

P-BLOCK ELEMENTS

- 1) Which of the following does not form a pentachloride?
(a) P (b) As (c) Sb **(d) N**
- 2) Which of the following on heating does not give nitrogen gas?
(a) NH_4NO_3 (b) NH_4NO_2 (c) $\text{Ba}(\text{N}_3)_2$ (d) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
- 3) The element which forms oxides in all oxidation states +I to +V is
(a) N (b) P (c) As (d) Sb
- 4) Which of the following elements is kept in water?
(a) White P (b) Na (c) S (d) Si
- 5) For H_3PO_3 and H_3PO_4 , the correct choice is
(a) H_3PO_3 is dibasic and reducing (b) H_3PO_4 is dibasic and non-reducing
(c) H_3PO_4 is tribasic and reducing (d) H_3PO_3 is tribasic and non-reducing
- 6) Which of the following is the increasing order of enthalpy of vaporisation?
(a) NH_3 , PH_3 , AsH_3 (b) AsH_3 , PH_3 , NH_3 (c) NH_3 , AsH_3 , PH_3 **(d) PH_3 , AsH_3 , NH_3**
- 7) The number of P-O-P bonds in the structure of phosphorus pentoxide and phosphorus trioxide are respectively
(a) 6,6 (b) 5,5 (c) 5,6 (d) 6,5
- 8) Which of the following is not hydrolysed?
(a) AsCl_3 (b) PF_3 (c) SbCl_3 **(d) NF_3**
- 9) The value of oxidation number of S in S_8 , S_2F_2 and H_2S are respectively
(a) -2,+1 and -2 (b) -2, -1 and +2 (c) 0,+1 and +2 **(d) 0,+1 and -2**
- 10) Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species?
(a) $\text{F} < \text{Cl} < \text{O} < \text{S}$ (b) $\text{S} < \text{O} < \text{Cl} > \text{F}$ **(c) $\text{O} < \text{S} < \text{F} < \text{Cl}$** (d) $\text{Cl} < \text{F} < \text{S} < \text{O}$
- 11) The element evolving two different gases on reaction with cone. Sulphuric acid is
(a) P **(b) C** (c) Hg (d) S
- 12) Ozone is tested by
(a) Ag **(b) Hg** (c) Zn (d) Au
- 13) There are no S-S bond in
(a) $\text{S}_2\text{O}_4^{2-}$ (b) $\text{S}_2\text{O}_5^{2-}$ (c) $\text{S}_2\text{O}_3^{2-}$ **(d) $\text{S}_2\text{O}_7^{2-}$**
- 14) Which of the following compounds exists?
(a) KCl_2 **(b) KHF_2** (c) KBr_2 (d) KI_2
- 15) Which of the following has the highest reducing power?
(a) HCl **(b) HI** (c) HBr (d) HF
- 16) When I_2 is passed through KCl, KF, KBr
(a) Cl_2 and Br_2 are evolved (b) Cl_2 is evolved (c) Cl_2 , Br_2 , F_2 are evolved
(d) none of these
- 17) Which products are expected from the disproportionation reaction of hypochlorous acid?
(a) HClO_3 and Cl_2O (b) HClO_2 and HClO_4 (c) HCl and Cl_2O **(d) HCl and HClO_3**
- 18) Which of the following orders is not in accordance with the property stated against it?
(a) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$; Bond dissociation energy
(b) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$; oxidising power (c) $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$; acidic property power
(d) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$; electronegativity

