## **Engineering Chemistry-II**

# SOME IMPORTANT QUESTIONS WITH SOLUTIONS

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#### What happens when

1. Hydrogen sulphide gas is passed into acidified K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution?

Solution: When hydrogen sulphide gas is passed into acidified  $K_2Cr_2O_7$  solution, then a green coloured solution is obtained along with deposition of little amount of pale yellow substance.

$$K_2Cr_2O_7 + 4H_2SO_4 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3[O]$$

$$H_2S + [O] \longrightarrow H_2O + S] \times 3$$

$$K_2Cr_2O_7 + 4H_2SO_4 + 3H_2S \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O + 3SV$$
Orange yellow
Green
Pale yellow

2. Aluminium is reacted with concentrated H<sub>2</sub>SO<sub>4</sub>?

Solution: When aluminium is heated with concentrated H<sub>2</sub>SO<sub>4</sub>, SO<sub>2</sub> is produced along with formation of aluminium sulphate.

$$H_2SO_4 \longrightarrow H_2O + SO_2 + [O]] \times 3$$
  
 $2Al + 3[O] \longrightarrow Al_2O_3$   
 $Al_2O_3 + 3H_2SO_4 \longrightarrow Al_2(SO_4)_3 + 3H_2O$   
 $2Al + 6H_2SO_4 \longrightarrow Al_2(SO_4)_3 + 6H_2O + 3SO_2$ 

3. Zinc is treated with very dilute HNO<sub>3</sub>?

Solution: When zinc is treated with very dilute HNO<sub>3</sub>, a mixture of Zn(NO<sub>3</sub>)<sub>2</sub> and ammonium nitrate is obtained.

$$Zn + 2HNO_3 \longrightarrow Zn(NO_3)_2 + 2[H]] \times 4$$
  
 $HNO_3 + 8[H] \longrightarrow NH_3 + 3H_2O$   
 $NH_3 + HNO_3 \longrightarrow NH_4NO_3$   
 $4Zn + 10HNO_3 \longrightarrow 4Zn(NO_3)_2 + NH_4NO_3 + 3H_2O$ 

4. Silver nitrate is strongly heated?

**Solution:** When silver nitrate is heated strongly, metallic silver is obtained along with evolution of  $NO_2$  and  $O_2$ .

$$2AgNO_3 \xrightarrow{\Delta} 2Ag + 2NO_2\uparrow + O_2\uparrow$$

5. Benzene is heated with concentrated HNO<sub>3</sub> in the presence of concentrated H<sub>2</sub>SO<sub>4</sub>?

Solution: When benzene is heated with concentrated HNO<sub>3</sub> in the presence of concentrated H<sub>2</sub>SO<sub>4</sub>, nitrobenzene is formed.

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6. Concentrated HNO3 reacts with iodine?

Solution: When iodine reacts with hot and concentrated HNO<sub>3</sub>, iodic acid is formed.

$$2HNO_{3} \longrightarrow H_{2}O + 2NO_{2} + [O]] \times 5$$

$$I_{2} + 5[O] \longrightarrow I_{2}O_{5}$$

$$I_{2}O_{5} + H_{2}O \longrightarrow 2HIO_{3}$$

$$I_{2} + 10HNO_{3} \xrightarrow{\Delta} 2HIO_{3} + 10NO_{2} \uparrow + 4H_{2}O$$

$$Iodic acid$$

7. Copper is heated with concentrated HNO<sub>3</sub>?

Solution: When copper is heated with concentrated HNO<sub>3</sub>, cupric nitrate is formed along with evolution of NO<sub>2</sub> gas.

$$2HNO_{3} \longrightarrow H_{2}O + 2NO_{2} + [O]$$

$$Cu + [O] \longrightarrow CuO$$

$$CuO + 2HNO_{3} \longrightarrow Cu(NO_{3})_{2} + H_{2}O$$

$$Cu + 4HNO_{3} \longrightarrow Cu(NO_{3})_{2} + 2H_{2}O + 2NO_{2} \uparrow$$

$$Cupric nitrate \qquad Brown gas$$

8. Zinc is boiled with caustic soda solution?

Solution: When zinc is boiled with caustic soda solution, hydrogen gas is evolved along with formation of sodium zincate.

$$Zn + 2NaOH \xrightarrow{\Delta} Na_2ZnO_2 + H_2$$
Caustic soda Sodium zincate

9. Lead is heated in air?

Solution: When lead is heated in air or with oxygen forms PbO (litharge) which on further heating to about 450°C forms red lead (Pb<sub>3</sub>O<sub>4</sub>).

