

XIIth P.D

Assignment Unit - 5 Surface Chemistry

1. Explain why?

- (i) Adsorbents in finely divided form are more effective.
- (ii) Chemisorption increases with increase in temperature.
- (iii) Gas masks are used by miners in coal mines.
- (iv) Colloidal particles show Brownian movement.
- (v) Colloidal particles are charged.
- (vi) Sky appears blue in colour.
- (vii) Hydrolysis of an ester is slow in the beginning and becomes faster after some time.
- (viii) $K_3[Fe(CN)_6]$ is more effective in coagulating positively charged ferric hydroxide sol, as compared to $CaSO_4$ or KCl solution.
- (ix) Artificial rain can be caused by spraying electrified sand on the clouds.
- (x) Cottrell precipitators are used in industries.
- (xi) Sun looks red at the time of setting.
- (xii) Deltas are formed when river water meets the sea water.

2. Explain the following terms

- (i) physisorption
- (ii) chemisorption
- (iii) Tyndall effect
- (iv) Brownian movement
- (v) Hardy Schulze rule.
- (vi) adsorption enthalpy.

3. Name the catalyst used for the following process

- (i) Haber process for the manufacture of NH_3 gas.
- (ii) Ostwald process for the manufacture of HNO_3 .
- (iii) One shape-selective catalyst to convert alcohol into gasoline.

4. Write the difference between

- (i) Catalyst and enzyme.
- (ii) promoters and poisons.
- (iii) adsorption and absorption.
- (iv) Physisorption and chemisorption.

- (v) homogenous and heterogenous catalyst-
- (vi) sol and a gel
- (vii) gel and an emulsion
- (viii) coagulation and flocculation.

5. What are emulsions? How emulsions are classified? How they can be distinguished from each other?

6. What happens when?

- i) hydrated ferric oxide and arsenious sulphide are mixed in equal proportions.
- ii) animal charcoal is added to a solution of methylene blue dye.
- iii) Sulphur dioxide is passed through an aqueous solution of H_2S .
- iv) persistent dialysis of a sol is done.
- v) river water meets the sea water.
- vi) alum is applied on cuts during bleeding.

7. Define the following terms.

- i) Helmholtz electrical double layer
- ii) Zeta potential
- iii) aerosol
- iv) hydrosol
- v) ultrafiltration
- vi) micelles
- vii) emulsifying agents
- viii) Electrophoresis

General Principles and processes of
Isolation of elements

- Q.1. Name three metals which occur in native state in nature.
- Q.2. Give the names and formulae of three ores which are concentrated by froth floatation process.
- Q.3. What is thermodynamic criteria for the feasibility of a reaction?
- Q.4. Indicate the temperature at which carbon can be used as a reducing agent for FeO .
- Q.5. Why Al can not be reduced by carbon?
- Q.6. Name the impurities present in bauxite ore.
- Q.7. What are froth stabilizers? Give two examples.
- Q.8. What are the constituents of German silver?
- Q.9. Why is froth floatation process selected for concentration of the sulphide ore?
- Q.10. What is hydrometallurgy? Give one example where it is used for metal extraction.
- Q.11. Name the process for concentration of
(i) an ore having impurities lighter than it
(ii) sulphide ore
- Q.12. What is cryolite? Mention its use in the extraction of Aluminium.

Q.13. What is the role of following:

(a) SiO_2 in the metallurgy of Cu

(b) CaCO_3 in the metallurgy of Fe

Q.14. The graphite electrodes in the extraction of 'Al' by Hall-Heroult process need to be changed frequently why?

Q.15. Write equations for the industrial extraction of zinc from calamine

Q.16. Write the chemical reactions taking place in different zones in the blast furnace for the extraction of Fe from its ore.

Q.17. How are impurities separated from bauxite ore to get pure alumina?

Q.18. Why is the reduction of a metal oxide easier if metal formed is in liquid state at the temperature of reduction?

Q.19. Name the alloying element added to iron for making

(i) steel used in cutting tools and crushers

(ii) steel used in making cables, measuring tapes and aeroplane parts.

Q.20. What is pyrometallurgy? Explain with one example.

Q.21. Write the method to produce copper matte from copper pyrites.

Q.2 Free energies of formation ΔG_f° of $MgO(s)$ and $CO(g)$ at 1273K and 2273K are given below.

$$\Delta G_f^\circ [MgO(s)] = -941 \text{ kJ mol}^{-1} \text{ at } 1273K$$

$$\Delta G_f^\circ [CO(g)] = -439 \text{ kJ mol}^{-1} \text{ at } 1273K$$

Q. State the principles of refining of metal by the following methods

(a) Zone refining (b) Electrolytic refining (c) vapour phase refining.