- 19) An aqueous solution of KBr is treated with each of the following. In which case bromine will be liberated?
(a) Cl₂ (b) HI (c) SO₂ (d) I₂
- 20) Which of the following gas is filled in the tyres of aeroplanes?
 (a) H₂ (b) He **(c) N₂** (d) Ar
- 21) The formation of O₂⁺[PtF₆]⁻ is the basis for the formation of xenon fluorides. This is because
 (a) O₂ and Xe have comparable sizes (b) both O₂ and Xe are gases
(c) O₂ and Xe have comparable ionisation energies
 (d) O₂ and Xe have comparable electronegativities.
- 22) Number of lone pairs of electrons on Xe atoms in XeF₂, XeF₄, XeF₆ and XeO₄ molecules are respectively.
(a) 3,2,1,0 (b) 1,3,2,0 (c) 0,2,3,1 (d) 3,2,0,1
- 23) On addition of conc.H₂SO₄ to a chloride salt, colourless fumes are evolved but in case of iodide salt, violet fumes comes out. This is because
(a) H₂SO₄ reduces HI to I₂ (b) HI is of violet colour (c) HI gets oxidised to I₂
 (d) HI changes to HIO₃
- 24) In quantitative analysis when H₂S is passed through an aqueous solution of salt acidified with dil . HCl, a black precipitate is obtained. On boiling the precipitate with dil . HNO₃ it forms a solution of blue colour. Addition of excess of aqueous solution of ammonia to this solution gives.....
 (a) deep blue precipitate of Cu(OH)₂ **(b) deep blue solution of [Cu(NH₃)₄]²⁺**
 (c) deep blue solution of Cu(NO₃)₂ (d) deep blue solution of Cu(OH)₂.Cu(NO₃)₂
- 25) In a cyclo tri metaphosphoric acid molecule, how many single and double bonds are present?
(a) 3 double bonds ; 9 single bonds (b) 6 double bonds ; 6 single bonds
 (c) 3 double bonds ; 12 single bonds (d) zero double bonds ; 12 single bonds
- 26) Which of the following elements can be involved in pπ-dπ bonding?
 (a) Carbon (b) Nitrogen **(c) Phosphorus** (d) Boron
- 27) Which o the following pairs o ions are isoelectronic and isostructural?
(a) CO₃²⁻, NO₃⁻ (b) ClO₃⁻, CO₃²⁻ (c) SO₃²⁻, NO₃⁻ (d) ClO₃⁻, SO₃²⁻
- 28) Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy?
(a) HF (b) HCl (c) HBr (d) HI
- 29) Bond dissociation enthalpy of E-H (E=element) bonds is given below. Which of the compounds will act as strongest reducing agent? Compound NH₃ PH₃
 AsH₃ SbH₃ Δ_{diss}(E-H)/kJ mol⁻¹ 389 322 297 255
(a) NH₃ (b) PH₃ (c) AsH₃ **(d) SbH₃**
- 30) On heating with concentrated NaOH solution in an inert atmosphere of CO₂, white phosphorus gives a gas. Which of the following statement is incorrect about the gas?
 (a) It is highly poisonous and has smell like rotten fish
 (b) It's solution in water decomposes in the presence of light (c) It is more basic than NH₃
(d) It is less basic than NH₃
- 31) Which of the following acids forms three series of salts?
 (a) H₃PO₂ (b) H₃BO₃ **(c) H₃PO₄** (d) H₃PO₃
- 32) Strong reducing behaviour of H₃PO₂ is due to
 (a) Low oxidation state of phosphorus (b) Presence of two -OH groups and one P-H
(c) Presence of One -OH group and two P-H bonds
 (d) High electron gain enthalpy of phosphorus.
- 33) On heating, lead nitrate forms oxides of nitrogen and lead. The oxides formed are.....
 (a) N₂O, PbO **(b) NO₂, PbO** (c) NO, PbO (d) NO, PbO₂

