

Guess Paper – 2014
Class – XII
Subject – Chemistry

TIME – 3 Hrs

MM 70

INSTRUCTIONS: i) ALL QUESTIONS ARE COMPULSORY. However internal choices are given.

ii) Question nos 1 to 8 carry 1 mark each.iii) Question nos 9 to 18 carry 2 marks each.

i v) Question nos 19 to 27 carry 3 marks each.v) Question nos 28 to 30 carry 5 marks each.

1. What is the co-ordination number of hcp? [1]
 2. Aquatic species are more comfortable in cold water than in hot water. Why? [1]
 3. What is the function of cryolite in the extraction of Aluminium? [1]
 4. Why does conductivity of a solution decrease with dilution? [1]
 5. Name the factors that affect the rate of reaction. [1]
 6. PCl_5 exists but not NCl_5 , Why? [1]
 7. H_3PO_3 acts as a good reducing agent whereas H_3PO_4 does not. Explain. [1]
 8. Write the two applications of co-ordination compounds. [1]
 9. Calculate the packing efficiency in hcp/ccp crystals. [2]
 10. Write short notes on a) Schottky defect , b) P – type semiconductor. [2]
 11. The cell in which the following reactions occur :

$$2 \text{Fe}^{3+} (\text{aq}) + 2 \text{I}^- \rightarrow 2 \text{Fe}^{2+} (\text{aq}) + \text{I}_2 (\text{s})$$
 has $E^\circ_{\text{cell}} = 0.236 \text{ v}$ at 298 K. [2]
 Calculate $\Delta_r G^\circ$ and the equilibrium constant, K_c , of the cell reaction.
 12. a) The rate law for the reaction is, $\text{rate} = [\text{A}]^2[\text{B}]$.What is order of reaction?
 b) What is the effect of catalyst on activation energy? [2]
- OR**
- Prove that $t_{1/2} = 0.693/k$ [2]
13. a) Distinguish between order and molecularity of a reaction.

- b) What is meant by pseudo first order reaction? Give an example of it.
14. a) Distinguish between physisorption and chemisorption. [2]
15. Write short notes on a) Ultrafiltration, b) Peptization. [2]
16. a) What happens when PCl_5 is heated?
- b) Write the principles involved in preparing NH_3 by Haber process. [2]
17. a) Arrange the following compounds in order of their increasing acidity: $\text{HI}, \text{HCl}, \text{HF}, \text{HBr}$
- b) During the preparation of ozone silent electric discharge is being done. Explain. [2]
18. a) State the factors which govern the stability of co-ordination complex.
- b) Write the IUPAC name following compound; $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$ [2]
19. Vapour pressure of chloroform (CHCl_3) and dichloromethane (CH_2Cl_2) at 298 K are 200 mm Hg and 415 mm Hg respectively. Calculate the vapour pressure of solution prepared by mixing 25.5 gm of CHCl_3 and 40 gm of CHCl_2 at 298 K and also calculate mole fractions of each component in vapour phase. [3]
20. Aluminium crystallizes in a cubic close-packed structure. Its metallic radius is 125 pm.
- (i) What is the length of the side of unit cell? (ii) How many unit cells are there in 1.00 cm^3 of Al?
21. The following results have been obtained during the kinetic studies of the reaction: $2\text{A} + \text{B} \rightarrow \text{C} + \text{D}$

Experiment	[A]/mol L ⁻¹	[B]/mol L ⁻¹	Initial rate of formation of D/mol L ⁻¹ min ⁻¹
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

- Determine the order of reaction and write the rate law for this reaction. [3]
22. a) Suggest two ways for preventing corrosion.
- b) Why molar conductivity of weak electrolyte at infinite dilution cannot be determined directly.
- c) What are the advantages of using fuel cell?
23. a) Explain the principle involved in the concentration of sulphide ores. [3]