$$2Pb + O_2 \xrightarrow{} 2PbO$$

$$6PbO + O_2 \xrightarrow{450^{\circ}C} 2Pb_3O_4$$

10. Steam is passsed over red hot iron?

Solution: When steam is passed over red hot iron, hydrogen gas is produced along with formation of Fe<sub>3</sub>O<sub>4</sub>.

$$3\text{Fe} + 4\text{H}_2\text{O} \stackrel{600-850^{\circ}\text{C}}{=} \text{Fe}_3\text{O}_4 + 4\text{H}_2$$

Ferreso-ferric oxide

11. Methane burns in air? www.arjun00.com.np Solution: When methane burns in air carbon dioxide is produced along with water vapours.

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

Methane

12. Copper coin is dropped into silver nitrate solution?

Solution: When copper coin is dropped into silver nitrate solution, cupric nitrate is formed along with formation of metallic silver.

$$Cu + 2AgNO_3 \longrightarrow 2Ag + Cu(NO_3)_2$$

13. Acetylene gas is passed into ammoniacal cuprous chloride solution?

Solution: When acetylene is passed into ammoniacal solution of cuprous chloride, a red precipitate of cuprous acetylide is formed.

HC = CH + Cu<sub>2</sub>Cl<sub>2</sub> + 2NH<sub>4</sub>OH 
$$\longrightarrow$$
 CuC = CCu + 2NH<sub>4</sub>Cl + 2H<sub>2</sub>O Copper acetylide (Red ppt.)

14. Chlorine is passed into hot and concentrated caustic soda solution?

Solution: When chlorine gas is passed through hot and concentrated caustic soda solution, a mixture sodium chloride and sodium chlorate is formed:

$$Cl_2 + H_2O \longrightarrow HCl + HClO] \times 3$$
 $NaOH + HCl \longrightarrow NaCl + H_2O] \times 3$ 
 $NaOH + HClO \longrightarrow NaClO + H_2O] \times 3$ 
 $3NaClO \longrightarrow NaClO_3 + 2NaCl$ 
 $3Cl_2 + 6NaOH \longrightarrow NaClO_3 + 5NaCl + 3H_2O$ 
(Conc.)

15. Ethylene gas is passed into alkaline KMnO<sub>4</sub> solution?

Solution: When ethylene gas is passed into alkaline KMnO<sub>4</sub> solution (Baeyer's reagent), ethylene glycol is formed and the pink colour of Baeyer's reagant is discharged.

$$CH_{2} = CH_{2} + H_{2}O + [O] \longrightarrow CH_{2} - CH_{2}$$
Ethylene
$$OH OH$$
Ethylene glycol
Ethane-1, 2-diol

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16. Moist red coloured flower is introduced into gas jar containing chlorine gas?

Solution: When moist red coloured flower is introduced into gas jar containing chlorine gas, then the flower is discolourized due to bleaching action of chlorine.

$$Cl_2 + H_2O \longrightarrow 2HCl + [O]$$

Vegetable colouring matter + [O] \_\_\_\_\_\_ Oxidized colourless matter

17. Ammonia is passed into copper sulphate solution for long time?

Solution: When ammonia gas is passed into copper sulphate solution, at first a bluish white precipitate is formed which dissolves in excess of ammonia forming a deep blue coloured solution due to formation of a soluble complex compound tetramminecopper (II) sulphate.

$$CuSO_4 + 2NH_4OH \longrightarrow Cu(OH)_2 + (NH_4)_2SO_4$$

$$Cu(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \longrightarrow [Cu(NH_3)_4] SO_4 + 4H_2O$$

$$Tetramminecopper(II) sulphate$$
(Deep blue)

18. Aluminium is heated with sodium hydroxide solution?

Solution: When aluminium is heated with sodium hydroxide, hydrogen gas is evolved along with formation of soluble aluminates

$$2Al + 2NaOH + 2H_2O \xrightarrow{\Delta} 2NaAlO_2 + 3H_2$$
Sodium
$$meta-aluminate$$

$$2Al + 6NaOH \xrightarrow{\Delta} 2Na_3AlO_3 + 3H_2$$
Sodium
$$aluminate$$

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19. Benzene is treated with concentrated H<sub>2</sub>SO<sub>4</sub>?

