CHEMISTRY

BOOKS - V PUBLICATION

The p-BLOCK ELEMENTS

Question Bank

1. Why are pentahaildes more covalent than tirhalides

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2. Why is 'BiH_3' the strongest reducing agent amongst all the hydrides of group 15 elements?

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3. Why is N_2 less reactive at room temperature?

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4. Mention the conditions required to maximise the yield of ammonia.

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5. How does ammonia react with a solution of Cu^{2+} ?

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6. What is the covalence of nitrogen in N_2O_5?

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7. Bond angle in is PH_4^+ higher than that in PH_3

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8. What happens when white phosphorus is heated with NaOH solution in an inert atmosphere of CO_2 ?

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9. What happens when PCl_5 is heated?

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10. Write balanced equation for the hydrolytic reaction of PCl_5 with heavy water?

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11. What is the basicity of H_3PO_4?

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12. What happens when H_3PO_3 is heated?

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13. List the important sources of sulphur

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14. Write the order thermal stability of the hydrides of group-16 elements

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15. Why is 'H_2 O' a liquid and 'H_2 S' a gas?

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16. Which of the following does not react with O_2 directly Zn, Ti,Pt, Fe?

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17. Complete the following reactions?

'4Al+3O_2`

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18. What happens when SO_2 is passed through an aqueous solution of Fe (III) salt?

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19. Comment on the nature of two S-O bonds in SO_2 molecule. Are the two S:O bonds in this molecule equal?

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20. How is the presence of SO_2 detected?

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21. Why does ozone act as a powerful oxidising agent?

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22. How is 'O_3' estimated quantitatively?

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23. Mention three areas in which H_2SO_4 plays an important role.

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24. Write the conditions to maximise the yield of H_2SO_4 in contact process.

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25. Why is Ka_2 less than Ka_1 for H_2SO_4 in water.?

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26. Give the reason for the bleaching property of chlorine.

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27. Name two poisonous gases that can be prepared from chlorine gas

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28. Why is ICl more reactive than I_2 ?

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29. Why is helium used in diving apparatus?

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30. Balance the following equation: 'XeF6 + H2O -> XeO2F2 +HF

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31. Why has it been difficult to study the chemistry of radon?

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32. Discuss the general characteristics of Group 15 elements with reference to their electronic configuration, oxidation state, atomic size, Ionisation, enthalpy, and electronegativity.

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33. Why does the reactivity of nitrogen differ from phosphorus?

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34. Discuss the trends in chemical reactivity of group 15 elements.

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35. Why does NH3 form hydrogen bond but 'PH3 does not?

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36. How is nitrogen prepared in the laboratory? Write the chemical equation of the reaction involved.

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37. How is ammonia manufactured industrially?

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38. Illustrate how copper metal can give different products on reaction with 'HNO3'

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39. Give the resonating structures of NO_2 and N_2O_5

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40. The HNH angle value is higher than HPH, HAsH and HSbH angles. Why?

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41. Why does $R_3P = 0$ exist but $R_3N = 0$ does not. [R = alkyl group]?

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42. Explain why 'NH3', is basic. while 'BiH3 is only feebly basic.

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43. Nitrogen exists as diatomic molecule and phosphorus as 'P4'. Why?

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44. Write main differences between the properties of white phosphorus and red phosphorus.

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45. Why does nitrogen show catenation properties less than phosphourus?

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46. Give the-disproportionation reaction of 'H_3 PO_3'

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47. Can 'PCl5', act as oxidising as well as a reducing agent? Justify.

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48. Justify the placement of '0, S', Se, Te and 'Po' in the same group of the periodic table in terms of electronic configuration, oxidation state and hydride formation.

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49. Why is dioxygen a gas, but sulphur a solid?

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50. Knowing the electron gain enthalpy values for $O \rightarrow O^-$ and $O \rightarrow O^2-$ as -141 and $702\text{~}kJ\text{~}mol^{-1}$ respectively, how can you account for the formation of a large number of oxides having O^2- species and not O^-

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51. Which aerosols deplete ozone?

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52. Describe the manufacture of 'H_2 SO_4' by contact process.

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53. How is SO2 an air pollutant?

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54. Why are halogens strong oxidizing agents?

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55. Explain why fluorine forms only one oxoacid HOF?

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56. Explain why inspite of nearly the same electronegativity, oxygen forms hydrogen

bonding while chlorine does not.

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57. Write two uses of ClO2

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58. Why are halogens coloured?

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59. Write the reactions of F_2 and Cl_2 with water.