- b) What is 'roasting'?
- c) What are the roles of Ellingham diagram in metallurgy?
24. Complete the following reactions : [3]
- i) a) $P_4 + SOCl_2 \longrightarrow$
- b) $XeF_6 + KF \longrightarrow$
- ii) Draw the structures of the following compounds : $XeOF_4$.
25. Explain : a) There is a greater range of oxidation states among the actinoids than lanthanoids.
- b) Atomic radii of second and third d- series elements almost same.
- c) The highest oxidation state of a metal exhibited in its oxides or fluorides only.
26. a) What is the role of desorption in the process of catalysis.? [3]
- b) What are micelles?
- c) Why does physisorption decrease with the increase of temperature?
27. a) What are secondary cells ? Give two examples. [3]
- b) Deduce a relation among conductance, cell constant and conductivity.
28. a) Explain i) vant-Hoff factor ii) molality.
- b) Calculate the depression in the freezing point of water when 10.0 gm of $CH_3CH_2CH(Cl)COOH$ is added to 250 gm of water. $K_a = 1.4 \times 10^{-3}$, K_f for water = 1.86 K kg/mol. Density of solution = 0.904 g/ml. [5]
29. a) Explain the steps involved in the preparation of sulphuric acid during contact process.
- b) $BiCl_3$ is more stable than $BiCl_5$. Explain.
- c) Except water, reducing character of hydrides of group 16 elements increases. Explain.
- d) What happens when H_3PO_3 is heated ?
- e) Fluorine is a stronger oxidizing agent than chlorine. Why ? [5]
- OR**
- i) Write any two important sources of sulphur. [5]
- ii) What is meant by aqua regia ?

- iii) $\text{ClF} + \text{H}_2\text{O} \rightarrow$. Complete the reaction.
- iv) How XeF_6 can be prepared ?
- v) How chlorine can be prepared by Deacon's process ?
30. i) Indicate the steps involved in the preparation of $\text{K}_2\text{Cr}_2\text{O}_7$ from chromite ore. [2]
- ii) The enthalpies of atomization of transition metals are high. Explain. [1]
- iv) $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$. Explain. [1]
- v) Which is a stronger reducing agent Cr^{+2} or Fe^{+2} and why? [1]

OR

- a) Actinoids show more oxidation states than lanthanoids. Why? [5]
- b) Indicate the steps involved in the preparation of KMnO_4 from pyrolusite ore.
- c) Balance the equation by ion-electron method: $\text{MnO}_4^- + \text{S}_2\text{O}_3^{2-} \rightarrow \dots + \dots$ (alkaline medium)
- d) Cu^+ is less stable than Cu^{+2} in aqueous solution. Why?
- e) The melting point of Mn is abnormally low in the 3d series. Explain.

Bi-Annual Examination 2013-14

Class – XII
Subject – Chemistry

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Date- 14/08/2013

SN	Name of Chapter	VSA	SA	LA	VLA	Total Marks (No.of question)
1	The Solid State	1(1)	2(2)	3(1)	-	8(4)
2	The Solution	-	-	3(1)	5(1)	8(2)

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3	Electrochemistry	1(1)	2(1)	3(2)	-	8(4)
4	Chemical Kinetics	1(1)	2(2)	3(1)	-	8(4)
5	Surface Chemistry	-	2(2)	3(1)	-	7(3)
6	Isolation of elements	1(1)	-	3(1)	-	4(2)
7	p-Block Elements	1(3)	2(2)	3(1)	5(1)	15(7)
8	d & f-Block Element	-	-	3(1)	5(1)	8(2)
9	Coordination Compound	1(1)	2(1)	-	-	3(2)

Total 70(30)

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PGT, Chemistry

ANSWER KEY (XII) CHEMISTRY

1. The co-ordination number of hcp is 12. [1]
2. Aquatic species are more comfortable in cold water than in hot water due to more dissolve oxygen. [1]
3. The function of cryolite is to improve the conductivity & reduce the m. pt of alumina. [1]
4. Conductivity is the no of ions present in unit volume. On dilution, no of ions decreases per unit volume. [1]
5. Concentration, temperature & catalyst. [1]
6. Due to unavailability of d-orbital. Nitrogen can't expands its covalence. [1]