Solution: When benzene is heated with concentrated H<sub>2</sub>SO<sub>4</sub>, benzenesulphonic acid is formed

20. Acetylene gas is passed into silver nitrate solution?

Solution: When acetylene gas is passed into ammoniacal solution of silver nitrate, a white precipitate of silver acetylide is obtained.

$$AgNO_3 + 3NH_4OH \longrightarrow [Ag(NH_3)_2]OH + 2H_2O + NH_4NO_3$$

$$H - C = C - H + 2[Ag(NH_3)_2]OH \longrightarrow AgC = CAg + 2H_2O + 4NH_2$$
Silver acetylide
(White ppt.)

21. Copper is treated with dilute HNO<sub>3</sub>?

Solution: When copper is treated with dilute HNO<sub>3</sub>, cupric nitrate is formed along with evolution of nitric oxide gas.

$$2HNO_3 \longrightarrow H_2O + 2NO + 3[O]$$

$$Cu + [O] \longrightarrow CuO] \times 3$$

$$CuO + 2HNO_3 \longrightarrow Cu(NO_3)_2 + H_2O] \times 3$$

$$3Cu + 8HNO_3 \longrightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$$

22. Calcium is burnt in atmosphere of nitrogen?

Solution: When calcium is burnt in atmosphere of nitrogen, calcium nitride is formed.

$$3Ca + N_2 \xrightarrow{\qquad \qquad} Ca_3N_2$$
Calcium nitride

23. Ammonia is passed over heated sodium?

**Solution:** When ammonia is passed over heated sodium metal, sodamide is formed along with liberation of hydrogen gas.

$$2Na + 2NH_3 \xrightarrow{\Delta} 2NaNH_2 + H_2$$
Sodamide

24. Gold is treated with aqua-regia?

Solution: When gold is treated with aqua-regia, gold(III) chloride is formed.

$$\frac{\text{HNO}_3 + 3\text{HCl}}{\text{Aqua-regia}} \longrightarrow \frac{\text{NOCl} + 2\text{H}_2\text{O} + 2[\text{Cl}]}{\text{Nitrosyl}}$$

$$\text{chloride}$$

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25. Iron is treated with moderately concentrated HNO<sub>3</sub>?

Solution: When iron is treated with moderately concentrated HNO<sub>3</sub>, ferric nitrate is formed along with evolution of NO<sub>2</sub> gas.

Fe + 3HNO<sub>3</sub> 
$$\longrightarrow$$
 Fe(NO<sub>3</sub>)<sub>3</sub> + 3[H]  
HNO<sub>3</sub> + [H]  $\longrightarrow$  NO<sub>2</sub> + H<sub>2</sub>O] × 3  
Fe + 6HNO<sub>3</sub>  $\longrightarrow$  Fe(NO<sub>3</sub>)<sub>3</sub> + 3NO<sub>2</sub> + 3H<sub>2</sub>O  
Ferric nitrate

26. Hydrochloric acid is treated with silver nitrate solution followed by the addition of ammonia solution?

Solution: When hydrochloric acid is treated with silver nitrate solution, a white precipitate of silver chloride is formed which on adding ammonia solution gets dissolved due to formation of water soluble complex compound.

HCl + AgNO<sub>3</sub> 
$$\longrightarrow$$
 AgCl $\downarrow$  + HNO<sub>3</sub>  
White ppt.  
AgCl + 2NH<sub>4</sub>OH  $\longrightarrow$  [Ag(NH<sub>3</sub>)<sub>2</sub>]Cl + 2H<sub>2</sub>O  
Diamminesilver(I)  
chloride (soluble)

27. Concentrated  $H_2SO_4$  is treated with HI?

Solution: When concentrated H<sub>2</sub>SO<sub>4</sub> is treated with HI, violet vapours of iodine are produced.

$$H_2SO_4 \longrightarrow H_2O + SO_2 + [O]$$

$$2HI + [O] \longrightarrow H_2O + I_2$$

$$H_2SO_4 + 2HI \longrightarrow 2H_2O + SO_2 + I_2$$
Violet

28. Methane reacts with chlorine in presence of diffused sunlight?

Solution: When methane reacts with chlorine in the presence of diffused sunlight, a mixture of CH<sub>3</sub>Cl, CH<sub>2</sub>Cl<sub>2</sub>, CHCl<sub>3</sub> and CCl<sub>4</sub> is obtained.

$$\begin{array}{c} CH_4 + Cl_2 & \xrightarrow{Sunlight} & CH_3 - Cl & \xrightarrow{Cl_2} & CH_2Cl_2 & \xrightarrow{Cl_2} \\ & & & & \\ Chloromethane & & & \\ CHCl_3 & \xrightarrow{Cl_2} & CCl_4 \\ \hline Trichloromethane & & Tetrachloromethane \\ \end{array}$$

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29. Acetylene reacts with hydrochloric acid?

