

Daily Tutorial Sheet 8

JEE Advanced (Archive)

106.(A) Structure of
$$H_3OP_3$$
 is $OP_1 OH$

Since it has only two $\,$ –OH groups so it is dibasic.

In it, the oxidation state of P is +3 whereas P can also have an oxidation state of +5, so H_3PO_3 can be oxidised (from +3 to +5 state). Since it can be oxidised so it is a reducing agent.

Structure of
$$H_3PO_4$$
 is $HO = P$ OH

107. (i)
$$Al_4C_3 + 12H_2O \longrightarrow 4Al(OH)_3 + 3CH_4 \uparrow$$

(ii)
$$CaNCN + 3H_2O \longrightarrow CaCO_3 + 2NH_3$$

Ammonia (NH₃) formed when dissolved in water yields NH₄OH.

$$2 \text{NH}_3 + 2 \text{H}_2 \text{O} \longrightarrow 2 \text{NH}_4 \text{OH} + \text{CaCO}_3$$

$$\texttt{CaNCN} + \texttt{5H}_2\texttt{O} \longrightarrow \texttt{2NH}_4\texttt{OH} + \texttt{CaCO}_3$$

(v)
$$2 \text{XeF}_4 + 3 \text{H}_2 \text{O} \longrightarrow \text{Xe} + \underset{(\text{Xenon trioxide})}{\text{XeO}_3} + \text{F}_2 + 6 \text{HF}$$

108.
$$\operatorname{Na_2CO_3} + 2\operatorname{SO_2} + \operatorname{H_2O} \longrightarrow 2\operatorname{NaHSO_3} + \operatorname{CO_2}$$

$$2 \text{NaHSO}_3 + \text{Na}_2 \text{CO}_3 \longrightarrow 2 \text{Na}_2 \text{SO}_3 + \text{H}_2 \text{O} + \text{CO}_2 \\ \text{(B)}$$

$$Na_2SO_3 + S \longrightarrow Na_2S_2O_3$$
(C)

$$2\text{Na}_2\text{S}_2\text{O}_3 + \text{I}_2 \longrightarrow \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaI}$$

Oxidation states of S:

In A it is
$$+4$$
 $(1+1+x-6=0 \text{ or } x=+4)$

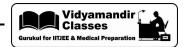
In B it is
$$+4$$
 $(2 \times 1 + x - 6 = 0 \text{ or } x = +4)$

In C it is
$$+2$$
 $(2 \times 1 + 2x - 6 = 0 \text{ or } x = +2)$

In D it is
$$+2.5$$
 $(2 \times 1 + 4x - 12 = 0 \text{ or } x = +2.5)$

Note: The values of oxidation states of S in C and D gives are average values.

Structures of $\mathrm{Na_2S_2O_3}$ and $\mathrm{Na_2S_4O_6}$ may be drawn as



109.(C) It appears at the first sight that Me₂SiCl₂ on hydrolysis will produce Me₂Si(OH)₂ which ultimately upon loss of water, will form $Me_2Si = O$.

But silicon atom, because of its very large size in comparison to oxygen, is unable to form π -bond. Thus, the product of hydrolysis is polymeric in nature.

$$\begin{array}{c} \text{Me} \\ \text{Me} \\ \text{Si} \\ \text{OH} \end{array} \xrightarrow{\text{Me}} \begin{array}{c} \text{Me} \\ \text{Si} = \text{O} + \text{H}_2\text{O} \end{array} \xrightarrow{\text{Polymerisation}} \begin{array}{c} \text{Me} \\ \text{Me} - \text{Si} - \text{O} - \text{Si} - - - \\ \text{O} \\ \text{O} \\ \text{I} \\ \text{Me} - \text{Si} - \text{O} - \text{Si} - - - \\ \text{I} \\ \text{Me} \end{array}$$

 $\textbf{110.(C)} \ \text{From amongst the given oxyacids of S only } \ H_2S_2O_8 \ \ \text{has O-O linkage.} \ \ H_2S_2O_8 \ \ \text{is known as Marshall's linkage.} \ \ H_2S_2O_8 \ \ \text{only H_2S_2O_8} \ \ \text{only H$ acid.

