SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

CHEMISTRY

Class 12 - Chemistry

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

General Instructions:

The question paper is divided into **four sections**:

1. **Section A**
   - Q. No. 1 contains **Ten multiple choice type** of questions carrying **One mark** each.
   - Q. No. 2 contains **Eight very short answer type** of questions carrying **One mark** each.
2. **Section B**
   - Q. No. 3 to Q. No. 14 contain **Twelve short answer type** of questions carrying **Two marks** each. (Attempt any Eight).
3. **Section C**
   - Q. No. 15 to Q. No. 26 contain **Twelve short answer type** of questions carrying **Three marks** each. (Attempt any Eight).
4. **Section D**
   - Q. No. 27 to Q. No. 31 contain **Five long answer type** of questions carrying **Four marks** each. (Attempt any Three).
5. Use of the log table is allowed. Use of calculator is not allowed.
6. Figures to the right indicate full marks.
7. For each MCQ, correct answer must be written along with its alphabet. e.g., (a).... / (b) ...../ (c)..... / (d)..... Only first attempt will be considered for evaluation.
8. Physical constants:- i) ---------- ii) ---------- iii) ----------

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Section A

1. **Select and write the correct answer:** **[10]**

(a) An ionic compound crystallises in FCC type structure with **A** ions at the centre of each face and **B** ions occupying corners of the cube. The formula of compound is _____. **[1]**

a) A_3B b) AB_3

c) AB_4 d) AB

(b) The pH of 0.001 M HCl solution is _____. **[1]**

a) 11 b) 10

c) 3 d) 2

(c) Which among the following reactions is an example of a zero order reaction? **[1]**

a) $C_{12}H_{22}O_{11(aq)} + H_2O_{(l)} \rightarrow C_6H_{12}O_{6(\text{ aq })} + C_6H_{12}O_{6(aq)}$ b) $2NH_{3(g)} \xrightarrow{Pt} N_{2(g)} + 3H_{2(g)}$

c) $2H_2O_{2(l)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$ d) $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$

(d) Fe_2O_3 is reduced to spongy iron near the top of blast furnace by _____. **[1]**

a) CaO b) H_2

c) SiO_2 d) CO

(e) IUPAC name of $K_4\left[Fe(CN)_6\right]$ is _____. **[1]**

a) potassium ferrocyanide b) potassium hexacyanoferrate

c) potassium ferricyanide d) tetrapotassium ferrocyanide

(f) Grignard's reagent is prepared by action of magnesium metal on _____. **[1]**

a) benzene b) alcohol

c) phenol d) alkyl halide

(g) The product of following reaction is $CH_3 - CH = CH - CH_2 - CHO \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } LiAlH_4}$ _____? **[1]**

a) $CH_3 - CH = CH - CH_2 - COOH$ b) $CH_3 - CH_2 - CH_2 - CH_2 - COOH$

c) $CH_3 - CH = CH - CH_2 - CH_2 - OH$ d) $CH_3 - CH_2 - CH_2 - CH_2 - OH$

(h) How many moles of acetic anhydride will be required to form glucose pentaacetate from 2 M of glucose? **[1]**

a) 10 b) 2.5

c) 2 d) 5

(i) The name of metal nanoparticle which acts as highly effective bacterial disinfectant in water purification process is _____. **[1]**

a) carbon black b) copper

c) silver d) gold

(j) Carboxylic acids on heating with P_2O_5 give _____. **[1]**

a) acid chlorides b) acid amides

c) alkyl halides d) acid anhydrides

2. **Answer the following:** **[8]**

(a) Define nanoscience. **[1]**

(b) Write the formula of Hinsberg's reagent. **[1]**

(c) Write the product formed when alkyl halide reacts with silver nitrite. **[1]**

(d) What is the action of selenium on magnesium metal? **[1]**

(e) Write the name of isomerism in the following complexes: **[1]**

$[Cu(NH_3)_4]\left[PtCl_4\right]$ and $[Pt(NH_3)_4]\left[CuCl_4\right]$

(f) Define: Freezing point. **[1]**

(g) Define Extensive property. **[1]**

(h) Write the net cell reaction during discharging of lead accumulator. **[1]**

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Section B

Attempt any 8 questions

3. What are interstitial compounds? Give the classification of alloys with examples. **[2]**
4. Define van't Hoff factor. How is it related to the degree of dissociation? **[2]**
5. Define nanochemistry. **[2]**
6. How is ethanol prepared from methanal by using Grignard reagent? **[2]**
7. Write conversion of 2-bromobutane into unsaturated hydrocarbon by using alcoholic KOH. **[2]**
8. Give the limitations of Arrhenius theory of acids and bases. **[2]**
9. How is ethylamine prepared from nitroalkane? **[2]**
10. Determine whether the following reaction is exothermic or endothermic and spontaneous or non-spontaneous for the given data: **[2]**