Solution: When acetylene reacts with hydrochloric acid, 1, 1-dichloroethane is formed.

$$HC = CH + 2HC1 \longrightarrow CH_3CHCl_2$$
  
1, 1-Dichloroethane

30. A piece of copper metal is exposed in moist atmosphere?

Solution: When a piece of copper metal is exposed to moist air, it is slowly converted into green basic carbonate.

$$2Cu + H_2O + CO_2 + O_2 \longrightarrow CuCO_3.Cu(OH)_2$$
Basic cupric carbonate (Green)

31. Sodium is burnt in the atmosphere of CO<sub>2</sub>?

**Solution:** When sodium is burnt in atmosphere of CO<sub>2</sub>, formation of sodium carbonate takes place.

$$4Na + 2CO_2 + O_2 \longrightarrow 2Na_2CO_3$$
Sodium carbonate

32. Zinc is dissolved in moderately concentrated HNO<sub>3</sub>?

**Solution:** When zinc is dissolved in moderately concentrated HNO<sub>3</sub>, zinc nitrate is formed along with evolution of NO gas

$$Zn + 2HNO_3 \longrightarrow Zn(NO_3)_2 + 2[H]] \times 3$$
  
 $HNO_3 + 3[H] \longrightarrow 2H_2O + NO] \times 2$   
 $8HNO_3 + 3Zn \longrightarrow 3Zn(NO_3)_2 + 4H_2O + 2NO^{\uparrow}$ 

33. Chlorine is passed over finely powdered aluminium?

Solution: When chlorine is passed over heated finely powdered aluminium, aluminium chloride is formed

$$2Al + 3Cl_2 \xrightarrow{\Delta} 2AlCl_3$$
Aluminium chloride

34. Iron is allowed to react with very dilute HNO<sub>3</sub>?

**Solution:** When iron is allowed to react with very dilute HNO<sub>3</sub>, a mixture of ferrous nitrate and ammonium nitrate is obtained.

Fe + 2HNO<sub>3</sub> 
$$\longrightarrow$$
 Fe(NO<sub>3</sub>)<sub>2</sub> + 2[H]] × 4  
HNO<sub>3</sub> + 8[H]  $\longrightarrow$  NH<sub>3</sub> + 3H<sub>2</sub>O  
NH<sub>3</sub> + HNO<sub>3</sub>  $\longrightarrow$  NH<sub>4</sub>NO<sub>3</sub>  
4Fe + 10HNO<sub>3</sub>  $\longrightarrow$  4Fe(NO<sub>3</sub>)<sub>2</sub> + NH<sub>4</sub>NO<sub>3</sub> + 3H<sub>2</sub>O  
Ferrous nitrate Ammonium nitrate

35. Copper is treated with moist air containing CO2?

Solution: When copper is treated with moist air containing CO<sub>2</sub>, it turns green due to formation of basic cupric carbonate.

36. Ammonia gas is treated with excess of chlorine?

Solution: When ammonia is treated with excess of chlorine, an explosive substance, nitrogen trichloride is formed.

NH<sub>3</sub> + 3Cl<sub>2</sub> 
$$\longrightarrow$$
 NCl<sub>3</sub> + 3HCl  
Nitrogen  
trichloride

37. Zinc is heated with concentrated H<sub>2</sub>SO<sub>4</sub>?

**Solution:** When zinc is heated with concurrated H<sub>2</sub>SO<sub>4</sub>, sulphur dioxide is evolved along with formation of zinc sulphate.

$$Zn + 2H_2SO_4 \xrightarrow{\Delta} ZnSO_4 + 2H_2O + SO_2$$
(Conc.)