The other acid of S having $\,\text{O}-\text{O}\,$ linkage is $\,\text{H}_2\text{SO}_5\,$ known as Caro's acid.

111.(B) In $XeOF_4$, Xe is sp^3d^2 hybridised and has one lone pair of electrons.

112.(B) Tin can be extracted only by carbon reduction method, while lead can be extracted by self as well as carbon reduction method.

$$SnO_2 + C \longrightarrow Sn + CO_2 \uparrow$$

$$PbS + 2PbO \longrightarrow 3PbO + SO_2$$

113.(B) NO(g) + NO₂(g)
$$\xrightarrow{-30^{\circ}\text{C}}$$
 N₂O₃ (blue liquid)

114.(C) Because the ignition temperature of black phosphorous is highest among various allotropes of phosphorus, so black phosphorus is most stable.

115.
$$A = concentrated H_2SO_4$$
,

$$B = Br_2$$

$$C = NO_2^+$$
 (intermediate)

$$D = O_2 N NO_2$$

$$NO_2$$

TNT (Explosive)

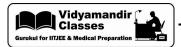
Reactions involved are:

$$NaBr + H_2SO_4 \rightarrow NaHSO_4 + HBr$$
(A)

$$4HBr + MnO_2 \rightarrow MnBr_2 + 2H_2O + Br_2(g)$$
(B)

$$\begin{array}{ccc} & \overset{\oplus}{\text{H}} - \overset{\oplus}{\text{O}} - \overset{}{\text{NO}}_2 & & \overset{\longrightarrow}{\text{H}}_2 \text{O} + \overset{}{\text{NO}}_2^+ \\ & & \text{(C)} \end{array}$$

Solutions | Workbook-6 45 p-Block Elements-II



$$\begin{array}{c} \text{CH}_3 \\ & \stackrel{\uparrow}{\text{NO}_2} \\ & & \\ & & \text{NO}_2 \\ & & \\ & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ &$$

116. $6\text{CaO} + P_4O_{10} \longrightarrow 2\text{Ca}_3(PO_4)_2$

Number of moles of
$$P_4O_{10} = \frac{852}{284} = 3$$
 [Mol. wt. of $P_4O_{10} = 284$]

Number of moles of CaO for 3 moles of $P_4O_{10} = 3 \times 6 = 18$

Weight of
$$CaO = 18 \times 56 g$$
 [Mol. wt. of $CaO = 56$]

$$= 1008 g$$

$$:O: \parallel$$

$$\vdots O : P = \vdots$$

117.(B) PbO_2 is a powerful oxidizing agent and liberate O_2 when treated with acids.

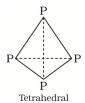
$$2 Pb O_2 + 4 HNO_3 {\longrightarrow} 2 Pb (NO_3)_2 + 2 H_2 O + O_2 \, {\uparrow}$$

118.(B) cis-1, 2-diol forms chetaled complex ion with the product, $[B(OH)_4]^-$ causing the reaction to proceed in forward direction.

119. [A-q] [B-s] [C-p] [D-r]

- (A) Bi^{3+} hydrolysis to yield BiO^{+} ion
- **(B)** AlO $_2^-$ on dilution yields a white ppt. of Al(OH) $_3$
- (C) When heated $(SiO_4)^{4-}$ changed to $(Si_2O_7)^{6-}$
- (D) When acidified $(B_4O_7)^{2-}$ gives $B(OH)_3$ (or H_3BO_3)

120.(D) In P_4 , the P-P linkage is formed by $sp^3 - sp^3$ hybridised orbital overlapping. So the percentage of p-character will be 75%.



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