- 34) Which of the following elements does not show allotropy?
(a) Nitrogen (b) Bismuth (c) Antimony (d) Arsenic
- 35) Maximum covalency of nitrogen is.....
 (a) 3 (b) 5 **(c) 4** (d) 6
- 36) Which of the following statement is wrong?
(a) Single N-N bond is stronger than the single P-P bond
 (b) PH_3 can act as a ligand in the formation of coordination compound with transition elements.
 (c) NO_2 is paramagnetic in nature. (d) Covalency of nitrogen in N_2O_5 is four.
- 37) A brown ring is formed in the ring test for NO_3^- ion. It is due to the formation of
(a) $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]^{2+}$ (b) $\text{FeSO}_4 \cdot \text{NO}_2$ (c) $[\text{Fe}(\text{H}_2\text{O})_4(\text{NO})_2]^{2+}$ (d) $\text{FeSO}_4 \cdot \text{HNO}_3$
- 38) Elements of group-15 form compounds in +5 oxidation state. However, bismuth forms only one well characterised compound in +5 oxidation state. The compound is
 (a) Bi_2O_5 **(b) BiF_5** (c) BiCl_5 (d) Bi_2S_5
- 39) On heating ammonium dichromate and barium azide separately we get
(a) N_2 in both cases (b) N_2 with ammonium dichromate and NO with barium azide
 (c) N_2O with ammonium dichromate and N_2 with barium azide.
 (d) N_2O with ammonium dichromate and NO_2 with barium azide.
- 40) In the preparation of HNO_3 , we get NO gas by catalytic oxidation of ammonia. The moles of NO produced by oxidation of two moles of NH_3 will be
(a) 2 (b) 3 (c) 4 (d) 6
- 41) The oxidation state of central atom in the anion of compound NaH_2PO_2 will be
 (a) +3 (b) +5 **(c) +1** (d) -3
- 42) Which of the following is not tetrahedral in shape?
 (a) NH_4^+ (b) SiCl_4 **(c) SF_4** (d) SO_4^{2-}
- 43) Which of the following are peroxy acids of sulphur?
 (a) H_2SO_5 and $\text{H}_2\text{S}_2\text{O}_8$ (b) H_2SO_5 and $\text{H}_2\text{S}_2\text{O}_7$ **(c) $\text{H}_2\text{S}_2\text{O}_7$ and $\text{H}_2\text{S}_2\text{O}_8$**
 (d) $\text{H}_2\text{S}_2\text{O}_6$ and $\text{H}_2\text{S}_2\text{O}_7$
- 44) Hot conc. H_2SO_4 acts as moderately strong oxidising agent. It oxidises both metals and nonmetals. Which of the following element is oxidised by conc. H_2SO_4 into two gaseous products?
 (a) Cu (b) S **(c) C** (d) Zn
- 45) A black compound of manganese reacts with a halogen acid to this gas reacts with NH_3 an unstable trihalide is formed. In this process the oxidation state of nitrogen changes from.....
(a) -3 to +3 (b) -3 to 0 (c) -3 to +5 (d) 0 to -3
- 46) In the preparation of compounds of Xe, Bartlett had taken $\text{O}_2^+\text{PtF}_6^-$ as a base compound. This is because
 (a) both O_2 and Xe have same size (b) both O_2 and Xe have same electron gain enthalpy
(c) both O_2 and Xe have almost same ionisation enthalpy
 (d) both Xe and O_2 are gases
- 47) In solid state PCl_5 is a
 (a) covalent solid (b) octahedral structure
(c) ionic solid with $[\text{PCl}_6]^+$ octahedral and $[\text{PCl}_4]^-$ tetrahedral
 (d) ionic solid with $[\text{PCl}_4]^+$ tetrahedral and $[\text{PCl}_6]^-$ octahedral.
- 48) Reduction potentials of some ions are given below. Arrange them in decreasing order of oxidising power. Ion ClO_4^- IO_4^- BrO_4^- Reduction $E^\circ = -1.19\text{V}$
 $E^\circ = 1.65\text{V}$ $E^\circ = 1.74\text{V}$ potential E°/V
 (a) $\text{ClO}_4^- > \text{IO}_4^- > \text{BrO}_4^-$ (b) $\text{IO}_4^- > \text{BrO}_4^- > \text{ClO}_4^-$ **(c) $\text{BrO}_4^- > \text{IO}_4^- > \text{ClO}_4^-$**
 (d) $\text{BrO}_4^- > \text{ClO}_4^- > \text{IO}_4^-$
- 49) Which of the following is isoelectronic pair?
 (a) ICl_2 , ClO_2 **(b) BrO_2^- , BrF_2^+** (c) ClO_2 , BrF (d) CN^- , O_3

50) If chlorine gas is passed through hot NaOH solution, two changes are observed in the oxidation number of chlorine during the reaction. These are and

(a) 0 to +5 (b) 0 to +3 (c) 0 to -1 (d) 0 to +1

51) Draw the structure of XeF₆.

Answer :

52) Why does O₃ act as a powerful oxidising agent?

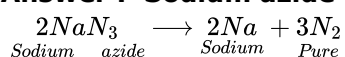
Answer : It is because it has low bond dissociation energy, it is more reactive therefore it liberates nascent oxygen easily. O₃ ----- > O₂ + [O]

53) PH₃ has lower boiling point than NH₃ why?

