	Self Practice Paper (S	PP)							
1.	<ul> <li>There is considerable increase in covalent radius from N to P. However, from Sb to Bi only small increase (of 7 pm) in covalent radius is observed. This is due to:</li> <li>(1) poor shielding by completely filled d- and f-orbitals in Bi.</li> <li>(2) similar eletronegativity of Sb and Bi.</li> <li>(3) the Bi being last element of the group.</li> <li>(4) similar densities of Sb and Bi.</li> </ul>								
2.	Of the different allotropes of phosphorus, the one which is most reactive is (1) Violet phosphorus (2) Scarlet phosphorus (3) Red phosphorus (4) White phosphorus								
3.	Which of the following elements shows highe (1) N (2) P	st number of allotropes : (3) S (4) O							
4.	Nitrogen gas is prepared : (1) by heating ammonium nitrate. (3) by passing HNO <sub>3</sub> vapours on red hot copper. (4) by heating lead nitrate.								
5.	With respect to protonic acids, which of the form (1) $PH_3$ is more basic than $NH_3$ (3) $PH_3$ is equally basic as $NH_3$	wing statement is correct ? (2) $PH_3$ is less basic than $NH_3$ (4) $PH_3$ is amphoteric while $NH_3$ is basic.							
6.	Phosphorus is manufactured by heating in an (1) Bone ash and coke (3) Bone ash, silica and coke	lectric furnance a mixture of (2) Bone ash and silica (4) None of these							
7.	Which of the following may ignite spontaneou (1) White phosphorus (3) Black phosphorus	y in air ? (2) Red phosphorus (4) Nitrogen							
8.	Ozone is obtained from oxygen (1) By oxidation at high temperature (3) By silent electric discharge	<ul><li>(2) By oxidation using a catalyst</li><li>(4) By conversion at high pressure</li></ul>							
9.	Crown shape of S <sub>8</sub> molecule is present in : (1) Rhombic sulphur (2) Monoclinic sulphu	ur (3) Both (1) & (2) (4) None of these							
10.	Presence of ozone in a gas sample may be d (1) $H_2O_2$ (2) $SO_2$	etected by : (3) Hg (4) KI							
11.	Amongst $H_2O$ , $H_2S$ , $H_2Se$ and $H_2Te$ the one (1) $H_2O$ because of hydrogen bonding (3) $H_2S$ because of hydrogen bonding	th the highest boiling point is (2) $H_2$ Te because of higher molecular weight (4) $H_2$ Se because of lower molecular weight							
12.	When ammonia is passed over heated cop shows that ammonia is (1) A dehydrating agent (2) An oxidising ager	per oxide, the metallic copper is obtained. The reaction nt (3) A reducing agent (4) A nitrating agent							

