Exercise-1

✍ **Marked Questions may have for Revision Questions.**

ONLY ONE OPTION CORRECT TYPE

Section (A) : Physical and Chemical properties of Group 15th elements

1 Which one of the following does not show allotropy ?
(1) Nitrogen (2) Phosphorus (3) Arsenic (4) Antimony

2 In group 15, the melting points of the elements :
(1) increase regularly on moving down the group.
(2) decrease regularly on moving down the group.
(3) first decrease upto As and then increase to Bi.
(4) first increase from N to As and then decrease to Bi.

3✍ Which of the following statements is incorrect for the group 15th elements ?
(1) Metallic character increases down the group with decrease in ionisation enthalpy and increase in atomic size.
(2) The stability of +5 oxidation state decreases and that of +3 state increases down the group on account of inert pair effect.
(3) The tendency to undergoes –3 oxidation state decreases down the group due to increase in size and metallic character.
(4) In case of phosphorus compounds having +4 oxidation state disproportionates into +5 and +3 both in acid and alkali.

4 The hydrides of group 15 elements act as :
(1) lewis acids (2) lewis bases (3) both (4) none

5 Nitrogen shows different oxidation states in the range :
(1) 0 to 5 (2) – 3 to + 5 (3) – 5 to + 3 (4) – 5 to + 3

6✍ Single N-N bond is weaker than the single P-P bond . This is because of :
(1) larger N-N bond length in comparision to P-P bond length .
(2) high interelectronic repulsion of the non-bonding electrons, owing to the small N-N bond length in comparision to that in P-P single bond .
(3) higher electronegetivity of N in comparision to P.
(4) samaller atomic size of N as compared to that of P.

7 The basic strength of the hydrides of group 15 elements :
(1) decreases on moving down the group
(2) increases on moving down the group
(3) first decreases upto AsH_3 and then increases
(4) first increases upto AsH_3 and then decreases

8✍ What causes nitrogen to be chemically inert ?
(1) Multiple bond formation in the molecule (2) Absence of bond polarity
(3) Short internuclear distance (4) High bond energy

9. Among the members of group 15 (N, P, As, Sb and Bi), which of the following properties show an increase as we go down from nitrogen to bismuth
(1) Stability of +5 oxidation state (2) Reducing character of hydrides
(3) Electronegativity (4) Acidic nature of the pentoxide

10. Which of the following tendencies remains unchanged on going down in the nitrogen family ?
(1) Highest oxidation state (2) Non-metallic character
(3) Stability of hydrides (4) Physical state

11. The oxidation number of sulphur in S_8, S_2F_2 and H_2S respectively are :
(1) 0, + 1 and – 2 (2) + 2, + 1 and – 2 (3) 0, + 1 and + 2 (4) – 2, + 1 and – 2

12. Red and white phosphorus will differ but not in :
(1) smell (2) solubility in $CHCl_3$
(3) exhibiting phosphorescence (4) reaction with concentrated HNO_3

13. Which of the following is least reactive ?
(1) White phosphorus (2) Yellow phosphorus (3) Red phosphorus (4) Black phosphorus

14. Which of the following oxides is the most acidic?
(1) N_2O_5 (2) P_2O_5 (3) As_2O_5 (4) Sb_2O_5

15. Which of the following oxides is amphoteric in nature ?
(1) N_2O_3 (2) P_4O_6 (3) Sb_4O_6 (4) Bi_2O_3

16. The thermal stability of the hydrides of group 15 follows the order :
(1) $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$ (2) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
(3) $PH_3 > NH_3 > AsH_3 > SbH_3 < BiH_3$ (4) $AsH_3 < PH_3 > SbH_3 > BiH_3 > NH_3$

17. In case of nitrogen, NCl_3 is possible but not NCl_5 while in case of phosphorous, PCl_3 as well as PCl_5 are possible. It is due to
(1) Availability of vacant d-orbital in P but not in N
(2) Lower electronegativity of P than N
(3) Lower tendency of H bond formation in P than N
(4) Occurrence of P in solid while N in gaseous state at room temperature.

18. The P-P-P bond angle in white phosphorus is close to :
(1) 120º (2) 109º28' (3) 90º (4) 60º

19. Red phosphorus can be prepared from white phosphorus by :
(1) adding red colour to white phosphorus
(2) heating white phosphorus to red heat
(3) heating white phosphorus at high pressure, inert atmosphere to 250ºC or at low temperature in the presence of sun light.
(4) heating white phosphorus at low pressure to 250ºC or at low temperature in the presence of sun light.

20. Which of the following is the most basic oxide ?
(1) SeO_2 (2) P_2O_3 (3) Sb_2O_3 (4) Bi_2O_3

Section (B) : Compounds of Nitrogen and phosphorus

1. Thermal decomposition of ammonium dichromate yields :
(1) NH_3 (2) N_2 (3) NO_2 (4) O_2

2. In the manufacture of ammonia by Haber's process, the catalyst used is :
(1) oxide of iron only (2) oxide of iron and K_2O
(3) oxide of iron ,K_2O and AI_2O_3 (4) oxide of vanadium only

3. N_2O is formed :
(1) by heating NH_4NO_2 (2) by heating NH_4NO_3
(3) by heating $CsNO_3$ (4) by heating $Ca(NO_3)_2$

4. Which of the following metals gives N_2O gas with dilute HNO_3 ?
(1) Zn (2) Cu (3) Au (4) Pb

5. Which of the following will combine with Fe(II) ion to form a brown complex compound ?
(1) N_2O (2) NO (3) N_2O_3 (4) NO_2