38. Concentrated  $H_2SO_4$  is dropped on sugar?

**Solution:** When concentrated H<sub>2</sub>SO<sub>4</sub> is dropped on sugar, it extracts water and brings about charring. Sugar chars due to the formation of black carbon.

$$C_{12}H_{22}O_{11} \xrightarrow{\text{Conc. } H_2SO_4} 12C + 11H_2O$$
Sugar (Black)

39. Zinc is treated with concentrated HNO<sub>3</sub>?

**Solution:** When zinc is treated with hot and concentrated HNO<sub>3</sub>, zinc nitrate is formed along with evolution of NO<sub>2</sub> gas.

$$Zn + 2HNO_3 \longrightarrow Zn(NO_3)_2 + 2[H]$$
  
 $HNO_3 + [H] \longrightarrow H_2O + NO_2] \times 2$   
 $Zn + 4HNO_3 \longrightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$ 

40. Potassium carbonate is treated with dilute HCl?

Solution: When potassium carbonate is treated with dilute HCl, potassium chloride is formed along with carbon dioxide gas.

$$K_2CO_3 + 2HCl \longrightarrow 2KCl + H_2O + CO_2$$

41. Hydrogen chloride is passed into silver nitrate solution?

**Solution:** When hydrogen chloride is passed into silver nitrate solution, a white precipitate of silver chloride is formed.

$$AgNO_3 + HCl \longrightarrow AgCl + HNO_3$$
White ppt.

42. Zinc strip is immersed into ferrous sulphate solution?

Solution: When zinc strip is immersed into ferrous sulphate solution, it gets dissolved forming zinc sulphate along with precipitation of metallic iron.

$$Zn + FeSO_4 \longrightarrow ZnSO_4 + Fe$$

43. Copper is heated with conc. H<sub>2</sub>SO<sub>4</sub>?

Solution: When copper is heated with concentrated H<sub>2</sub>SO<sub>4</sub>, sulphur dioxide gas is produced along with formation of copper sulphate.

$$H_2SO_4 \longrightarrow H_2O + SO_2 + [O]$$

$$Cu + [O] \longrightarrow CuO$$

$$CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$$

$$Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$$

44. sodium nitrate is strongly heated?

**Solution:** When sodium nitrate is strongly heated, sodium nitrite is formed along with evolution of oxygen gas.

$$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$$

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45. Soap is treated with hard water containing CaCl<sub>2</sub>?

**Solution:** When soap is treated with hard water containing CaCl<sub>2</sub>, a white curdy precipitate is formed.

$$2C_{17}H_{35}COONa + CaCl_2 \longrightarrow (C_{17}H_{35}COO)_2Ca \downarrow + 2NaCl$$
Sodium stearate
(Soap)

(White curdy ppt.)

46. Chlorine reacts with excess of ammonia? Solution: When chlorine reacts with excess of ammonia, ammonium chloride is formed along with evolution of N2 gas.  $2NH_3 + 3Cl_2 \longrightarrow H_2 + 6HCl$  $NH_3 + HCl \longrightarrow NH_4Cl] \times 6$  $8NH_3 + 3Cl_2 \longrightarrow N_2 \uparrow + 6NH_4Cl$ (Excess) www.arjun00.com.np 47. Hydrogen chloride gas is passed into KMnO4 solution? Solution: When hydrogen chloride gas is passed into acidified KMnO<sub>4</sub> solution, the pink colour of KMnO<sub>4</sub> discharged.  $2KMnO_4 \longrightarrow K_2O + 2MnO + 5[O]$  $2HCl + [O] \longrightarrow H_2O + Cl_2 \times 5$  $K_2O + 2HCl \longrightarrow 2KCl + H_2O$  $MnO + 2HCl \longrightarrow MnCl_2 + H_2O] \times 2$  $2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2 \uparrow$ (Pink) Greenish Greenish

Colourless yellow

48. Hydrogen sulphide gas is passed into acidified KMnO4 solution?

Solution: When hydrogen sulphide gas is passed into acidified KMnO<sub>4</sub> solution, the pink colour of KMnO<sub>4</sub> is discharged.

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2 + 5[O]$$

$$H_2S + [O] \longrightarrow H_2O + S] \times 5$$

$$2KMnO_4 + 3H_2SO_4 + 5H_2S \longrightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5S\downarrow$$
(Pink)
$$Colourless \qquad yellow$$

49. Chlorine is treated with ethylene?

When chlorine is treated with ethylene, 1,2-**Solution:** dichloroethane is formed.

$$Cl_2 + CH_2 = CH_2 \longrightarrow CH_2 - CH_2$$
Ethylene

 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 

50. The mixture of sodium chloride and concentrated H<sub>2</sub>SO<sub>4</sub> is heated?

Solution: When a mixture of sodium chloride and concentrated H<sub>2</sub>SO<sub>4</sub> is heated, hydrogen chloride gas is produced.

$$2\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow{\Delta} \text{Na}_2\text{SO}_4 + 2\text{HCl}$$
(Conc.)