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7. H_3PO_3 contains one P-H bond whereas in H_3PO_4 does not contains P-H bond. [1]

8. Any two applications of co-ordination compounds. [1]

9. The volume of the ccp unit cell = $a^3 = 32r^3/\sqrt{2}$ The volume of the 4 sphere = $16\pi r^3/3$ 1

Packing efficiency = $\frac{\text{Volume of 4 atom} \times 100\%}{\text{Volume of ccp unit cell}}$

$$= 0.74\% = 74\% \quad [1]$$

10. a) Schottky defect- Equal no of ions are missing from there sites so that electrical neutrality is maintain. 1

, b) P – type semiconductor is formed by dopping Si or Ge by group 15 element. [1]

11. The reactions is : $2 \text{Fe}^{3+} (\text{aq}) + 2 \text{I}^- \rightarrow 2 \text{Fe}^{2+} (\text{aq}) + \text{I}_2 (\text{s})$

$$E^\circ_{\text{cell}} = 0.236 \text{ \& } n=2. \quad \Delta_r G^\circ = -nF E^\circ_{\text{cell}} = - 45.55 \text{ kJ/mol.} \quad 1$$

$$\Delta_r G^\circ = -2.303 RT \log K_c \quad K_c = 9.616 \times 10^7 \quad 1$$

12) a) The order of reaction is 3. 1

b) Due to presence of catalyst activation energy decreases. 1

OR

$$K = \frac{2.303}{t} \cdot \log \frac{[R]_0}{[R]} \quad 1$$

$$\text{at } t_{1/2}, [R] = [R]_0 / 2 \quad K = \frac{2.303}{t_{1/2}} \cdot \log \frac{[R]_0}{[R]_0 / 2}$$

$$t_{1/2} = \frac{2.303}{K} \cdot \log 2 \quad t_{1/2} = 0.693/K \quad 1$$

13.a) Any two points. 1/2 marks each

b) The reaction which are not truly of 1st order but behave as 1st order under certain conditions.

any example of it. 1

14. a) Any four points. 1/2m each

15. a) Ultrafiltration –filtration one by using ultrafilter paper made by soaking in formalin & collidin solution. 1

b) Peptization – process of converting a fresh ppt into colloidal particles by shaking it with dispersion