6. NO_2 can be prepared by heating :
(1) NH_4NO_3 (2) $NaNO_3$ (3) $Pb(NO_3)_2$ (4) KNO_3

7. Which of the following acids can form two types of salts?
(1) Hyponitrous acid (2) Nitrous acid (3) Nitric acid (4) Pernitric acid

8. Concentrated nitric acid oxidises P into :
(1) PH_3 (2) P_2O_5 (3) HPO_3 (4) H_3PO_4

9. Which of the following metals does not dissolve in concentrated HNO_3?
(1) Pb (2) Cu (3) Au (4) Hg

10. $HNO_3 + P_4O_{10} \longrightarrow HPO_3 + X$
in the above reaction the product X is :
(1) NO_2 (2) N_2O_3 (3) N_2O_4 (4) N_2O_5

11. Which one of the following allotropic forms of phosphorus does glow in dark ?
(1) Red (2) Black (3) White (4) All of these

12. When P_4O_{10} is dissolved in water, the acid formed finally is :
(1) H_3PO_2 (2) H_3PO_4 (3) H_3PO_3 (4) $H_4P_2O_7$

13. Metaphosphoric acid exists in polymeric form and may have :
(1) a linear structure (2) a cyclic structure
(3) both linear as well as cyclic structures (4) none

14. Which of the following statements are correct ?
(a) NH_3 has higher boiling point than SbH_3 dues to H-bonding .
(b) NH_3 produces deep blue colouration with soluble copper (II) salts.
(c) Pure nitrogen can be obtained by the thermal decomposition of sodium or barium azide.
(d) N_2 is used for creating inert atmosphere in iron and steel industry.
(1) (b) and (c) only (2) (b), (c) and (d) only
(3) (a), (b) and (c) only (4) All of these

15. The solution of phosphine in water decomposes in presence of light to give :
(1) white phosphorus only (2) red phosphorus and H_2
(3) phosphorus pentaoxide and H_2 (4) phosphorus hydroxide.

16. Which of the following acids is monobasic?
(1) H_3PO_2 (2) H_3PO_4 (3) $H_4P_2O_7$ (4) $H_4P_2O_6$.

17. Amongst the following oxo-acids of phosphorus , how many of them are dibasic in nature ?
H_3PO_2 , H_3PO_3, H_3PO_4, $H_4P_2O_5$
(1) 1 (2) 2 (3) 3 (4) 4

18. Amongst the following acids, which one has strong reducing property ?
(1) H_3PO_2 (2) H_3PO_4 (3) $(HPO_3)_3$ (4) $H_4P_2O_6$

Section (C) : Physical and Chemical properties of Group 16th elements :

1. Which of the following statements is false for group 16th elements ?
(1) Oxygen is a gas while other elements exist as solids.
(2) Sulphur exists as staggered 8-atom rings.
(3) Density in solid stable decreases from oxygen to tellurium.
(4) First ionisation energy of sulphur is higher than that of selenium.

2 Which of the following acts as semi metal ?
(1) S (2) Te (3) Po (4) O

3. Which element of chalcogens has maximum tendency to show catenation ?
(1) Oxygen (2) Selenium (3) Sulphur (4) Tellurium

4. Which one of the following hydrides is the strongest acid ?
(1) H_2S (2) H_2Se (3) H_2Te (4) H_2O

5. Which of the following compounds is the strongest reducing agent ?
(1) H_2O (2) H_2S (3) H_2Se (4) H_2Te

6. If X is a member of chalcogen family, the highest stability of X^{2-} is exhibited by :
(1) oxygen (2) selenium (3) tellurium (4) sulphur

7 Which of the following bonds has the highest energy ?
(1) Se—Se (2) Te—Te (3) S—S (4) O—O

8 Which one of the following statements is false ?
(1) Because of the compact nature of oxygen atom, it has less negative electron gain enthalpy than sulphur.
(2) Next to fluorine, oxygen has the highest electronegativity value amongst the elements (exclude zero group).
(3) There is large difference in the melting and boiling points of oxygen and sulphur because oxygen exists as diatomic molecules (O_2) where as sulphur exists as polyatomic molecules (S_8) .
(4) None

9 The correct order of the thermal stability of the following hydrides is :

H_2O	H_2Se	H_2S	H_2Te
(I)	(II)	(III)	(IV)

(1) I > II > III > IV (2) I > III > II > IV (3) III > I > IV > II (4) IV > III > II > I

10. The boiling points of hydrides of group 16 are in the order :
(1) $H_2Te > H_2Se > H_2S > H_2O$ (2) $H_2O > H_2S > H_2Se > H_2Te$
(3) $H_2O > H_2Te > H_2Se > H_2S$ (4) $H_2O > H_2Se > H_2S > H_2Te$

11. The increasing thermal stability of the hydrides of group 16 follows the sequence :
(1) H_2O, H_2S, H_2Se, H_2Te (2) H_2Te, H_2Se, H_2S, H_2O
(3) H_2S, H_2O, H_2Se, H_2Te (4) H_2Se, H_2S, H_2O, H_2Te