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60. How can you prepare 'Cl', from 'HCl' and HCl' from 'Cl_2' ? Write reactions only.

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61. What Inspired N. Bartlett for carrying out reaction between 'Xe and 'PtF_6 ?'

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62. What are the oxidation states of phosphorus in the following: H_3PO_3, PCl_3, Ca_3P_2, Na_3PO_4, POF_3

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63. Write balanced equations for the following: i. 'NaCl is heated with sulphuric acid

in the presence of 'MnO2 ii. Chlorine gas is passed into a solution of NaI in water.

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64. How are xenon fluorides 'XeF2, XeF4 and XeF6 obtained?

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65. With what neutral molecule is 'ClO-' isoelectronic? Is that molecule a Lewis base?

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66. .How are 'XeO3 and 'XeOF4' prepared?

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67. Arrange the following in the order of property indicated for each F2, Cl2,Br2, I2 increasing bond dissociation enthalpy. ii. 'HF, HCl, HBr', HI - increasing acid strength. iii.

NH3,PH3,AsH3, SbH3, BiH3 -increasing báse strength.

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68. Which one of the following does not exist?

i 'XeOF4' iiNeF2 iii XeF iv 'XeF6'

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69. Give the formula and describe the structure of A.noble gas species which is

isostructural with: a ICl4-

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70. Why do noble gas have comparatively large atomic sizes?

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71. List the uses of neon and argon gases.

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72. Except CO_2 all other dioxides of group 14 exist as solid at room temperature. A student says that this is related to bonding. Explain the reason:

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73. Nitrogen does not form pentahalides, while other group members form. Describe the reaction based on hybridization of the central atom.

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74. Complete the following table:

'(##VPS_HSS_CHE_ XII_C07_E03_003_Q01##)'

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75. Two allotropic forms of sulphur have same structure.

i. Identify the allotropes

ii. How they are prepared?

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76. Sulphur forms two chlorides, SCl_2 and S_2Cl_2 Write a note on their preparation and structure.

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77. The acidic strength of oxoacids of chlorine is in the order 'HClO4,HClO3,HClO2,HClO' Briefly explain the reason for this.

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78. "Inter halogén compounds are. more reactive than the constituent halogen molecules" ' Do you agree with this' statement? Justify.

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79. In a role play, student A is named as Boron and student B is naméd as silicon. Both are presenting thé diagonal relationsinip between the two.

a. Compare the comments of the students about the products of hydrolysis of their halides.

b. Both the students presented charts to show the nature of their oxides. Write the chemical equation they have written in ęach chart and give the nature of oxides.

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80. Carbon and Silicon are present in the same group. Their dioxides CO_2 and SiO_2, show

some similarities. For example both are acidic oxides. a. But, CO_2 is a gas while SiO_2 is a solid. Account. b. The basic building blocks of silicates are (SiO4)^4-tetrahedra. Differentiate Orthosilicates and Pyrosilicates. c. Silica gel is used as-a drying agent. Justify.

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81. Phosphorus is an essential constituent of both the plants and animals.

Phosphorus is stored under water. Give reason.

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82. Account for the' "play of-colours' shown by. sodium thiosulphate with-silver' nitrate.

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83. a, What are inter-halogen compounds? Give any two example. b. The number of electrons

'in the valence shell decides the oxidation state of an element What are the possible oxidation states of Pb? Atomic number of 'Pb=82' Which is more stable? Why?

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84. PCl , is known but 'NCl_5' is unknown. Why?

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85. N2 is inert. Why?

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86. Urea is used as a fertilizer. Why?

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87. What is the reaction between ammonium and chloroplatinic acid?

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88. Which property is made use of in separating red phosphorus from white phosphorus?

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89. Which is more stable PCl3 or PCl5 Why?

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90. Group 16 elements are called chalcogens? Why?

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91. Which has higher value for 1st ionisation enthalpy - oxygen or nitrogen. Why?

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92. Group 16 elements have higher values of electronegativity. Why?

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93. Oxygen is a diatomic gas. Why?

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94. Suluphur has a strong tendency for catenation than oxygen. Why?

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95. Hydrocarbons are used as fuels. Why?

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96. Name the anhydride of sulphurous acid. Why is it called so?

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97. Sulphuir dioxide 'SO_2' is, a reducing agent. Why?

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98. Hot concentrated sulphuric acid is a strong oxidising agent. Why?

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99. Fluorine does not show higher positive oxidation states. Why?