medium in presence of small amount of a suitable electrolyte. 1

16.a) $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$ 1

- b) NH_3 prepared by Haber process at 700K & 200 atm in presence of $\text{FeO} + \text{K}_2\text{O} + \text{Al}_2\text{O}_3$ 1
17. a) The order of increasing acidity : $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$ 1
- b) Since ozone formation is endothermic & also it prevents decomposition of ozone back to oxygen. 1
18. a) Any two factors. 1
- b) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$ – Hexaaminocobalt(II)Chloride. 1
19. (i) Molar mass of $\text{CH}_2\text{Cl}_2 = 12 \times 1 + 1 \times 2 + 35.5 \times 2 = 85 \text{ g mol}^{-1}$
- Molar mass of $\text{CHCl}_3 = 12 \times 1 + 1 \times 1 + 35.5 \times 3 = 119.5 \text{ g mol}^{-1}$ 1/2
- Moles of $\text{CH}_2\text{Cl}_2 = 140 \text{ g} / 85 \text{ g mol}^{-1} = 0.47 \text{ mol}$ Moles of $\text{CHCl}_3 = 125.5 \text{ g} / 119.5 \text{ g mol}^{-1} = 0.213 \text{ mol}$
- Total number of moles = $0.47 + 0.213 = 0.683 \text{ mol}$ 1/2
- $\text{CH}_2\text{Cl}_2 \text{ } x = 0.47 \text{ mol} / 0.683 \text{ mol} = 0.688$. $\text{CHCl}_3 \text{ } x = 1.00 - 0.688 = 0.312$
- total $p = p_{10} + (p_{20} - p_{10}) \cdot x_2 = 200 + (415 - 200) \times 0.688 = 200 + 147.9 = 347.9 \text{ mm Hg}$ 1
- (ii) $y_i = p_i / p_{\text{total}}$,
- $\text{CH}_2\text{Cl}_2 \text{ } p = 0.688 \times 415 \text{ mm Hg} = 285.5 \text{ mm Hg}$ $\text{CHCl}_3 \text{ } p = 0.312 \times 200 \text{ mm Hg} = 62.4 \text{ mm Hg}$
- $\text{CH}_2\text{Cl}_2 \text{ } y = 285.5 \text{ mm Hg} / 347.9 \text{ mm Hg} = 0.82$ $\text{CHCl}_3 \text{ } y = 62.4 \text{ mm Hg} / 347.9 \text{ mm Hg} = 0.18$ 1
20. i) ccp = fcc, For fcc, $a = 2\sqrt{2}r = 2 \times 4.414 \times 125 = 354 \text{ pm}$ 1
- ii) Volume of one unit cell = $(354 \times 10^{-10} \text{ cm})^3 = 4.44 \times 10^{-23} \text{ cm}^3$ 1
- Unit cells in $1 \text{ cm}^3 = 1 / 4.44 \times 10^{-23} = 2.25 \times 10^{22}$ 1
21. Rate $(r) = k [\text{A}]^x [\text{B}]^y$
- $(r)_1 = k [0.1]^x [0.1]^y$ $(r)_2 = k [0.3]^x [0.2]^y$ $(r)_3 = k [0.3]^x [0.4]^y$ $(r)_4 = k [0.4]^x [0.1]^y$ 1
- $(r)_1 / (r)_4 = k [0.1]^x [0.1]^y / k [0.4]^x [0.1]^y = 6.0 \times 10^{-3} / 2.40 \times 10^{-2}$ or $1/4 = [0.1]^x [0.4]^x$ $x = 1$ 1/2
- $(r)_2 / (r)_3 = k [0.3]^x [0.2]^y / k [0.3]^x [0.4]^y = 7.2 \times 10^{-2} / 2.88 \times 10^{-1}$ or $1/4 = [0.2]^y [0.4]^y$ $y = 2$ 1/2
- The order of reaction = 3 and the rate law is: Rate $(r) = k [\text{A}][\text{B}]^2$. 1
22. a) Any two methods. 1
- b) Because of concentrations of ions per unit volume is very low. 1
- c) Any two advantages of using fuel cell. 1

23. a) The surface of sulphide ores is preferentially wetted by oils that of gangue is wetted by water. 1
 b) Process of converting ore to its metallic oxide by strongly heating below its m. pt in excess of air. 1
 c) Ellingham diagram help in predicting feasibility of thermal reduction of an ore in metallurgy. 1
24. i) a) $P_4 + 8 SOCl_2 \rightarrow 4 PCl_3 + 4 SO_2 + 2 S_2Cl_2$ 1
 b) $XeF_6 + KF \rightarrow K^+[XeF_7]^-$ 1
 ii) Correct structures of $XeOF_4$ square pyramidal 1
25. a) Due to small energy gap between 5f,6d & 7s subshells.All their electron can take part in bond formation.
 b) Atomic radii of second and third d- series elements almost same due to lanthanoids contraction. 1
 c) Since Oxygen & fluorine have small size & high electronegativity. 1
26. a) Desorption make the surface of solid catalyst free for fresh adsorption of the reactant on the surface. 1
 b) The aggregated particles formed when substance dissolved in a medium at high concentration. 1
 c) Physisorption is exothermic process.Thus it is decrease with the increase of temperature. 1
27. a) The cells which can recharge by passing electric current through them & can use again & again. 1
 Examples : Lead storage cell & Ni-Cd storage cell. 1/2
 b) Since conductivity: $k = G \times l/a$ 1/2.
 But, Cell constant $G^* = l/a$ Thus Conductivity (k) = Conductance (G)xCell Constant (G*) 1
28. a) i) vant-Hoff factor is the ratio of experimental value to the calculated value of colligative property. 1
 ii) molality is the number of moles of solute dissolved per kg of solvent. 1
 b) Molar mass of $CH_3CH_2CH(Cl)COOH = 15+14+13+35.5+45= 122.5$ g/mol 1/2
 10 g of $CH_3CH_2CH(Cl)COOH = 10/122.5 = 8.16 \times 10^{-2}$ mol 1/2
 Molality of solution (m)= 8.16×10^{-2} mol x1000/250 = 0.3264 1/2

