10. For the reaction

$2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$,

the rate of formation of NO_2 (g) is 2.8×10^{-3} M s^{-1}. Calculate the rate of disappearance of N_2O_5 (g).

11. (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.

12. 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 J K^{-1} mol^{-1})

13. An element 'X' (At. mass = 40 g mol^{-1}) having f.c.c. 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 × 10^{23} mol^{-1})

14. Give reasons for the following:

(a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.

(b) Aquatic animals are more comfortable in cold water than in warm water.

(c) Elevation of boiling point of 1 M KCl solution is nearly double than that of 1 M sugar solution.

15. What happens when

(a) a freshly prepared precipitate of $Fe(OH)_3$ 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?

16. Write the chemical reactions involved in the process of extraction of Gold. Explain the role of dilute NaCN and Zn in this process.

17. (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?

18. (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?

Aspartame, Aspirin, Sodium Benzoate, Paracetamol

19. (a) Write the formula of the following coordination compound:

Iron(III) hexacyanoferrate(II)

(b) What type of isomerism is exhibited by the complex $[Co(NH_3)_5Cl]SO_4$?

(c) Write the hybridisation and number of unpaired electrons in the complex $[CoF_6]^{3-}$. (Atomic No. of Co = 27)

20(a). Define the following with an example of each:

(a) Polysaccharides

(b) Denatured protein

(c) Essential amino acids

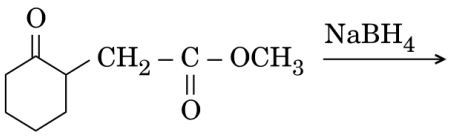
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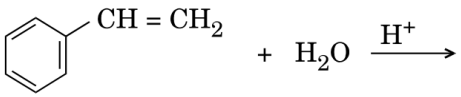
20(b). (a) Write the product when D-glucose reacts with conc. HNO_3.

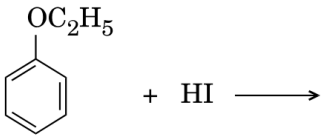
(b) Amino acids show amphoteric behaviour. Why?

(c) Write one difference between α-helix and β-pleated structures of proteins.

21. Write the structures of the main products in the following reactions:

(i) 

(ii) 

(iii) 

22. Give reasons:

(a) E° 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.

23. Shyam went to a grocery shop to purchase some food items. The shopkeeper packed all the items in polythene bags and gave them to Shyam. But Shyam refused to accept the polythene bags and asked the shopkeeper to pack the items in paper bags. He informed the shopkeeper about the heavy penalty imposed by the government for using polythene bags. The shopkeeper promised that he would use paper bags in future in place of polythene bags.

Answer the following:

(a) Write the values (at least two) shown by Shyam.

(b) Write one structural difference between low-density polythene and high-density polythene.

(c) Why did Shyam refuse to accept the items in polythene bags?

(d) What is a biodegradable polymer? Give an example.

24(a). (a) Write the reactions involved in the following:

(i) Hofmann bromamide degradation reaction

(ii) Diazotisation

(iii) Gabriel phthalimide synthesis

(b) Give reasons:

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

(ii) Aromatic diazonium salts are more stable than aliphatic diazonium salts.

OR

24(b). (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:

$C_2H_5NH_2$, $C_6H_5NH_2$, $C_6H_5NHCH_3$

25(a). (a) Give reasons:

(i) H_3PO_3 undergoes disproportionation reaction but H_3PO_4 does not.

(ii) When Cl_2 reacts with excess of F_2, ClF_3 is formed and not FCl_3.

(iii) Dioxygen is a gas while Sulphur is a solid at room temperature.

(b) Draw the structures of the following:

(i) XeF_2

(ii) $HClO_4$

OR

25(b). (a) When concentrated sulphuric acid was added to an unknown salt present in a test tube a brown gas (A) was evolved. This gas intensified when copper turnings were added to this test tube. On cooling, the gas (A) changed into a colourless solid (B).

(i) Identify (A) and (B).

(ii) Write the structures of (A) and (B).

(iii) Why does gas (A) change to solid on cooling?

(b) Arrange the following in the decreasing order of their reducing character:

HF, HCl, HBr, HI

(c) Complete the following reaction:

$XeF_4 + SbF_5 \longrightarrow$

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

Sn (s) | Sn^{2+} (0.004 M) || H^+ (0.020 M) | H_2 (g) (1 bar) | Pt (s)

(Given: $E^{\circ}_{Sn^{2+}/Sn} = -0.14$ 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.

OR

26(b). (a) For the reaction

$2AgCl(s) + H_2(g)\,(1\,atm) \longrightarrow 2Ag(s) + 2H^+(0.1\,M) + 2Cl^-(0.1\,M)$,

$\Delta G^{\circ} = -43600$ J at 25°C.

Calculate the e.m.f. of the cell.

[log 10^{-7} = -7]

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

- End of Question Paper -