12. Which of the following hydride is most acidic ?
(1) H_2Te (2) H_2Se (3) H_2O (4) H_2S

13. The correct order of decreasing stability of hexa fluorides of group 16 members is :
(1) $SF_6 > SeF_6 > TeF_6$ (2) $TeF_6 > SeF_6 > SF_6$ (3) $SF_6 > TeF_6 > SeF_6$ (4) $TeF_6 > SF_6 > SeF_6$

14. Which of the following allotropes of sulphur has maximum S^o at 0 K
(1) Rhombic sulphur (2) Monoclinic sulphur (3) Plastic sulphur (4) None of these

15. Correct statement about allotropy of sulphur is :
(1) Monoclinic sulphur is more stable than Rhombic sulphur at room temperature.
(2) Both Monoclinic and Rhombic sulphur have same ring structures and crystalline structure.
(3) Rhombic sulphur exists at room temperature.
(4) None of these

16. Which of the following statement is false ?
(1) Superoxides give hydrogen peroxide and oxygen with water.
(2) CrO_3 is an acidic oxide.
(3) SnO_2 is an amphoteric oxide.
(4) KO_2 is peroxide which with H_2O forms hydrogen peroxide only.

17. H_2S is far more volatile than water because :
(1) sulphur atom is more electronegative than oxygen atom.
(2) oxygen being more electronegative than sulphur forms hydrogen bond.
(3) H_2O has bond angle of nearly 105°.
(4) hydrogen atom is loosely bonded with sulphur.

18. It is possible to obtain oxygen from air by fractional distillation because
(1) Oxygen is in a different group of the periodic table from nitrogen
(2) Oxygen is more reactive than nitrogen
(3) Oxygen has higher b.p. than nitrogen
(4) Oxygen has a lower density than nitrogen

19. The most abundant element in the earth's crust is :
(1) aluminium (2) oxygen (3) silicon (4) iron

Section (D) : Compounds of Oxygen and sulphur

1. $4HCl + O_2 \xrightarrow{(X)} 2Cl_2 + 2H_2O$

X is :
(1) $COCl_2$ (2) $CuCl_2$ (3) V_2O_5 (4) FeO

2. Pure ozone is : (Select correct option)
(1) a pale blue gas (2) a dark blue liquid (3) a violet black solid (4) all

3. Which of the following is responsible for the depletion of ozone layer ?
(1) Nitrogen oxide emitted from the exhaust systems of supersonic jet.
(2) Aerosol sprays
(3) Refrigerants
(4) All of these

4. The compound which on strong heating gives oxygen is :
(1) $AgNO_3$ (2) BaO_2 (3) $Pb(NO_3)_2$ (4) all of these

5. Ozone is obtained from oxygen :
(1) by oxidation at high temperature (2) by oxidation using a catalyst
(3) by silent electric discharge (4) by conversion at high pressure

6. Ozone with KI solution produces :
(1) Cl_2 (2) I_2 (3) HI (4) IO_3^-

7. A considerable part of the harmful UV rays of the sun does not reach the surface of the earth. This is because high above the earth's atmosphere , there is a layer of :
(1) O_3 (2) CO_2 (3) SO_2 (4) NO

8. Which one of the following gives mixture of SO_2 and SO_3 on heating ?
(1) $ZnSO_4$ (2) $CuSO_4$ (3) $Fe_2(SO_4)_3$ (4) $FeSO_4$

9. SO_2 can reduce :
(1) $HClO_3$ to HCl (2) $Cr_2O_7^{2-}$ / H^+ to Cr^{3+} (3) MnO_4^- / H^+ to Mn^{2+} (4) all of these

10. The following catalyst is used in the manufacturing of sulphuric acid by lead chamber process.
(1) NO (2) NO_2 (3) Pt (4) V_2O_5

11. Which of the following behaves as both oxidising and reducing agents ?
(1) H_2SO_4 (2) SO_2 (3) H_2S (4) HNO_3

12. The acid which has a peroxy linkage is :
(1) sulphurous acid (2) pyrosulphuric acid (3) dithionic acid (4) Caro's acid

13. Out of $H_2S_2O_3$, $H_2S_4O_6$, H_2SO_5 and $H_2S_2O_8$ peroxy acids are :
(1) $H_2S_2O_3$, $H_2S_4O_6$ (2) $H_2S_4O_6$, H_2SO_5 (3) H_2SO_5 , $H_2S_2O_8$ (4) $H_2S_2O_3$, $H_2S_2O_8$

14. Which of the following statemetn is true about ozone layer ?
(1) It is harmful because ozone is dangerous to living organism.
(2) It is beneficial because oxidaiton reaction can proceed faster in the presence of ozone.
(3) It is beneficial because ozone cuts out the ultraviolet radiation of the sun.
(4) It is beneficial because ozone cuts out the important radiation of the sun which are vital for photosynthesis.

15. Identify the incorrect statement with respect to ozone.
(1) Ozone is formed in the upper atmosphere by a photochemical reaction involving dioxygen.

(2) Ozone is more reactive than oxygen.
(3) Ozone is diamagnetic whereas disoxygen is paramagnetic.
(4) Ozone protects the earth's inhabitants by absorbing γ radiations.

16. Which one of the following property is not correct for ozone.
(1) It oxidises lead sulphide. (2) It oxidises potassium iodide.
(3) It oxidises mercury. (4) It cannot act as bleaching agent.