$$\alpha = \sqrt{K_a/C} = \sqrt{1.4 \times 10^{-3}/0.3264} = 0.065 \quad \& \quad i = 1.065 \quad 1$$

$$\text{Freezing point depression} = i K_f \cdot m = 0.65^\circ \quad 1/2$$

- 29.a) i. Production of SO₂ by burning sulphur or roasting iron pyrites 1/2
- ii. Catalytic oxidation of SO₂ by air to give sulphur trioxide. 1/2
- b) Due to more stable +5 oxidation state & inert pair effect. 1
- c) Water, is thermally stable & ability of formation of hydrogen bond. 1
- d) $4 \text{H}_3\text{PO}_3 \rightarrow \text{PH}_3 + 3 \text{H}_3\text{PO}_4$ 1
- e) Due to its low bond dissociation enthalpy & high heat of hydration as compare to Cl₂ 1

OR

- i) Any two sources. 1
- ii) 1:3 mixture of concentrated nitric acid & concentrated HCl is aqua regia 1
- iii) $\text{ClF} + \text{H}_2\text{O} \rightarrow \text{HF} + \text{HOCl}$. 1
- iv) $\text{Xe} + 3\text{F}_2 \rightarrow \text{XeF}_6$ 1
- (1:20 ratio) & 573K & 60-70 bar
- v) Deacon's process: $4 \text{HCl} + \text{O}_2 \xrightarrow{\text{CuCl}_2, 723\text{K}} 2 \text{Cl}_2 + 2 \text{H}_2\text{O}$ 1

30. i) The steps involved in the preparation of K₂Cr₂O₇ from chromite ore
- I. $4 \text{FeCr}_2\text{O}_4 + 8 \text{Na}_2\text{CO}_3 + 7\text{O}_2 \rightarrow 8 \text{Na}_2\text{CrO}_4 + 2\text{Fe}_2\text{O}_3 + 8\text{CO}_2$ 1
- II. $2\text{Na}_2\text{CrO}_4 + 2 \text{H}^+ \rightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{O}$ 1/2
- III. $\text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{KCl} \rightarrow \text{K}_2\text{Cr}_2\text{O}_7 + 2 \text{NaCl}$. 1/2
- iii) Due to large number of unpaired electrons they have strong interatomic attraction. 1
- iv) Due to decrease in size of lanthanoid ions, increases covalent character of hydroxides.
- v) Cr⁺² is a stronger reducing agent than Fe⁺² because std electrode potential of Cr⁺² is less than Fe⁺²

OR

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- a) Due to small energy gap between 5f,6d & 7s subshells.All their electron can take part in bond formation. 1
- b) The steps involved in the preparation of KMnO_4 from pyrolusite ore.
- I. $2\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \rightarrow 2\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O}$ 1/2
- II. $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$ 1/2
- c) Balance the following equation by ion-electron method:
- $2\text{MnO}_4^- + \text{S}_2\text{O}_3^{2-} + \text{H}_2\text{O} \rightarrow \text{MnO}_2 + 2\text{SO}_4^{2-} + 2\text{OH}^-$ 1
- d) 2nd IP of copper is large but hydration enthalpy for Cu^{2+} much more negative. 1
- e) Due to stable half filled configuration delocalization of electron is less & metallic bond is weaker. 1

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