Answer : NH₃ molecules are associated with intermolecular H-bonding whereas PH₃ is not that is why NH₃ has higher boiling point than phosphine.

54) Write the reaction of the thermal decomposition of sodium azide.

Answer : Sodium azide gives pure dinitrogen gas on heating along with sodium metal.



55) What happens when PCl₅ is heated?

Answer : PCl₅ $\xrightarrow{\text{heat}}$ PCl₃ + PCl₂

56) Why does PCl₃ fume in moisture?

Answer : PCl₃ is covalent compound. It gets hydrolysed in presence of moisture to form HCl which fumes in moist air. The reaction takes place as follows: PCl₃(g) + 3H₂O → H₃PO₃ + 3HCl

57) Why does NO₂ dimerise?

Answer :

58) What is the covalence of nitrogen in N₂O₅?

Answer : It is four.

59) Why is BiH₃ the strongest reducing agent amongst all hydrides of group 15 element?

Answer : It is due to its lowest bond dissociation energy due to longer bond length.

60) Give reason for the following: Among the noble gases only xenon is well known to form chemical compounds.

Answer : Xe is largest in size and has highest polarizing power and lowest ionisation enthalpy

61) Fluorine does not exhibit any positive oxidation state. Why?

Answer : It is because it is most electronegative element and best oxidising agent.

62) Which one PCL₄⁺ and PCL₄⁻ is not likely to exist and why?

Answer : PCL₄⁻ does not exist because octet of 'P' is not complete and it is unstable.

63) Despite lower value of its electron gain enthalpy with negative sign, fluorine (F₂) is a stronger oxidising agent than Cl₂.

Answer : It is due to higher standard reduction potential of F₂ which is due to low bond dissociation energy of F-F bond due to small size of F atom, high electron gain enthalpy and highest hydration enthalpy

64) Which is a stronger reducing agent, SbH₃ or BiH₃, and why?

Answer : BiH₃ is stronger reducing agent because it has low bond dissociation energy than SbH₃ due to longer bond length.

65) What is the basicity of H₃PO₂ acid and why?

Answer :

66) Although the H-bonding in hydrogen fluoride is much stronger than that in water, yet water has a much higher boiling point than hydrogen fluoride. Why?

Answer : It is because H₂O molecules form H-bonds to more extent as compared to HF molecules.

67) Complete the following chemical equation: NH₄Cl(aq) + NaNO₂(aq) →

Answer : NH₄Cl(aq) + NaNO₂(aq) → NH₄NO₂(aq) + NaCl(aq)

68) Explain giving a reason for the following situation: In aqueous medium HCl is a stronger acid than HF.

Answer : It is because bond dissociation energy of H---Cl is lower than HF due to longer bond length.

69) Assign a reason for each of the following statements: Phosphorus(P_4) is more reactive than nitrogen(N_2)

Answer : It is due to single bond in phosphorus which has less bond dissociation energy as compared to nitrogen which has triple bond ($N \equiv N$) has high bond dissociation energy, so nitrogen is unreactive.

70) Arrange F_2 , Cl_2 , Br_2 and I_2 in the order of increasing bond dissociation enthalpy.

Answer : $I_2 < F_2 < Br_2 < Cl_2$

71) What is the oxidation number of phosphorus in H_3PO_2 molecule?

Answer : $(+1) \times 3 + X \times 2 \times (-2) = 0 \Rightarrow X - 1 = 0 \Rightarrow X = +1$

72) Draw the structure of O_3 molecule.

Answer :

73) Nitrogen is relatively inert as compared to phosphorus. Why?

Answer : It is due to presence of triple bond in nitrogen ($N \equiv N$), which has high bond dissociation energy as compared to single (p-p) bond.

74) Which is a stronger acid in aqueous solution, HCl or HI, and why?

Answer : HI is stronger acid than HCl in aqueous solution because it has lower bond dissociation energy due to longer bond length.

75) Why are pentahalides of a metal more covalent than its trihalides?

Answer : It is because pentavalent metal ion has higher polarising power than trivalent metal ion.

76) Which one has higher electron gain enthalpy with negative sign, sulphur or oxygen?

Answer : Sulphur has higher electron gain enthalpy with negative sign.