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13.	<ul> <li>Phosphine is generally prepared in the laboratory</li> <li>(1) By heating phosphorus in a current of hydrogen</li> <li>(2) By heating white phosphorus with aqueous solution of caustic potash</li> <li>(3) By decomposition of P<sub>2</sub>H<sub>4</sub> at 110°C</li> </ul>								
	(4) By heating red phosphorus with an aqueous solution of caustic soda.								
14.	Cyanamide process is used in the formation of (1) $N_2$ (2) $HNO_3$ (3) $NH_3$ (4) $PH_3$								
15.	Ammonium nitrate deco (1) Ammonia and nitric (3) Nitrogen, hydrogen	omposes on warming int acid and ozone	<ul> <li>(2) Nitrous oxide and water</li> <li>(4) Nitric oxide, nitrogen dioxide and hydrogen</li> </ul>						
16.	Which one of the follow (1) $N_2O$	ing combines with Fe(II) (2) NO	ions to form a brown co (3) CO	mplex ? (4) SO <sub>2</sub>					
17.	Formula for tear gas is (1) COCl <sub>2</sub>	: (2) CCl <sub>3</sub> NO <sub>2</sub>	(3) N <sub>2</sub> O	(4) None of these					
18.	In $P_4O_{10}$ , the number of (1) 2	f oxygen atoms bonded (2) 3	to each phosphorus atom (3) 4	n are : (4) 5					
19.	In the reaction, conc. H (1) PH <sub>3</sub>	$_{2}SO_{4} + P_{2}O_{5} \xrightarrow{\Lambda} (X$ (2) $H_{3}PO_{4}$	) + SO <sub>3</sub> ; the major prod (3) HPO <sub>3</sub>	duct (X) is : (4) H <sub>4</sub> P <sub>2</sub> O <sub>7</sub>					
20.	Bleaching action of SO (1) its reducing nature (3) its acidic nature	<sub>2</sub> is due to :	<ul><li>(2) its oxidising nature</li><li>(4) its both oxidising as well as reducing nature</li></ul>						
21.	Ortho phosphoric acid ( (1) hypophosphorus ac (3) metaphosphoric aci	on heating above 300ºC id d	gives : (2) hypophosphoric acid (4) phosphorous acid						
22.	1 mol each of $H_3PO_2$ , $H_3PO_3$ and $H_3PO_4$ will neutralise x mole of NaOH, y mol of Ca(OH) <sub>2</sub> and z mol Al(OH) <sub>3</sub> (assuming all as strong electrolytes) respectively. x,y,z are in the ratio of : (1) 3 : 1 . 5 : 1 (2) 1 : 2 : 3 (3) 3 : 2 : 1 (4) 1 : 1 : 1								
23.	Which of the following (1) $SO_2 / H_2SO_3 / H_2SO_3$ (3) $SO_3^{2-} / H_2S / Fe^{2+}$	can convert acidified $Cr_2$	<ul> <li><sup>2</sup><sub>2</sub>O<sub>7</sub><sup>2-</sup> to green ?</li> <li>(2) SO<sub>3</sub> / H<sub>2</sub>SO<sub>3</sub> / H<sub>2</sub>S</li> <li>(4) S<sub>2</sub>O<sub>3</sub><sup>2-</sup> / SO<sub>3</sub> / Fe<sup>3+</sup></li> </ul>						
24.	<ul> <li>Which of the following statements is true for HNO<sub>2</sub>?</li> <li>(1) It can be prepared by acidifying an aqueous solution of nitrite.</li> <li>(2) It is unstable weak acid which is known only in aqueous solution.</li> <li>(3) N<sub>2</sub>O<sub>3</sub> is an anhydride of HNO<sub>2</sub>.</li> <li>(4) All of these</li> </ul>								
25.	The compound which h (1) PCI <sub>5</sub>	as ionic nature in solid s (2) POCl <sub>3</sub>	tate is : (3) P <sub>4</sub> O <sub>10</sub>	(4) PCI <sub>3</sub>					