51. Benzene is treated with methyl chloride in the presence of anhydrous AlCl<sub>3</sub>?

Solution: When benzene is treated with methyl chloride in the presence of anhydrous AlCl<sub>3</sub>, methylbenzene (toluene) is formed.

52. Iron rod is immersed into copper sulphate solution?

**Solution:** When iron rod is immersed into copper sulphate solution following reaction takes place.

$$Fe(S) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$$

53. Acetylene gas is reacted with metallic sodium in the presence of liquid NH<sub>3</sub>?

**Solution:** When acetylene gas is reacted with metallic sodium in the presence of liquid NH<sub>3</sub>, ethylene is formed.

$$CH = CH + 2[H] \xrightarrow{Na/liq. NH_3} CH_2 = CH_2$$
Acelytene Ethylene

54. Lead is heated with oxygen below 300°C?

Solution: When lead is heated with oxygen below 300°C, litharge (PbO) is formed.

55. Sodium metal is exposed to moist air?

Solution: When sodium metal is exposed to moist air, it gets tarnished due to following reactions.

$$4Na + O_2 \longrightarrow 2Na_2O$$
 $Na_2O + H_2O \longrightarrow 2NaOH$ 
 $2NaOH + CO_2 \longrightarrow Na_2CO_3 + H_2O$ 

56. Calcium metal is heated with phosphorus?

Solution: When calcium metal is heated with phosphorus, calcium phosphide is formed. www.arjun00.com.np

$$3Ca + 2P \xrightarrow{\Delta} Ca_3P_2$$
Calcium phosphide

57. Lead is boiled with concentrated hyrochloric acid?

**Solution:** When lead is boiled with concentrated hydrochloride acid, a water soluble lead complex is formed.

$$Pb + 4HCl \longrightarrow H_2[PbCl_4] + H_2$$

58. Ethylene reacts with concentrated H<sub>2</sub>SO<sub>4</sub>?

Solution: When ethylene reacts with concentrated H<sub>2</sub>SO<sub>4</sub>, ethyl hydrogen sulphate is formed.

$$CH_2 = CH_2 + H_2SO_4 \longrightarrow CH_3CH_2HSO_4$$
(Conc.) Ethyl hydrogen sulphate

59. Freshly prepared FeSO<sub>4</sub> solution is added to the mixture of concentracted HNO<sub>3</sub> and concentrated H<sub>2</sub>SO<sub>4</sub>?

**Solution:** When freshly prepared FeSO<sub>4</sub> solution is added to a well cooled mixture of concentrated HNO<sub>3</sub> and concentrated H<sub>2</sub>SO<sub>4</sub>, a dark coloured ring is formed at the junction of two liquids.

$$2HNO_{3}(aq) \longrightarrow H_{2}O + 2NO + 3[O]$$

$$2FeSO_{4} + H_{2}SO_{4} \longrightarrow Fe_{2}(SO_{4})_{3} + H_{2}O$$

$$FeSO_{4} + NO \longrightarrow [Fe(NO)]SO_{4}$$
Nitrosyl ferrous sulphate
$$(Dark brown ring)$$

60. Silver is exposed to air containing  $H_2S$  gas?

**Solution:** When silver is exposed to air containing H<sub>2</sub>S gas, it blackens due to formation of silver sulphide

$$2Ag + H_2S \longrightarrow Ag_2S + H_2$$
Silver sulphide
(Black)

61. Calcium carbonate comes in contact with hydrochloric acid?

**Solution:** When calcium carbonate comes in contact with hydrochloric acid, carbon dioxide gas evolved along with formation of calcium chloride.

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$$

62. Lead is treated with acetic acid in presence of air?

Solution: When lead is treated with acetic acid in the presence of air, lead acetate is formed.

Pb + 2CH<sub>3</sub>COOH + 
$$1/2$$
 O<sub>2</sub>  $\longrightarrow$  (CH<sub>3</sub>COO)<sub>2</sub>Pb + H<sub>2</sub>O  
Lead acetate

63. Carbon monoxide reacts with iron at 120°C?

Solution: When carbon monoxide reacts with iron at 120°C, iron penta carbonyl is formed.

Fe + 5CO 
$$\stackrel{120^{\circ}\text{C}}{\longrightarrow}$$
 Fe(CO)<sub>5</sub>