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100. Arrange HF, HCI, HBr and HI in the order of their i dipole moments. ii bond length

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101. In presence of moisture, 'C l2' acts as a powerful oxidising agent. Why?

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102. Does the hydrolysis of 'XeF_6' lead to a redox reaction?

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103. Explain i) Sulphur vapours, exhibits some paramagnetism ii) ClF, exists but FCl_3 does not. iii)$N(CH_3)_3$, is pyramidal but $N(SiH_3)_3$ is planar. iv) Interhalogen compounds are more reactive than the corresponding, elemental hálogens?

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104. Explain i Helium is used in inflating aeroplane tyres? ii. Solubility of noble gases in

water inereases as we move down the group.

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105. In the reaction 'A+2B+H2O gives C+2D. draw the structures of A, B, C, D , where A is 'HNO2 B is H2SO3 and C is NH2OH .

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106. Element A burns, in nitrogen to give an ionic compound B. The compound B reacts

with 'H2O' to give 'C' and 'D'. A solution of 'C' becomes milky on bubbling 'CO2'. Identify 'A, B, C, D'.

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107. An orange solid. 'X' on heating gives a green residue 'Y', water vapours and a colourless gas Z. The gas 'Z' in dry conditions is passed over heated 'Mg' to give à solid 'W' which further reacts, with water to produce

gas E which gives dense white fumes with HCl.

Identify 'X, Y_ Z W. E

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108. i Why HF acid is stored in wax coated glass bottles? ii Iodine is more soluble in KI than in 'H2O'. Why?

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109. Bleaching of flowers by chlorine permanent while that by 'SO2', is temporary. Explain.

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110. A translucent white waxy solid A on heating in an inert atmosphere is converted into its allotropic form B. Allotrope 'A' on reaction with véry dilute agueous KOH liberates a highly poisonous gas C having

rotten fish smell. With excess of chlorine C form. D which hydrolyses to compound E: Identify 'A' to E.

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111. Explain i. Oxides of nitrogen have open chain structures while those of phosphorus have closed chain or cage structure. Why is it so? Ilustrate with one structural example for each type of oxides or The oxides of phosphorus have cage strućtures but not

open ones. ii. Elemental phosphorus does not exist as P_2 as N_2

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112. Explain i. It is advisable to grow a leguminous crop on a soil every three or four years

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113. Explain i) ozone layer acts as an umbrella for the earth against the harmful radiation from sun. ii) The wooden shelf under thé reagent bottle containing conc. H_2SO_4 blackens after sometime. iii Precipitation of secònd group sulphides in qualitative analysis is càrried out with H_2S in presence of HCl and not nitric acid.

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114. Name the catalysts used in contact process. Write the optimum temperature for their efficient working

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115. Explain i For the dilution of 'H2 SO4', water should not be added to conc. 'H2 SO4?' ii Conc. 'H2 SO4', cannot be used for drying 'H2S

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116. i. HF exists a dimeric molecule ie. HF has higher viscocity or high boiling point. Explain. ii. Anhydrous HCl is a bad conductor of electricity but aqueous HCl is a good conductor. iii. Fluorine gives fumes with moist air?

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117. i. Neon is used in warming signal illuminations. ii. Neon is used in safety devices for protecting electrical instrument. Explain.

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118. The reddish brown gas formed when nitric oxide is oxidised by air is

A. N_2O_5

B. N_2O_4

C. NO_2

D. N_2O_3

Answer: C

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119. Which of the following oxides is most acidic

N_2O_5

P_2O_5

As_2O_5

Sb_2O_5

A. N2O5

B. P2O5

C. As2O5

D. Sb_2O_5

Answer: A

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120. In 'NO3' ion,the number of bond pairs and lone pairs of electrons on nitrogen atom are

A. 2,2

B. 3, 1

C. 1, 3

D. 4, 0

Answer: D

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121. The true statement for the acids of phosphorus, 'H3PO2, H3PO3 and H3PO4 ' is

A. The order of their acidity is H3PO4>H3PO3>H3PO2

B. All of them are reducing in nature

C. All of them are tribasic acids

D. The geometry of P is tetrahedral in all the three

Answer: A

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122. For H_3PO_3 and H_3PO_4 the correct choice is.

H_3PO_3 is dibasic and reducing.