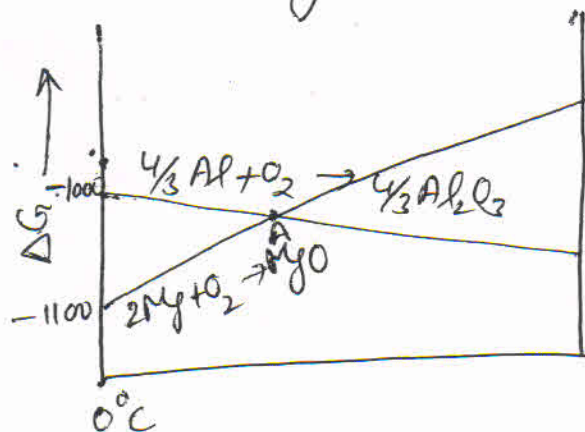
Q. Name the method of refining of the following metal :-

(a) Hg (b) Sn (c) Cu (d) Ge (e) Ni (f) Zr

Q. Suggest a condition under which,

(i) Mg can reduce Al_2O_3

(ii) Al can reduce MgO .



Q. The native silver forms a water soluble compound (B) with dil aq. solution of NaCN in the presence of a gas (A). The silver metal is obtained by the addition of metal (C) to (B) and complex (D) is formed as byproduct. Identify A, B, C, D.

Assignment Unit 7 - P-block Elements

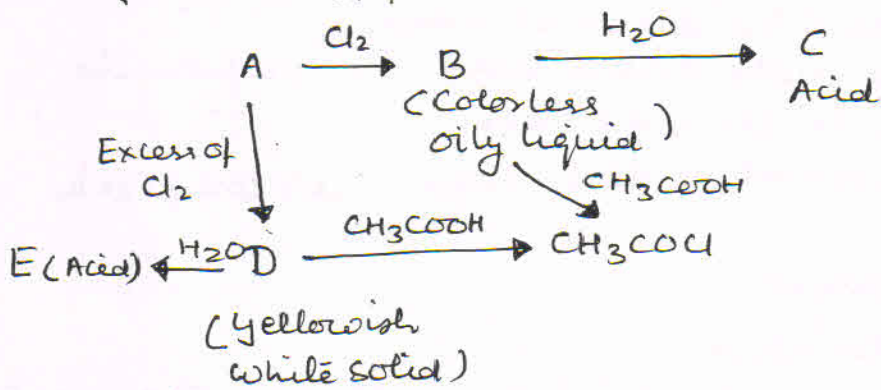
VSA Type questions (1 mark)

1. Give reason for the following
 1. In group 15 elements, there is considerable increase in covalent radius from N to P but small increase from As to Bi.
 2. The tendency to exhibit -3 oxidation state, decreases down the group 15 elements.
 3. Maximum covalence of nitrogen is '4' but the heavier elements of group 15 shows covalence greater than '4'.
 4. Nitrogen exists as diatomic molecule with a triple bond whereas other heavier elements do not.
 5. The ionization enthalpies of group 15 elements are higher than that of group 14 & group 16 elements.
 6. The boiling point of PH_3 is lesser than NH_3 .
 7. NO_2 dimerises to form N_2O_4 .
 8. NH_3 forms hydrogen bonds but PH_3 does not.
 9. NH_3 acts as a good complexing agent.
 10. HF is the weakest acid and HI is strongest acid.
 11. Halogens are strong oxidising agents.
 12. Bi(V) is stronger oxidising agent than Sb(V).
 13. SF_4 is easily hydrolysed, whereas SF_6 is not easily hydrolysed.
 14. Bond dissociation energy of F_2 is less than that of Cl_2 ?
 15. In group 16, the stability of +6 oxidation state decreases and that of +4 oxidation state increases down the group.
 16. HBr can not be prepared by heating KBr with H_2SO_4 .
 17. Sulphur disappears when boiled with aqueous solution of sodium sulphide.
 18. Fluorine exhibits only -1 oxidation state whereas other halogens exhibit '+ve' oxidation states also.
 19. Majority of known noble gas compounds are those of Xenon.
 20. Chlorine water acts as a bleaching agent.