17. In the reaction $O_3 + I_2 + H_2O \longrightarrow (X) + O_2$. The compound (X) is :
(1) HIO_3 (2) HI (3) HIO_4 (4) I_2O_5

18. Which of the following is oxidised by O_3 ?
(1) K_2MnO_4 (2) $Fe_2(SO_4)_3$ (3) $KMnO_4$ (4) $K_2Cr_2O_7$

19. About H_2SO_4 which is incorrect ?
(1) Reducing agent (2) Dehydrating agent
(3) Sulphonating agent (4) Highly viscous

20 Which of the following reactions depict the oxidising behaviour of H_2SO_4 ?
(1) $2PCl_5 + H_2SO_4 \longrightarrow 2POCl_3 + 2HCl + SO_2Cl_2$
(2) $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$
(3) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$
(4) $2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + 2H_2O$

Exercise-2

Marked Questions may have for Revision Questions.

1. What are the covalence and oxidation state of nitrogen in N_2O_5 ?
(1) 5,5 (2) 4,5 (3) 4,4 (4) None

2. Which statement is not correct for nitrogen ?
(1) It is obtained by heating $(NH_4)_2Cr_2O_7$ (2) It does not readily react with O_2
(3) It is a typical non-metal (4) d-orbitals are available for bonding

3. A mixture of alumina and coke is heated in a current of nitrogen to about 1800ºC and the product obtained is treated with water. A gas is evolved. The gas is :
(1) N_2 (2) N_2O (3) NH_3 (4) NO

4. When ammonia is oxidsed by oxygen in the presence of platinum at 800ºC, the gas obtained is :
(1) N_2O (2) NO (3) NO_2 (4) N_2O_5

5. Which of the following is a mixed acid anhydride ?
(1) NO (2) NO_2 (3) N_2O_5 (4) N_2O

6. The boiling points of the following hydrides follow the order
(1) $SbH_3 > NH_3 > AsH_3 > PH_3$ (2) $NH_3 > PH_3 > AsH_3 > SbH_3$
(3) $NH_3 > SbH_3 > AsH_3 > PH_3$ (4) $SbH_3 > AsH_3 > NH_3 > PH_3$

7. Which of the following statements is false for the various allotropic forms of phosphorus ?
(1) White phosphorus readily catches fire in air but α–black phosphorus does not oxidise in air.
(2) α- black phosphorus can be sublimed in air and has opaque monoclinic or rhombohedral cystals.
(3) Red phosphorus is insoluble in water but soluble in carbon disulphide.
(4) Amongst all allotropic forms, black phosphorus is thermodynamically most stable and white phosphorus is least stable.

8. Which of the following products is formed when phosphine is absorbed in copper sulphate solution?
(1) $Cu(OH)_2$ (2) $[Cu(PH_3)_4]\ SO_4$ (3) Cu_3P_2 (4) $Cu_3(PO_4)_2$

9. Which of the following statement is incorrect for phosphine ?
(1) It is not very soluble in water and aqueous solutions are neutral.
(2) The solution of PH_3 in water is stable even in presence of sun light.
(3) It does react with gaseous HI to form PH_4I.
(4) The spontaneous combustion of phosphine is technically used in Holme's signals.

10. Holme's signals can be given by using
(1) $CaC_2 + CaCN_2$ (2) $CaC_2 + Ca_3P_2$ (3) $CaC_2 + CaCO_3$ (4) $Ca_3P_2 + CaCN_2$

11. Column -I contains the different oxo-acids of phosphorus and Column- II contains their methods of preparation. Match the column-I with column-II and give the correct answer using the codes given.

Column – I	**Column – II**
(a) H_3PO_2	(p) $P_4O_{10} + H_2O$
(b) $H_3\ PO_4$	(q) $P_2O_3 + H_2O$
(c) $H_3\ PO_3$	(r) $H_3PO_3 + Br_2$, heat in a sealed tube .
(d) $(HPO_3)_3$	(s) White P_4 + Alkali

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(1)	(p)	(q)	(r)	(s)	(2)	(r)	(p)	(q)	(s)
(3)	(s)	(r)	(q)	(p)	(4)	(s)	(p)	(q)	(r)

12. Which of the following is not correctly matched with respect to the oxidation state of phosphorus atoms?
(1) POF_3 ; +5 (2) NaH_2PO_2 ; + 1 (3) Hg_3P_2 ; – 3 (4) $H_4P_2O_6$; + 5

13. Phosphorus trichloride, PCl_3 undergoes, hydrolysis at room temperature to produce an oxoacid. It has the formula :
(1) HPO_3 (2) H_3PO_3 (3) H_3PO_4 (4) H_3PO_2

14. The true statement for the acids of phosphorus, H_3PO_2, H_3PO_3 and H_3PO_4 is :
(1) H_3PO_3 on heating does not disproportionate
(2) H_3PO_2 and H_3PO_3 both have two P–OH bonds.
(3) all of them are tribasic acids
(4) H_3PO_2 is obtained by alkaline hydrolysis of P_4 (white)

15. Which among the following statements are correct ?
(a) Rhombic sulphur transforms to monoclinic sulphur when heated above 369 K.
(b) Solution of roll sulphur in CS_2, on evaporation gives the crystals of rhombic sulphur.
(c) Both rhombic and monoclinic sulphur have S_8 molecules.
(d) Both rhombic and monoclinic sulphur are soluble in carbon disulphide.
(1) (a) and (b) only (2) (a), (b) and (c) only
(3) (b), (c) and (d) only (4) (a), (b), (c) and (d)