77) In which one of the two structures, NO_2^+ and NO_2^- , the bond angle has a higher value?

Answer : NO_2^+ will have higher value of bond angle.

78) Why is the bond angle in PH_3 molecule lesser than that in NH_3 molecule?

Answer : It is because 'P' is larger in size and less electronegative than 'N'. In NH_3 , there is high electron density around 'N' as compared to 'P' in PH_3 which causes greater repulsion between electron pairs around 'N' atom resulting in maximum bond angle. In PH_3 , electron density around 'P' is less, there is less repulsion between electron pairs and lesser bond angle.

79) Complete the following reaction: $Xe + PtF_6 \rightarrow$

Answer : $Xe + PtF_6 \rightarrow Xe^+[PtF_6]^-$

80) Why does NH_3 act as a Lewis base?

Answer : In NH_3 , there is lone pair of electrons due to which it acts as Lewis base.

81) Mention the conditions required to maximise the yield of ammonia.

Answer : (i) Moderate temperature 700 K (ii) High pressure 20×10^6 Pa. (iii) Iron oxide + Al_2O_3 + K_2O as catalyst.

82) How does ammonia react with a solution of Cu^{2+} ?

Answer : $Cu^{2+}(aq) + 4 NH_3(aq) \rightarrow [Cu(NH_3)_4]^{2+}$ Blue Deep blue

83) In what way can it be proved that PH_3 is basic in nature?

Answer : PH_3 is weaker base that is why it reacts with stronger acid like HI to form a salt $PH_4^+ I^-$ (Phosphonium iodide). It shows PH_3 is basic in nature.

84) Bond angle in PH_4^+ is higher than that in PH_3 . Why?

Answer : It is because PH_4^+ has sp^3 hybridization with lone pair whereas PH_3 has pyramidal shape with one lone pair.

85) What happens when white phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2 ?

Answer :

- 86) Write a balanced equation for the hydrolytic reaction of PCl_5 in heavy water.
Answer : $\text{PCl}_5 + 4\text{D}_2\text{O} \longrightarrow \text{D}_3\text{PO}_4 + 5\text{DCl}$
- 87) How do you account for the reducing behaviour of H_3PO_2 on the basis of its structure?
Answer :
- 88) What is the basicity of H_3PO_4 ?
Answer :
- 89) What happens when H_3PO_3 is heated?
Answer : $\text{H}_3\text{PO}_3 \longrightarrow 3\text{H}_3\text{PO}_4 + \text{PH}_3$ **Phosphoric acid and phosphine are formed.**
- 90) Elements of Group 16 Generally show lower value of first ionization enthalpy compared to the corresponding periods of group 15. Why?
Answer : **It is because half filled p-orbitals in group 15 which as extra stability as compared to group 16 that is why ionisation enthalpy of group 15 elements is higher.**
- 91) Write the order of thermal stability of the hydrides of Group 16 elements.
Answer : $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te} > \text{H}_2\text{Po}$
- 92) Why is H_2O liquid and H_2S a gas?
Answer : **It is because water is associated with intermolecular H-bonding whereas H_2S is not.**
- 93) Which of the following does not react with oxygen directly? Zn, Ti, Pt, Fe
Answer : **Platinum.**
- 94) Which form of sulphur shows paramagnetic behaviour?
Answer : **In vapour state sulphur partly exists as S_2 molecule which has two unpaired electrons in the antibonding π^* orbitals like O_2 and, hence, exhibits paramagnetism.**
- 95) What happens when sulphur dioxide is passed into aqueous solution of Fe(III) salt?
Answer : $2\text{Fe}^{3+} + \text{SO}_2 + 2\text{H}_2\text{O} \longrightarrow 2\text{Fe}^{2+} + \text{SO}_4^{2-} + 4\text{H}^+$, **Ferric ions get reduced to Fe^{2+} ions.**
- 96) How is the presence of SO_2 detected?
Answer : **Take acidified potassium dichromate paper. If it turns green, presence of SO_2 is confirmed.**
- 97) Halogens have maximum negative electron gain enthalpy in the respective periods of the periodic table. why?
Answer : **It is due to smaller atomic size, they can gain electron easily and more energy is released on addition of electron due to force of attraction between nucleus and electron which is added.**
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