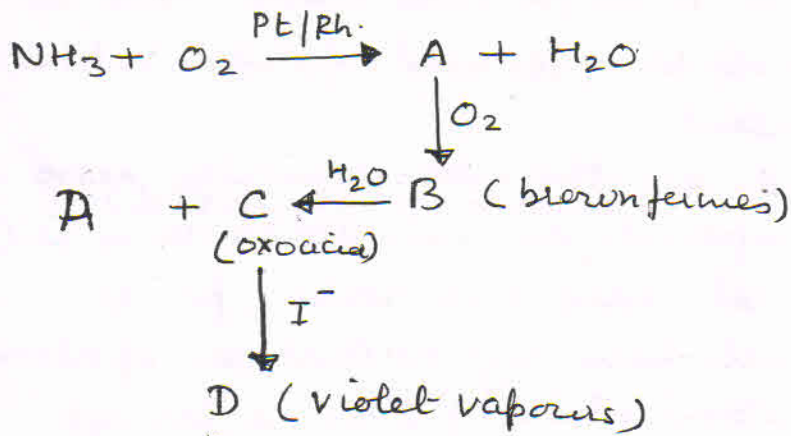
1. negative value of electron gain enthalpy of fluorine is less than that of chlorine.
22. PCl_5 is known but PI_5 is not known.
23. Red P. is denser and less chemically reactive than that of white P.
24. XeF_2 has a straight line structure and not a bent angular structure.
25. Phosphorous forms pentahalide whereas nitrogen and Bismuth do not.
26. Acidic character increases from H_2O to H_2Te .
27. Dioxygen is a gas while sulphur (S_8) is a solid.
28. Interhalogen compounds are more reactive than halogens.
29. Known binary compounds of noble gases are fluorides and oxides of Kr , Xe and Rn .
30. Hydrolysis of XeF_6 is not regarded as a redox reac.
31. Sulphur in vapour state exhibit paramagnetism.
32. In spite of same electronegativity oxygen forms hydrogen bond while chlorine does not.
33. Metal fluorides are more ionic than metal chlorides.
34. Perchloric acid is stronger than sulphuric acid.
35. Addition of Cl_2 to KI solution gives it a brown colour but excess of Cl_2 makes it colorless.
36. He does not form compounds.
37. Bond dissociation energy of fluorine is less than that of chlorine.
38. Two $S-O$ bonds in SO_2 are identical.
39. All the $P-Cl$ bonds in PCl_5 are not of same length.
40. Thermal stability of hydrides of group 16 elements decreases down the group.
41. Noble gases have large positive value of electron gain enthalpy.
42. Helium has the lowest boiling point than any known substance.
43. Fluorine forms only one oxoacid, HOF ?
44. H_2O is less acidic than H_2S .
45. SP_6 is inert while SP_4 is highly reactive.

46. H_3PO_2 and H_3PO_3 acts as a good reducing agents while H_3PO_4 does not.
47. Noble gases have comparatively large size in their respective period.
48. H_3PO_2 is a dibasic acid.
49. Molten alumina is a poor conductor of electricity.
50. Bleaching by SO_2 is temporary.
51. PCl_5 is ionic in solid state.

Ques. 2. Identify A, B, C, D and E in the following sequence of reaction.



Ques. 3. Identify A, B, C, D in the following sequence of reaction.



Ques. 4. A waxy solid M, insoluble in water but soluble in CS_2 , glows in dark. M dissolves in NaOH to form a poisonous gas N. Also M catches fire to give dense white fumes of O. Identify M, N & O and write the chemical reactions involved.

Assignment - Unit - 8
d- & f - block Elements

①

Ques : Give appropriate reason for the following .

1. CuSO_4 is blue while ZnSO_4 is colourless .
2. The third ionisation enthalpy of Manganese ($Z = 25$) is unexpectedly high .
3. Gold has completely filled d-orbitals ($5d^{10}$) in its ground state but still it is considered as a transition metal .
4. +3 oxidation states of La ($Z = 57$), Gd ($Z = 64$) and Lu ($Z = 71$) are specially stable .
5. First ionization enthalpy of 5d series of element is higher than those of 3d and 4d series element .
6. Mn^{2+} compounds are more stable than Fe^{2+} compounds towards oxidation to their +3 state .
7. Nickel shows an oxidation state zero in its complexes. $[\text{Ni}(\text{CO})_4]$.
8. V_2O_5 acts as a catalyst .
9. Cd^{2+} salts are colourless .
10. Yellow colour of aqueous solution of Na_2CrO_4 changes to orange on passing CO_2 gas .
11. In solution Cu^{2+} is much more stable than Cu^+ .
12. In permanganate ions, all bonds formed between Mn and oxygen are covalent .
13. Ni(II) compounds are thermodynamically more stable than Pt(II) compounds, whereas Pt(IV) compounds are more stable than Ni(IV) .
14. Transition metals have high boiling points .
15. Transition metals have high enthalpies of atomisation .
16. Enthalpy of atomisation of zinc is lowest .
17. Copper shows its inability to liberate hydrogen gas from the acids .
18. Scandium ($Z = 21$) does not exhibit variable oxidation state .
19. $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$.
20. Most of the transition metals do not displace hydrogen from dilute acids .
21. Transition metals form alloys .
22. Silver chloride dissolves in excess of ammonia .