16. Which of the following reactions represents the reducing behaviour of SO_2?
(1) $2NaOH\ (aq) + SO_2(g) \longrightarrow Na_2SO_3\ (aq) + H_2O\ (\ell)$
(2) $SO_2(g) + Cl_2(g) \xrightarrow{\text{charcoal}} SO_2Cl_2(l)$
(3) $2Fe^{3+} + SO_2\ (g) + 2H_2O \longrightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$
(4) $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$

17. The thermal stability of hydrides of oxygen family is in order :
(1) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$ (2) $H_2Po < H_2O < H_2Te < H_2Se < H_2S$
(3) $H_2S < H_2O < H_2Te < H_2Se < H_2Po$ (4) $H_2O < H_2S < H_2Te < H_2Se < H_2Po$

18. The gas respectively absorbed by alkaline pyrogallol and oil of cinnamon is :
(1) O_2, O_3 (2) SO_2, O_3 (3) O_3, CH_4 (4) N_2O, O_3

19. Consider the following compounds :
(i) sulphur dioxide (ii) hydrogen peroxide (iii) ozone
Among these compounds, those which can act as bleaching agents would include :
(1) 1 and 3 (2) 2 and 3 (3) 1 and 2 (4) 1, 2 and 3

20. When an article is bleached by SO_2 it loses its colour. The colour can be restored by :
(1) exposure to air (2) heating (3) dilution (4) none of these

21. A gas that can not be collected over water is :
(1) N_2 (2) O_3 (3) SO_2 (4) PH_3

22. Which of the following statement is true for sulphur dioxide?
(1) It reacts with dry chlorine in absence of moisture to form sulphuryl chloride.
(2) It in acidic medium reduces halogens to corresponding halides.
(3) Burning magnesium and potassium continue to burn in its atmosphere.
(4) All above are correct.

23. Which of the following does not have S–S linkage but have O—O linkage ?
(1) $S_2O_8^{2-}$ (2) $S_2O_6^{2-}$ (3) $S_2O_5^{2-}$ (4) $S_2O_3^{2-}$

24. There is no S–S bond in :
(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$

Exercise-3

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

1. Which of the following oxides is the most acidic ? **[AIPMT 1999]**
(1) N_2O_5 (2) P_2O_5 (3) As_2O_5 (4) Sb_2O_5

2. Which of the following has $p\pi - d\pi$ bonding ? **[AIPMT 2002]**
(1) NO_3^- (2) SO_3^{2-} (3) BO_3^{3-} (4) CO_3^{2-}

3. In NO_3^- ion, the number of bond pairs and lone pair of electrons on nitrogen atom are **[AIPMT 2002]**
(1) 2, 2 (2) 3, 1 (3) 1, 3 (4) 4, 0

4. On boiling phosphorus with KOH solution, product formed is **[AIPMT 2003]**
(1) Potassium sulphate (2) Phosphorus pentoxide
(3) Phosphorus hydroxide (4) Phosphine

5. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species ? **[AIPMT 2005]**
(1) F < Cl < O < S (2) S < O < Cl < F (3) O < S < F < Cl (4) Cl < F < S < O

6. Which one of the following oxides is expected to exhibit paramagnetic behaviour ? **[AIPMT 2005]**

(1) CO_2 (2) ClO_2 (3) SO_2 (4) SiO_2

7. Which of the following oxides of nitrogen is thermally most stable ? **[AIPMT 2006]**
(1) N_2O_5 (2) N_2O (3) NO (4) N_2O_3

8. Which of the following is the most basic oxide ? **[AIPMT 2006]**
(1) SeO_2 (2) Al_2O_3 (3) Sb_2O_3 (4) Bi_2O_3

9. Which one of the following ionic species has the greatest proton affinity to form stable compound ? **[AIPMT 2007]**
(1) I^- (2) HS^- (3) NH_2^- (4) F^-

10. In which of the following pairs, the two species are isostructural ? **[AIPMT 2007]**
(1) BrO_3^- and XeO_3 (2) SF_4 and XeF_4 (3) SO_3^{2-} and NO_3^- (4) BF_3 and NF_3

11. The angular shape of ozone molecule (O_3) consists of **[AIPMT 2008]**
(1) 1 sigma and 1 π bond (2) 2 sigma and 1 π bond
(3) 1 sigma and 2 π bond (4) 2 sigma and 1 π bond

12. The correct order of increasing bond angles in the following triatomic species is **[AIPMT 2008]**
(1) $NO_2^+ < NO_2 < NO_2^-$ (2) $NO_2^+ < NO_2^- < NO_2$ (3) $NO_2^- < NO_2^+ < NO_2$ (4) $NO_2^- < NO_2 < NO_2^+$

13. Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$ are respectively : **[AIPMT 2010]**
(1) +3, +5, +4 (2) +5, +3, +4 (3) +5, +4, +3 (4) +3, +4, +5

14. Sulphur trioxide can be obtained by which of the following reaction : **[AIPMT 2012]**
(1) $CaSO_4 + C \xrightarrow{\Delta}$ (2) $Fe_2(SO_4)_3 \xrightarrow{\Delta}$
(3) $S + H_2SO_4 \xrightarrow{\Delta}$ (4) $H_2SO_4 + PCl_5 \xrightarrow{\Delta}$