H_3PO_3 is dibasic and non reducing

H_3PO_4 is tribasic and reducing

H_3PO_3s tribasic acid non-reducing

A. H3PO3 is dibasic and reducing.

B. H3PO3 is dibasic and non reducing

C. H3PO4 is tribasic and reducing

D. H3PO3 is tribasic acid non-reducing

Answer: A

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123. The element which forms oxides in all oxidation states +1 to +5 is

A. N

B. P

C. As

D. Sb

Answer: A

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124. Which of the following is the increasing order of enthalpy of vapourisation

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

Answer: D

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125. The number of hydrogen atoms attached to phosphorus atom in hypophosphorus acid is

A. zero

B. two

C. one

D. three

Answer: B

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126. 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

Answer: A

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127. Which of the following is not hydrolysed

A. $AsCl_3$

B. PF_3

C. $SbCl_3$

D. NF_3

Answer: D

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128. The gases produced in the reactions Pb(NO3)2 -> Δ and 'NH4NO3' -> Δ are respectively,

A. N2O, NO

B. N2O ,NO2

C. NO,N2O

D. NO2,N2O

Answer: D

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129. The number of sigma -bonds in ' P4O10' is

A. 6

B. 16

C. 20

D. 7

Answer: B

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130. Nitrogen does not form pentahalide because

A. it is small in size

B. its ionisation energy is high

C. no d - orbital is available

D. its electronegativity is high

Answer: C

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131. Which of the following is a cyclic oxoacid

A. $H_4P_2O_6$

B. $H_4P_2O_7$

C. $H_3P_3O_9$

D. $H_5P_3O_{15}$

Answer: C

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132. The number of P -O- P bonds in cyclic metaphosphoric acid is zero two three four

A. zero

B. two

C. three

D. four

Answer: C

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133. Which of the following has. $p\pi - d\pi$ bonding : NO_3^- , SO_3^{2-} , BO_3^{3-} , CO_3^{2-}

A. NO_3

B. SO_3^2 r

C. BO_3^3-

D. CO_3^2-

Answer: B

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134. Which of the following oxides of nitrogen is solid NO_2 N_2O N_2O_3 N_2O_5

A. NO_2

B. H_2O

C. N_2O_3

D. N_2O_5

Answer: D

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135. On boiling phosphorus with KOH solution, product formed is

A. Potassium sulphate

B. Phosphrous pentoxide

C. Phosphorus hydroxide

D. Phosphene

Answer: D

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136. Which of the following isomers of phosphorus is thermodynamically most stable : red, white, black, yellow

A. red

B. white

C. black

D. yellow

Answer: C

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137. Which of the following when heated gives nitrogen gas

A. $(NH_4)_2Cr_2O_7$

B. $Ba(N_3)_2$

C. NH_4NO_3

D. both a and b

Answer: D

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138. Excess of 'PCl5' reacts with conc. 'H2SO4' giving

A. Sulphuryl chloride

B. Sulphorous acid

C. Chlorosulphonic acid

D. Thionyl chloride

Answer: A

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139. The reaction between NH_2^- and N_2O gives

A. NO

B. N_3^-

C. N_2O_5

D. NH_2NH_2

Answer: B

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140. Reaction of 'PCl3' and Ph Mg Br would givè

A. bromobenzene

B. chlorobenzene

C. triphenyl phosphine

D. dichlorobenzene

Answer: C

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141. The correct formula of salt formed by the neutralisation of hypophosphorus acid with NaOH is

A. Na_3PO_2

B. Na_3PO_3

C. NaH_2PO_2

D. Na_2HPO_2

Answer: C

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142. The correct order of the acidic nature of oxides is in the order : (1)NO

A. NO

B. N_2O,NO

C. N_2O_5

D. N_2O_5

Answer: B

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143. Which of the following oxides of nitrogen is the anhydride of nitrous acid?

A. N_2O_5

B. N_2O

C. NO

D. N_2O_3

Answer: C

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144. The brown ring test for nitrogen depends upon

A. the reduction of nirtate to nitric oxide

B. oxidation of nitric oxide to nitrogen dioxide

C. reduction of ferrous sulphate to iron

D. oxidising action of sulphuric acid

Answer: A

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145. The reaction $P_4+3NaOH+3H_2O$ --

$-3NaH_2PO_2+PH_3$ is an example of

A. disproportionation reaction

B. neutralisation reaction

C. double decomposition reaction

D. Pyrolytic reaction

Answer: A

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146. The percentage of 'p character in the orbitals forming P-P bonds in 'P4' is'

A. 25

B. 33

C. 50

D. 75

Answer: D

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147. In the brown ring test, the brown colour of the ring is due to

A. a mixture of NO and N0_2

B. nitrosoferrous sulphate

C. ferrous nitrate

D. ferric nitrate

Answer: B

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