23. Cuprous chloride is diamagnetic while cupric chlo. is paramagnetic.
24. There is no regular trends in E° values of M^{2+}/M systems in 3d series.
25. There is gradual decrease in the ionic radii (M^{2+}) in 3d series.
26. Transition metals form complexes.
27. Ce^{3+} can be easily oxidised to Ce^{4+} .
28. Tantalum and palladium metals are used to electroplate coinage metals.
29. Actinoids displays variety of oxidation states.
30. Yb^{2+} acts as a good reducing agent.
31. Cerium is a good analytical reagent.
32. Transition metal fluorides are ionic in nature while chlorides and bromides are covalent in nature.
33. Hydrochloric acid attacks all the actinoids.
34. $Co(II)$ is stable in aqueous solution but in the presence of complexing agent it is readily oxidised.
35. Eu^{2+} , Yb^{2+} are good reductant but Tb^{4+} is an oxidant.
36. Am and Cm ~~are~~ have exceptional configuration in Actinoids.
37. The highest oxidation state is exhibited by oxoanions of a metal.
38. Transition metals are less reactive than alkali and alkaline earth metals.
39. transition metals have very high negative values of E° still they are not good reducing agent.
40. Elements in the middle of transition series have higher melting points.

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Assignment Unit - 9 Co-ordination compounds

Ques 1: Write IUPAC names for the following complexes.

- (i) Tollen's reagent
- (ii) $L_4[AlH_4]$
- (iii) $NaBH_4$
- (iv) $K_3[CoF_6]$
- (v) $[Mo(CO)_5SCN]$
- (vi) $[Co(NH_3)_5NO_3]SO_4$
- (vii) $[NiCl_2(PPh_3)_2]$
- (viii) $[Ni(dmg)_2]$
- (ix) $[Fe(CO)_5]$
- (x) $[Cr(NH_3)_4 \cdot Br \cdot Cl]Cl$
- (xi) $[Ni(H_2O)_2(en)_2]Cl_2$
- (xii) $[Ni(en)_3]SO_4$

Ques 2: For the complexes (i) $[Fe(en)_2Cl_2]Cl$ (ii) $[Ni(H_2O)_4(en)]SO_4$ identify

- (a) The oxidation number of metal ion.
- (b) The hybrid orbitals and the shape of complex.
- (c) The magnetic behaviour of the complex.
- (d) The number of geometrical isomers.
- (e) Whether there is an optical isomer also?
- (f) Name of the complex.

Ques 3: Define the following terms.

- (i) Complex ion
- (ii) Central metal ion
- (iii) ligand
- (iv) Co-ordination number
- (v) Oxidation state
- (vi) Chelates
- (vii) Co-ordination sphere.

Ques 4: What are ambident ligands? Give two examples.

Ques 5: Explain the following by giving one example in each case.

- (i) Linkage Isomerism.
- (ii) Ionisation Isomerism
- (iii) An outer orbital complex with co-ordination no. 6.
- (iv) A hexadentate ligand.

Ques 6: Write IUPAC name, type of hybridisation of the central metal atom undergoing and the magnetic behaviour of the complex in the following species.

- (i) $[Fe(CN)_6]^{3-}$
- (ii) $[Cr(NH_3)_6]^{3+}$
- (iii) $[CoF_6]^{3-}$
- (iv) $[Ni(dmg)_2]$
- (v) $[Co(NH_3)_3Cl_3]$
- (vi) $[Cu(NH_3)_4]^{2+}$
- (vii) $[Cr(CN)_6]^{3-}$
- (viii) $[Zn(NH_3)_4]^{2+}$
- (ix) $[Ti(H_2O)_6]Cl_3$

7. Mention the main postulates of Werner's theory.
- Q. 8. How does EDTA help as a cure for lead poisoning.
- Q. 9. Write the formula and name of the coordinate isomer of $[\text{Co}(\text{en})_3][\text{Cr}(\text{CN})_6]$.
10. Write the name and formula of ionisation isomer of $[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{SO}_4$.
11. Draw the structure of geometrical isomers of the Co-ordination complexes -
 $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ and $[\text{CoCl}_2(\text{en})_2]^+$.
12. Explain the following
- All octahedral complexes of Ni^{2+} must be outer orbital complexes.
 - NH_4^+ ion does not form any complex.