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26.	Phosphorus trichloride, PCl <sub>3</sub> undergoes, hydrolysis at room temperature to produce an oxoacid. It has the formula :								
	(1) HPO <sub>3</sub>	(2) H <sub>3</sub> PO <sub>3</sub>	(3) H <sub>3</sub> PO <sub>4</sub>	(4) $H_3PO_2$					
27.	Which of the following $(1) SO_2$	dissolves in water but (2) $OF_2$ (3) S	does not give any oxy SCI <sub>4</sub> (4	vacid solution ? 4) SO <sub>3</sub>					
28.	<ul> <li>Hypo is used in photography to:</li> <li>(1) Reduce AgBr grains to metallic silver</li> <li>(2) Convert the metallic silver to silver salt</li> <li>(3) Remove undecomposed silver bromide as a soluble complex</li> <li>(4) Remove reduced silver</li> </ul>								
29.	Sulphur on boiling with NaOH solution gives								
	(1) $Na_2S_2O_3 + NaHSO_3$	$(2) \operatorname{Na}_2 \operatorname{S}_2 \operatorname{O}_3 + \operatorname{Na}_2 \operatorname{S}_3$	(3) Na <sub>2</sub> SO <sub>3</sub> + H <sub>2</sub> S	S (4) $Na_2SO_3 + SO_2$					
30.	Sodium thiosulphate is (1) reducing $Na_2 SO_3$ so (3) Neutralising $H_2S_2O_3$	prepared by plution with H <sub>2</sub> S <sub>3</sub> solution with NaOH	(2) Boiling Na <sub>2</sub> SC (4) Boiling Na <sub>2</sub> SC	(2) Boiling $Na_2SO_3$ with S in alkaline medium. (4) Boiling $Na_2SO_3$ with S in an acidic medium					
31.	<ul> <li>Which of the following is not correct ?</li> <li>(1) Ammonia is used as refrigerant.</li> <li>(2) A mixture of Ca(CN)<sub>2</sub> and C is known as nitrolim.</li> <li>(3) A mixture of Ca(H<sub>2</sub>PO<sub>4</sub>)<sub>2</sub> and CaSO<sub>4</sub> . 2H<sub>2</sub>O is known as superphosphate of lime.</li> <li>(4) Hydrolysis of NCl<sub>3</sub> gives NH<sub>3</sub> and HOCI.</li> </ul>								
32.	Which compound does not give oxygen on heating ?(1) HgO(2) KMnO4(3) $(NH_4)_2Cr_2O_7$ (4) KClO3								
33.	Which of the following is responsible for turning starch-iodide paper blue when it is brought in contact with $O_3$ ?								
	(3) Formation of alkali		(4) Reaction of ozone with litmus paper.						
34.	In the ostwald's process (1) $N_2$	s, nitric acid is prepare (2) NH <sub>3</sub>	ed by the catalytic oxid (3) N <sub>2</sub> O <sub>5</sub>	dation of : (4) NO <sub>2</sub>					
35.	Which amongst the follo (1) $H_2O$	owing the hydride is m (2) H <sub>2</sub> S	nost acidic in nature ? (3) H <sub>2</sub> Se	(4) H <sub>2</sub> Te					
36.	The oxidation state of s (1) $S_2O_6^{2-} < SO_4^{2-} < SO_4^{2-}$ (3) $SO_3^{2-} < S_2O_4^{2-} < S_2O_4^{2-}$	ulphur in the anions S $3^{2-}$ $P_6^{2-}$	$SO_{3}^{2-}$ , $S_{2}O_{4}^{2-}$ and $S_{2}O_{6}^{2-}$ (2) $S_{2}O_{4}^{2-} < SO_{3}^{2-}$ (4) $S_{2}O_{4}^{2-} < S_{2}O_{6}^{2-}$	$_{3}^{2^{-}}$ , $S_{2}O_{4}^{2^{-}}$ and $S_{2}O_{6}^{2^{-}}$ follows the order : (2) $S_{2}O_{4}^{2^{-}} < SO_{3}^{2^{-}} < S_{2}O_{6}^{2^{-}}$ (4) $S_{2}O_{4}^{2^{-}} < S_{2}O_{6}^{2^{-}} < SO_{3}^{2^{-}}$					
37.	Which of the following   sunlight ? (1) SO <sub>2</sub> CI	product is formed by t (2) SO <sub>2</sub> Cl <sub>2</sub>	the reaction of sulphu (3) SOCl <sub>2</sub>	r dioxide with chlorine in presence of (4) SO <sub>3</sub> Cl					

