

2020
CHEMISTRY
(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three hours

All the Questions are compulsory.

The figures in the right margin indicate full marks for the questions.

(Question Nos. 1-10 are Very short Answer (VSA) type of 1 mark each.)

1. KBr crystal does not show Frenkel defect. Give reason. 1
2. Atoms of element B (as anions) make CCP and those of element A (as cations) occupy all the octahedral voids. Predict the formula of the compound. 1
3. What is meant by 'limiting molar conductivity' ? 1
4. Why does physisorption decrease with rise of temperature ? 1
5. Copper (I) has d^{10} configuration while copper (II) has d^9 configuration, still copper (II) is more stable in aqueous solution than copper (I). Assign reason. 1
6. A solution of bromine in methanol or ethanol cannot be used for the detection of unsaturation in organic compounds. Why ? 1
7. Write the structure of the isomer that will have the lowest boiling point of all the isomers of C_4H_9Cl . 1

P.T.O.

8. Name the sugar formed when a nucleotide from DNA containing thymine is hydrolysed. 1
9. Why is bakelite a thermosetting polymer? 1
10. Why is the use of aspartame limited to cold foods and drinks? 1

Question Nos. 11–14 are Objective type carrying 1 mark each. Choose and rewrite the best answer out of the given alternatives.

11. Two faradays of electricity are passed through a solution of CuSO_4 . The mass of copper deposited at the cathode (at mass of $\text{Cu}=63.5$ amu) is 1
- A. 2 g
- B. 127 g
- C. 31.75 g
- D. 63.5 g
12. Which of the following is kept under water? 1
- A. White phosphorus
- B. Sodium metal
- C. Sulphur
- D. Red phosphorus

13. The colour of which of the following compounds is NOT due to d – d transition.

1

- A. CoCl_2
- B. KMnO_4
- C. $\text{Cr}_2(\text{SO}_4)_3$
- D. NiSO_4

14. Which of the following is the IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$?

1

- A. Platinum diammine chloronitrite
- B. Chloronitrito-N-ammine platinum-II
- C. Diamminechlorido nitrito-N-platinum-II
- D. Diammine chloronitrito-N-platinate.

Question Nos. 15 – 24 are Short Answer (SA-II) types of 2 marks each.

15. What type of defect can arise when Sr^{2+} (as SrCl_2) is added as impurity in ionic solid Na^+Cl^- . Justify your answer.

2

16. Why molecularity is applicable only for elementary reactions and order is applicable for elementary as well as complex reactions ?

2

17. An aqueous solution of gas 'A' gave the following reactions.

2

(i) It decolourised an acidified KMnO_4 solution.

(ii) On boiling with H_2O_2 followed by cooling and then adding an aqueous solution of BaCl_2 , a white precipitate insoluble in dil. HCl was obtained. identify the gas 'A' and give the equation for step (ii).

18. What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand. 2
19. Give the equations for the preparation of 1-Iodobutane from
- (i) 1-butanol and
 - (ii) 1-chlorobutane 2
20. From the type of hybridisation with respect to haloalkanes and haloarenes, predict the reactivity of haloarenes towards nucleophilic substitution in comparison to haloalkanes. 2
21. Explain the following : 2
- (i) Diazonium salts of aromatic amines are more stable than those of aliphatic amines.
 - (ii) Amines are less acidic than alcohols of comparable molecular masses.
22. A saturated monoamine liberates nitrogen gas on reaction with nitrous acid in cold condition. On heating with methyl iodide it forms quaternary ammonium iodide (mol. mass = 215). Deduce the formula of the amine. (Given at. mass of iodine = 127). 2
23. Name the polymer which is used for making non-stick utensils and describe the preparation of it. 2
24. How are antiseptics different from disinfectants? Is chlorine in low concentration (0.2 to 0.41 ppm) antiseptic or disinfectant? 2

Question Nos. 25-31 are Short Answer (SA-I) types of 3 marks each.

25. Calculate the E.M.F. of the cell, 3



$$E_{\text{Ag}^+/\text{Ag}}^0 = +0.8\text{V}, E_{\text{Mg}^{2+}/\text{Mg}}^0 = -2.37\text{V}$$

What happens to the E.M.F. if the concentration of Ag^+ is decreased to $1 \times 10^{-4}\text{M}$? [given $\log 5 = 0.6990$]

26. What is the relation between rate constant and activation energy of a reaction? Illustrate the effect of a negative catalyst on activation energy by plotting a curve between the reaction co-ordinate and energy. 1+2=3

27. Give reasons for the following statements : 3

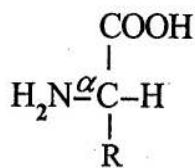
- (a) Smoke from fire often has blue tinge
- (b) Gelatin is generally added to ice cream
- (c) Lyophilic sols are called reversible colloids

28. Differentiate between 'Roasting' and 'Calcination' with one example each. 3

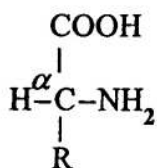
29. Write the stepwise process for the preparation of potassium dichromate from chromite ore. 3

30. What is Aldol condensation? Describe it with suitable example each for the formation of aldol and ketol. 3

31. (i) Assign D – and L– configuration of α – amine acids for the following structures I and II.



I



II

- (ii) On electrolysis in acidic medium amino acids migrate towards the cathode while in alkaline medium they migrate towards anode. Explain. 1+2 = 3

Question Nos. 32-34 are Essay (E) type of 5 marks each.

32. (a) Define colligative properties.
- (b) Establish the relationship between the relative lowering of vapour pressure of a solution and mole fraction of the solute in it when the solvent alone is volatile.
- (c) The van't Hoff factor (i) of a solution is more than one. What does it indicate?
1+3+1= 5
33. (i) Why are halogens placed in Group 17 ?
- (ii) Halogens except fluorine exhibit higher oxidation state. Explain why.
- (iii) Why are boiling points of noble gases very low? How the boiling points vary on going down the group (gr-18) ?
1+2+2=5

34. (a) An organic compound 'A' having molecular formula C_6H_6O gives a characteristic colour with $FeCl_3$ solution. When 'A' is treated with CO_2 and $NaOH$ at 400 K under pressure, compound 'B' is obtained. The compound 'B' upon acidification gives compound 'C' which reacts with acetylchloride to form 'D' which is a popular pain killer. Deduce the structures of A, B, C and D.

(b) Predict the products of the following reaction