15. In which of the following arrangements the given sequence is not strictly according to the property indicated against it ? **[AIPMT 2012]**
(1) HF < HCl < HBr < HI : increasing acidic strength
(2) $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values
(3) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character
(4) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

16. Which of the following does not give oxygen on heating ? **[AIPMT-2013]**
(1) $Zn(ClO_3)_2$ (2) $K_2Cr_2O_7$ (3) $(NH_4)_2Cr_2O_7$ (4) $KClO_3$

17. Acidity of diprotic acids in aqueous solutions increases in the order: **[AIPMT-2014]**
(1) $H_2S < H_2Se < H_2Te$ (2) $H_2Se < H_2S < H_2Te$
(3) $H_2Te < H_2S < H_2Se$ (4) $H_2Se < H_2Te < H_2S$

18. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$ **[AIPMT-2014]**
(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$
Role of hydrogen peroxide in the above reactions is respectively:
(1) oxidizing in (a) and reducing in (b) (2) reducing in (a) and oxidizing in (b)

(3) reducing in (a) and (b) (4) oxidizing in (a) and (b)

19. Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other ? **[AIPMT-1-2015]**

(1) is a reducing agent (2) is soluble in water

(3) is used as a food-preservative (4) form 'acid-rain'

20. Strong reducing behaviour of H_3PO_2 is due to : **[AIPMT-2-2015]**

(1) Presence of one –OH group and two P–H bonds

(2) High electron gain enthalpy of phosphourus

(3) High oxidation state of phosphorus

(4) Presence of two –OH groups and one P–H bond.

21. When copper is heated with conc. HNO_3 it produces : **[NEET-2016]**

(1) $Cu(NO_3)_2$ and N_2O (2) $Cu(NO_3)_2$ and NO_2

(3) $Cu(NO_3)_2$ and NO (4) $Cu(NO_3)_2$, NO and NO_2

22. Which is the correct statement for the given acids? **[NEET-2016]**

(1) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.

(2) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.

(3) Both are diprotic acids.

(4) Both are triprotic acids

23. The product obtained as a result of a reaction of nitrogen with CaC_2 is : **[NEET-2016]**

(1) Ca_2CN (2) $Ca(CN)_2$ (3) CaCN (4) $CaCN_3$

24. Name the gas that can readily decolourise acidified $KMnO_4$ solution: **[NEET-2017]**

(1) CO_2 (2) SO_2 (3) NO_2 (4) P_2O_5

25. The correct order of N-compounds in its decreasing order of oxidation states is **[NEET-2018]**

(1) HNO_3, NO, N_2, NH_4Cl (2) NH_4Cl, N_2, NO, HNO_3

(3) HNO_3, NH_4Cl, NO, N_2 (4) HNO_3, NO, NH_4Cl, N_2

26. Identify the incorrect statement related to PCl_5 from the following **[NEET-1-2019]**

(1) PCl_5 molecule in non-reactive

(2) Three equatorial P–Cl bonds make an angle of 120º with each other

(3) Two axial P–Cl bonds make an angle of 180º with each other

(4) Axial P–Cl bonds are longer than equatorial P–Cl bonds

27. Which is the correct thermal stability order for H_2E (E=O, S, Se, Te and Po)? **[NEET-1-2019]**

(1) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

(2) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

(3) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

(4) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

28. Which of the following oxoacids of phosphorus has strongest reducing property? **[NEET-2-2019]**

(1) $H_4P_2O_7$ (2) H_3PO_3 (3) H_3PO_2 (4) H_3PO_4

29. Identify the correct formula of 'oleum' from the following **[NEET-2-2019]**

(1) $H_2S_2O_7$ (2) H_2SO_3 (3) H_2SO_4 (4) $H_2S_2O_8$

PART - II : AIIMS QUESTION (PREVIOUS YEARS)

1. The true statement for the acids of phosphorus, H_3PO_2, H_3PO_3 and H_3PO_4 is **[AIIMS 2003]**

(1) The order of their acidity is $H_3PO_4 > H_3PO_3 > H_3PO_2$

(2) All of them are reducing in nature

(3) All of them are tribasic acids

(4) The geometry of phosphorus is tetrahedral in all the three

2. Which of the following is the increasing order of enthalpy of vaporization ? **[AIIMS 2004]**

(1) NH_3, PH_3, AsH_3 (2) AsH_3, PH_3, NH_3 (3) NH_3, AsH_3, PH_3 (4) PH_3, AsH_3, NH_3

3. The shape of O_2F_2 is similar to that of : **[AIIMS 2004]**

(1) C_2F_2 (2) H_2O_2 (3) H_2F_2 (4) C_2H_2

4. The element which forms oxides in all oxidation states +I to +V is : **[AIIMS 2004]**

(1) N (2) P (3) As (4) Sb

5. The number of P–O–P bonds in the structure of phosphorus pentoxide and phosphorus trioxide are respectively **[AIIMS 2005]**

(1) 6, 6 (2) 5, 5 (3) 5, 6 (4) 6, 5

6. The compound which has molecular nature in gas phase but ionic in solid state is **[AIIMS 2006]**

(1) PCl_5 (2) CCl_4 (3) PCl_3 (4) $POCl_3$

7. In the reaction : $P_2O_5 + 2HNO_3 \longrightarrow 2HPO_3 + x$, the term x is : **[AIIMS-2010]**

(1) N_2O_4 (2) H_2O only (3) N_2O_5 (4) PNO_3

8. N_2 and O_2 are converted into monocations, N_2^+ and O_2^+ respectively. Which of the following is wrong? **[AIIMS-2012]**