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38.	Which of the following i (1) $AsCl_3$	s not hydrolysed ? (2) PF <sub>3</sub>	(3) SbCl <sub>3</sub>	(4) NF <sub>3</sub>				
39.	Nitrogen forms a variet (1) –3 to +5	y of compounds in all oxi (2) –3 to +3	<pre>kidation states ranging from : (3) -3 to +4 (4) -3 to +6</pre>					
40.	Chlorine reacts with exercise (1) $NH_4CI$	cess of ammonia to give (2) $N_2 + HCI$	$\Rightarrow$ : (3) N <sub>2</sub> + NH <sub>4</sub> Cl (4) N <sub>2</sub> + NCl <sub>3</sub>					
41.	The correct order of the (1) NO < $N_2O < N_2O_3 <$ (3) $N_2O_5 < N_2O < N_2O_3 <$	e acidic nature of oxides i NO <sub>2</sub> < N <sub>2</sub> O <sub>5</sub> < NO < NO <sub>2</sub>	is in the order (2) $N_2O < NO < N_2O_3 < NO_2 < N_2O_5$ (4) $N_2O_5 < N_2O_3 < NO_2 < N_2O$					
42.	Excess of PCl <sub>5</sub> reacts v (1) sulphuryl chloride (3) chlorosulphonic acid	vith conc. H₂SO₄ giving	(2) sulphurous acid (4) thionyl chloride					
43.	$S_1$ : PCI5 has a trigonal bipyramidal structure in gaseous liquid phases. $S_2$ : Nitrogen show catenation properties less than phosphorus. $S_3$ : NH3 is basic while BiH3 is feebly basic.(1) T F T(2) T T T(3) F F F(4) F T F							
44.	<b>S</b> <sub>1</sub> : Red phosphorus readily catches fire in air to give dense white fumes of $P_4O_{10}$ . <b>S</b> <sub>2</sub> : Phosphine explodes when it is brought in contact with traces of oxidising agents like HNO <sub>3</sub> , Cl <sub>2</sub> and Br <sub>2</sub> vapours. <b>S</b> <sub>3</sub> : Concentrated HNO <sub>3</sub> renders iron passive probably because of the formation of an oxide film.							
	(1) T F T	(2) T T T	(3) F T T	(4) F T F				

- **45.** Which of the following statement is incorrect ?
  - (1)  $SbH_3 > NH_3 > ASH_3 > PH_3$  (boiling point)
  - (2)  $H_3PO_4 > H_3PO_3 > H_3PO_2$  (reducing character)
  - (3)  $N_2O < NO < N_2O_3 < N_2O_5$  (oxidation state on nitrogen atom)
  - (4)  $NH_3 > PH_3 > ASH_3 > SbH_3 \ge BiH_3$  (basicities)

	SPP Answers												
1.	(1)	2.	(4)	3.	(3)	4.	(3)	5.	(2)	6.	(3)	7.	(1)
8.	(3)	9.	(3)	10.	(3)	11.	(1)	12.	(3)	13.	(2)	14.	(3)
15.	(2)	16.	(2)	17.	(2)	18.	(3)	19.	(3)	20.	(1)	21.	(3)
22.	(4)	23.	(3)	24.	(4)	25.	(1)	26.	(2)	27.	(2)	28.	(3)
29.	(2)	30.	(2)	31.	(2)	32.	(3)	33.	(1)	34.	(2)	35.	(4)
36.	(2)	37.	(2)	38.	(4)	39.	(1)	40.	(3)	41.	(2)	42.	(1)
43.	(2)	44.	(3)	45.	(2)								

## **SPP** Solutions

- **1.** Poor shielding by f-and d- electrons enhences the effective nuclear charge in Bi. This causes contraction in size.
- 4. (1)  $(NH_4)NO_3$  gives  $N_2O_2$ , (2) chlorine (excess) with liquor  $NH_3$  forms  $NCI_3$  and (4)  $Pb(NO_3)_2$  gives  $NO_2$  not  $N_2$  on heating.

(3) 5Cu (red hot) + 2HNO<sub>3</sub>  $\longrightarrow$  5CuO + N<sub>2</sub>  $\uparrow$  + H<sub>2</sub>O

- **5.** PH<sub>3</sub> is less basic than NH<sub>3</sub> due to lesser availability of lone pair of electrons. The lone pair of electron is present in spherical s-orbital as compared to directional sp<sup>3</sup> hybrid orbital in NH<sub>3</sub>.
- 6.  $2Ca_3(PO_4)_2$  (from bone-ash) + 10C +  $6SiO_2 \xrightarrow{\Delta} 6CaSiO_3 + 10CO + P_4(s)$  white phosphorus