    $\Delta H = -110\ kJ$ and $\Delta S = +40\ J\ K^{-1}$ at 400 K.
11. Define optical activity. How many optical isomers are possible for glucose? **[2]**
12. Define: **[2]**

    i. Extensive and intensive properties.

    ii. Isobaric and adiabatic processes
13. Write chemical reaction for preparation of teflon. **[2]**
14. Describe anomalous behaviour of oxygen as compared with other elements of group 16 with reference to: **[2]**

    i. Magnetic property

    ii. Oxidation state

    iii. Hydrides

Section C

Attempt any 8 questions

15. Derive the relation between elevation of boiling point and molar mass of solute. **[3]**
16. A face centred cube (fcc) consists of how many atoms? Explain. **[3]**
17. What is the mass of Cu metal produced at the cathode during the passage of 5 ampere current through $CuSO_4$ solution for 6000 seconds? Molar mass of Cu is 63.5 $g\ mol^{-1}$. **[3]**
18. What is the action of following on ethyl bromide? **[3]**

    i. Silver nitrite

    ii. Mg in dry ether

    iii. Alcoholic sodium hydroxide
19. Calculate $C - Cl$ bond enthalpy from the following reaction: **[3]**

    $CH_3Cl_{(g)} + Cl_{2(g)} \rightarrow CH_2Cl_{2(g)} + HCl_{(g)}; \Delta H^\circ = -104\ kJ$

    If $C - H, Cl - Cl$ and $H - Cl$ bond enthalpies are 414, 243 and 431 $kJ\ mol^{-1}$ respectively.
20. Calculate spin only magnetic moment of divalent cation of transition metal with atomic number 25. **[3]**

    Salts of Ti^{4+} are colourless. Give reason.
21. The pH of solution is 3.12. Calculate the concentration of H_3O^+ ion. **[3]**
22. Explain monodentate and ambidentate ligands with example. **[3]**
23. Show that, half life of first order chemical reaction is independent of initial concentration of the reactant. **[3]**
24. Write the structure and IUPAC names of isomeric aldehydes having molecular formula $C_5H_{10}O$. **[3]**
25. Give reason: Bleaching action of ozone is also called dry bleach. **[3]**
26. **Answer the following:** **[3]**

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(a) Write the structure and IUPAC name of the following compound: **[2]**

i. Adipic acid

ii. α-methyl butyraldehyde.

(b) How is ethanamine prepared by using methyl cyanide? **[1]**

Section D

Attempt any 3 questions

27. **Answer the following:** **[4]**

(a) A reaction occurs by the following mechanism: **[2]**

i. $NO_{2(g)} + F_{2(g)} \rightarrow NO_2F_{(g)} + F_{(g)}$

ii. $F_{(g)} + NO_{2(g)} \rightarrow NO_2F_{(g)}$

Identify the intermediate and write net reaction.

(b) Give the observed outer electronic configuration of copper $(Z = 29)$. **[1]**

(c) Write the reaction involved in sol-gel process during hydrolysis. **[1]**

28. **Answer the following:** **[4]**

(a) Write one statement of first law of thermodynamics and its mathematical expression. **[2]**

(b) Explain the following term: Homopolymer **[1]**

(c) How is peptide linkage formed? **[1]**

29. **Answer the following:** **[4]**

(a) Face centred cubic crystal lattice of copper has density of $8.966\ g\ cm^{-3}$. Calculate the volume of the unit cell. **[2]**

[Given: Molar mass of copper is $63.5\ g\ mol^{-1}$ and Avogadro number N_A is $6.022 \times 10^{23}\ mol^{-1}$]

(b) Convert carboxylic acids to: **[2]**

i. ester

ii. acid amide

30. **Answer the following:** **[4]**

(a) Give cis and trans isomers of $[Co(NH_3)_4Cl_2]^+$. **[2]**

(b) Draw a neat and labelled diagram of lead storage battery. **[1]**

(c) Write the name of radioactive element in group 16. **[1]**

31. **Answer the following:** **[4]**

(a) From methyl magnesium iodide, how ethanol and propan-2-ol are prepared? **[2]**

(b) Write structure and molecular formula for the compound: **[2]**

Sulphurous acid

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