(1) In N_2^+, N — N bond weakens (2) In O_2^+, the O – O bond order increases

(3) In O_2^+, paramagnetism decreases (4) N_2^+ becomes diamagnetic

9. The oxidation number of sulphur in S_8, S_2F_2, H_2S respectively are : **[AIIMS-2012]**

(1) 0, + 1 and – 2 (2) + 2, + 1 and – 2 (3) 0, + 1 and + 2 (4) – 2, + 1 and – 2

10. P_4O_{10} is not used to dry NH_3 gas because : **[AIIMS-2012]**

(1) P_4O_{10} reacts with moisture in NH_3 (2) P_4O_{10} is not a drying agent

(3) P_4O_{10} is acidic and NH_3 is basic (4) P_4O_{10} is basic and NH_3 is acidic

11. Identify the wrong statement in the following : **[AIIMS-2012]**

(1) Chlorofluorocarbons are responsible for ozone layer depletion

(2) Greenhouse effect is responsible for global warming

(3) Acid rain is mostly because of oxides of nitrogen and sulphur

(4) Ozone layer does not permit infrared radiation from the sun to reach the earth

12. **Assertion :** When a metal is treated with conc. HNO_3 it generally yield a nitrate, NO_2 and H_2O.

Reason: Cons. HNO_3 reacts with metal and first produces a metal nitrate and nascent hydrogen. The nascent hydrogen then further reduces HNO_3 to NO_2. **[AIIMS-2013]**

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true but R is not correct explanation of A

(3) A is true but R is false

(4) A and R are false

13. **Assertion (A)** Elementary phosphorus exists in three principal allotropic forms. i.e., white (or yellow), red (or violet) and black. **[AIIMS-2015]**

Reason (R) Of the three forms, white phosphorus is the most important and most reactive.

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true but R is not correct explanation of A

(3) A is true but R is false

(4) A and R are false

14. The true statement for the acids of phosphorus, H_3PO_2 , H_3PO_3 and H_3PO_4 is : **[AIIMS-2016]**

(1) the order of their acidity is $H_3PO_2 > H_3PO_3 > H_3PO_4$

(2) all of them are reducing in nature

(3) all of them are tribasic acids

(4) the geometry of phosphorus is tetrahedral in all the three

15. **Assertion (A)** : Mg continues to burn in nitric oxide. **[AIIMS-2017]**

Reason (R) : During the burning, the heat evolved does not decompose NO.

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true but R is not correct explanation of A

(3) A is true but R is false

(4) A and R are false

16. Which of the following is true for N_2O_5 **[AIIMS-2018]**

(1) Paramagnetic (2) Anhydride of HNO_2

(3) Brown gas (4) Exist in solid state In form of $[NO_2^+]$ $[NO_3^-]$

17. **Assertion :** HCOOH formic acid react with H_2SO_4 form CO. **[AIIMS-2018]**

Reason : H_2SO_4 is mild (moderate) oxidizing agent

(1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

(3) If assertion is true but reason is false.

(4) If both assertion and reason are false.

18. **Assertion :** Pure N_2 is formed from $Ba(N_3)_2$ **[AIIMS-2018]**

Reason : Mass of Barium is high

(1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

(3) If assertion is true but reason is false.

(4) If both assertion and reason are false.

19. **Assertion :** Red phosphorous on heating changes its colour into black **[AIIMS-2018]**

Reason : Black phosphorous contain P_4 units

(1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

(3) If assertion is true but reason is false.

(4) If both assertion and reason are false.

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. The number of hydrogen atom (s) attached to phosphorus atom in hypophosphorus acid is :

(1) zero (2) two (3) one (4) three **[AIEEE 2005]**

2. Which of the following chemical reactions depicts the oxidizing behaviour of H_2SO_4? **[AIEEE 2006]**

(1) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$ (2) $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$

(3) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ (4) $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

3. Regular use of which of the following fertilizers increases the acidity of soil? **[AIEEE 2007, 3/120]**

(1) Superphosphate of lime (2) Ammonium sulphate

(3) Potassium nitrate (4) Urea

4.* Which of the following statement is wrong? **[AIEEE 2011, 4/120]**

(1) The stability of hydrides increase from NH_3 to BiH_3 in group 15 of the periodic table :

(2) Nitrogen cannot form $d\pi$-$p\pi$ bond.

(3) Single N – N bond is weaker than the single P – P bond.

(4) N_2O_4 has two resonance structure

5. Which of the following statements regarding sulphur is **incorrect** ? **[AIEEE 2011, 4/120]**

(1) S_2 molecule is paramagnetic.

(2) The vapour at 200ºC consists mostly of S_8 rings.

(3) At 600ºC the gas mainly consists of S_2 molecules.

(4) The oxidation state of sulphur is never less than +4 in its compounds.

6. Which of the following is the wrong statement ? **[JEE(Main) 2013, 4/120]**

(1) ONCl and ONO^- are not isoelectronic. (2) O_3 molecule is bent

(3) Ozone is violet-black in solid state (4) Ozone is diamagnetic gas.