**8.** 
$$3O_2 \xleftarrow{\text{electric}}{\text{discharge}} 2O_3$$

- **9.** Both rhombic & monoclinic sulphur has crown shape.
- **10.** Tailing of mercury.
- 11. The order of boiling point of hydride of oxygen family is  $H_2O > H_2Te > H_2Se > H_2S$ .
- **12.** The oxidation state of copper changes from +2 to 0 i.e. it gets reduced. So, NH<sub>3</sub> works as a reducing agent.
- **13.**  $P_4 + 3NaOH + 3H_2O \xrightarrow{\Delta} PH_3 + 3NaH_2PO_2$
- 14. CaO + 2C + N<sub>2</sub>  $\xrightarrow{2000^{\circ}C}$  CaCN<sub>2</sub> + CO<sup>↑</sup>; CaCN<sub>2</sub> + 3H<sub>2</sub>O  $\longrightarrow$  CaCO<sub>3</sub> + 2NH<sub>3</sub><sup>↑</sup> (calcium cynamide)
- **15.**  $NH_4NO_3 \xrightarrow{\Delta} N_2O + 2H_2O$
- **16.**  $Fe^{2+} + NO + 5H_2O \longrightarrow [Fe(H_2O)_5NO]^{2+}$  (brown complex).
- **17.**  $CHCl_3$  (chloroform) react with conc.  $HNO_3$  on heating to form chloropicrin ( $CCl_3NO_2$ )  $CHCl_3 + HONO_2 \longrightarrow CCl_3$ .  $NO_2 + H_2O$ Chloropicrin

Chloropicrin is used as an insecticide and also war gas. It is also known as nitrochloroform or tear gas.



2KI +  $H_2$ O +  $O_3 \longrightarrow O_2$  + 2KOH +  $I_2$ 

**34.**  $4NH_3(g) + 5O_2(g) \xrightarrow{Pt/Rh catalyst}{5 \text{ atm, } 850^\circ C} 4NO(g) + 6H_2O(g) ; NO + 1/2O_2 \longrightarrow NO_2$ 

 $3NO_2 + H_2O \longrightarrow 2HNO_3 + NO$ 

 The acidic strength increases in the order H<sub>2</sub>O < H<sub>2</sub>S < H<sub>2</sub>Se < H<sub>2</sub>Te The enthalpy of bond dissociation, (Δ<sub>diss</sub> H<sup>-</sup> (E–H) decreases down the group with increasing E–H bond length. This cause the release of proton.

**37.** 
$$SO_2 + CI_2 \xrightarrow{Sun light} SO_2CI_2$$

- **38.**  $NF_{3}$  does not hydrolysed on account of the absence of vacant orbitals.
- **39.** Nitrogen exhibits +1, +2, +3, +4 and +5 oxidation states when it reacts with oxygen ( $N_2O$ , NO,  $N_2O_3$ , NO<sub>2</sub> and  $N_2O_5$ ). In NH<sub>3</sub>, N has -3 oxidation state.
- **40.**  $8NH_3(\ell) + 3Cl_2(g) \longrightarrow 6NH_4Cl + N_2^{\uparrow}$
- **41.** As oxidation state of nitrogen increases the  $\Delta EN$  increases and therefore, acidic character increases. So the correct order would be ;  $N_2O(+1) < NO(+2) < N_2O_3(+3) < NO_2(+4) < N_2O_5(+5)$ .

42. 
$$2PCI_5 + H_2SO_4 \longrightarrow 2HCI + SO_2CI_2 + 2POCI_3$$
.

43. S₁ : In solid, it exists as an ionic solid [PCI₄]\* and [PCI₀]<sup>-</sup>
S₂ : Single N–N bond is weaker than the single P– P bond because of high interelectronic repulsion of the non- bonding electrons, owing to the small bond length.
S₃ : Lone pair of electrons in present in more directional sp³ hybrid orbital while in Bi, it is present in more compact non- directional s- orbital.
45. Correct order is : H₃PO₃ > H₃PO₂ > H₃PO₄

On the basis of  $pk_a$  value **Note :** Hydrogen atom directly attached to phosphorus is called reducing hydrogen.