7. Which of the following properties is not shown by NO ? **[JEE(Main) 2014, 4/120]**

(1) It is dimagnetic in gaseous state

(2) It is a neutral oxide

(3) It combines with oxygen to form nitrogen dioxide

(4) It's bond order is 2.5

8. From the following statements regarding H_2O_2, choose the **incorrect** statement : **[JEE(Main) 2015, 4/120]**

(1) It can act only as an oxidizing agent

(2) It decomposed on exposure to light

(3) It has to be stored in plastic or wax lined glass bottles in dark

(4) It has to be kept away from dust

9. **Assertion :** Nitrogen and Oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen. **[JEE(Main) 2015, 4/120]**

Reason : The reaction between nitrogen and oxygen requires high temperature.

(1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion

(2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

(3) The assertion is incorrect, but the reason is correct

(4) Both are assertion and reason are incorrect

10. The pair in which phosphorous atoms have a formal oxidation state of +3 is: **[JEE(Main) 2016, 4/120]**

(1) Pyrophosphorous and hypophosphoric acids

(2) Orthophosphorous and hypophosphoric acids

(3) Pyrophosphorous and pyrophosphoric acids

(4) Orthophosphorous and pyrophosphorous acids

11. The reaction of zinc with dilute and concentrated nitric acid, respectively, produces: **[JEE(Main) 2016, 4/120]**

(1) NO_2 and NO (2) NO and N_2O (3) NO_2 and N_2O (4) N_2O and NO_2

12. The compound that does not produce nitrogen gas by the thermal decomposition is : **[JEE(Main) 2018, 4/120]**

(1) NH_4NO_2 (2) $(NH_4)_2SO_4$ (3) $Ba(N_3)_2$ (4) $(NH_4)_2Cr_2O_7$

Answers

EXERCISE - 1

SECTION (A)

1	(1)	**2**	(4)	**3**	(4)	**4**	(2)	**5**	(2)	**6**	(2)	**7**	(1)
8	(4)	**9.**	(2)	**10.**	(1)	**11.**	(1)	**12.**	(4)	**13.**	(4)	**14.**	(1)
15.	(3)	**16.**	(2)	**17.**	(1)	**18.**	(4)	**19.**	(3)	**20.**	(4)		

SECTION (B)

1.	(2)	**2**	(3)	**3**	(2)	**4.**	(1)	**5.**	(2)	**6.**	(3)	**7.**	(1)
8	(4)	**9.**	(3)	**10.**	(4)	**11.**	(3)	**12.**	(2)	**13.**	(3)	**14.**	(2)
15.	(2)	**16.**	(1)	**17.**	(2)	**18.**	(1)						

SECTION (C)

1.	(3)	**2**	(2)	**3.**	(3)	**4.**	(3)	**5.**	(4)	**6.**	(1)	**7**	(3)
8	(4)	**9**	(2)	**10.**	(3)	**11.**	(2)	**12.**	(1)	**13**	(1)	**14.**	(3)
15.	(3)	**16.**	(4)	**17.**	(2)	**18.**	(3)	**19.**	(2)				

SECTION (D)

1	(2)	**2.**	(4)	**3.**	(4)	**4.**	(4)	**5**	(3)	**6.**	(2)	**7.**	(1)
8.	(4)	**9.**	(4)	**10.**	(1)	**11.**	(2)	**12.**	(4)	**13.**	(3)	**14**	(3)
15	(4)	**16.**	(4)	**17.**	(1)	**18.**	(1)	**19.**	(1)	**20**	(4)		

EXERCISE - 2

1.	(2)	**2.**	(4)	**3.**	(3)	**4.**	(2)	**5.**	(2)	**6.**	(1)	**7.**	(3)
8.	(3)	**9.**	(2)	**10.**	(2)	**11.**	(4)	**12.**	(4)	**13.**	(2)	**14.**	(4)
15.	(4)	**16.**	(3)	**17.**	(1)	**18.**	(1)	**19.**	(4)	**20.**	(1)	**21.**	(3)
22.	(4)	**23.**	(1)	**24.**	(4)								

EXERCISE - 3

PART-I

1.	(1)	**2.**	(2)	**3.**	(4)	**4.**	(4)	**5.**	(3)	**6.**	(2)	**7.**	(3)
8.	(4)	**9.**	(4)	**10.**	(1)	**11.**	(2)	**12.**	(4)	**13.**	(4)	**14.**	(2)
15.	(2)	**16.**	(3)	**17.**	(1)	**18.**	(3)	**19.**	(3)	**20.**	(1)	**21.**	(2)
22.	(2)	**23.**	(Bonus)	**24.**	(2)	**25.**	(1)	**26.**	(1)	**27.**	(4)	**28.**	(3)
29.	(1)												

PART-II

1.	(1)	**2.**	(4)	**3.**	(2)	**4.**	(1)	**5.**	(1)	**6.**	(1)	**7.**	(3)
8.	(4)	**9.**	(1)	**10.**	(3)	**11.**	(4)	**12.**	(1)	**13.**	(2)	**14.**	(4)
15.	(3)	**16.**	(4)	**17.**	(2)	**18.**	(2)	**19.**	(3)				

PART-III

1.	(2)	**2.**	(1)	**3.**	(2)	**4.***	(1,4)	**5.**	(4)	**6.**	(All)	**7.**	(1)
8.	(1)	**9.**	(1)	**10.**	(4)	**11.**	(4)	**12.**	(2)				