

THE P BLOCK ELEMENTS - B

Single Correct Answer Type

- HNO_3 is manufactured by:
 - Birkeland and Eyde's process
 - Haber's process
 - Contact's process
 - Fischer-Tropsch's process
- In Fisher-Ring's method of separation of noble gas mixture from air, Is used.
 - 90% CaC_2 +10% CaCl_2
 - Coconut charcoal
 - Soda lime +potash solution
 - 90% CaCO_3 +10% urea
- Major credit for the discovery of noble gases is given to:
 - Cavendish
 - Ramsay
 - Rayleigh
 - None of these
- Mark the strongest acid
 - HI
 - HBr
 - HCl
 - HF
- The correct order of acidic nature is:
 - $\text{Cl}_2\text{O}_7 > \text{SO}_2 > \text{P}_4\text{O}_{10}$
 - $\text{CO}_2 > \text{N}_2\text{O}_5 > \text{SO}_3$
 - $\text{Na}_2\text{O} > \text{MgO} > \text{Al}_2\text{O}_3$
 - $\text{K}_2\text{O} > \text{CaO} > \text{MgO}$
- Phosphine is:
 - Basic
 - Acidic
 - Amphoteric
 - Neutral
- $\text{SO}_2 + \text{H}_2\text{S} \rightarrow$ product, the final product is
 - H_2SO_3
 - H_2SO_4
 - $\text{H}_2\text{S}_2\text{O}_3$
 - $\text{H}_2\text{O} + \text{S}$
- Which of the following pairs is obtained on heating ammonium dichromate?
 - N_2 and H_2O
 - N_2O and H_2O
 - NO_2 and H_2O
 - NO and NO_2
- The lightning bolts in atmosphere cause the formation of:
 - NO
 - O_3
 - CO_2
 - H_2O_2
- H_2SO_4 and H_2SO_3 can be distinguished by the addition of:
 - Litmus solution
 - FeCl_3 solution
 - NaHSO_4 solution
 - Magnesium powder
 - HClO_4 is a weaker acid than HClO_3
 - HNO_3 is a stronger acid than HNO_2
- Number of lone pairs of electrons on Xe atoms in XeF_2 , XeF_4 and XeO_3 molecule are respectively
 - 3, 2 and 1
 - 4, 3 and 2
 - 2, 3 and 1
 - 3, 2 and 0
- Paramagnetic molecule is:
 - Oxygen
 - Nitrogen
 - Hydrogen
 - Chlorine
- Conc. H_2SO_4 displaces HCl from sodium chloride because:
 - Conc. H_2SO_4 is stronger than HCl
 - HCl is a gas whereas H_2SO_4 is a liquid
 - Sulphates are more soluble in water than chlorides
 - Sulphates are less soluble in water than chlorides
- CN^- ion and N_2 are isoelectronic but in contrast to CN^- , N_2 is chemically inert because of:
 - Low bond energy
 - Absence of bond polarity
 - Unsymmetrical electron distribution
 - Presence of more number of electrons in bonding orbitals

- d) The gases found in atmosphere
15. Hydrogen sulphide reacts with lead acetate forming a black compound which reacts with H_2O_2 to form another compound. The colour of the compound is:
 a) Black b) Yellow c) White d) pink
16. Which compound is prepared by the following reaction?

$$Xe + 2F_2 \xrightarrow[673K, 5.6 \text{ atm}]{Ni \text{ vessej}} \text{Product}$$
 (1:5 volume ratio)
- a) XeF_2 b) XeF_6 c) XeF_4 d) $XeOF_2$
17. Red P can be obtained by white P by
 a) Heating it with a catalyst in an inert atmosphere b) Distilling it in an inert atmosphere
 c) Dissolving it in CS_2 and crystallising d) Melting it and pouring the liquid into water
 d) The resultant of the individual polarities is opposed by the polarity of lone pair
18. Which of the following oxides of nitrogen is the anhydride of nitrous acid?
 a) NO b) N_2O_4 c) N_2O_3 d) N_2O_5
19. In the treatment of leukaemia..... is used.
 a) White phosphorus b) Red phosphorus c) Scarlet phosphorus d) P^{32} isotope
20. Which of the following has—O—O—linkage?
 a) $H_2S_2O_6$ b) $H_2S_2O_8$ c) $H_2S_2O_3$ d) $H_2S_4O_6$
 a) Rn b) Kr c) Ne d) Ar
21. Which of the following is not oxidised by O_3 ?
 a) KI b) $FeSO_4$ c) $KMnO_4$ d) K_2MnO_4
 d) A solution of KOH (aq.)
22. Which statement is correct?
 a) Noble gases are not found in nature
 b) Some compounds of noble gas elements are known
 c) Atmospheric air is free from noble gases
 d) None of the above
23. Which of the light effective in the formation of chlorophyll?
 a) Sodium lamp b) Neon lamp c) Mercury lamp d) Argon lamp
24. The hydroxide of which metal is soluble in excess of ammonia:
 a) Cr b) Cu c) Fe d) Bi
25. Which noble gas was first of all detected in solar chromosphere?
 a) Helium b) Neon c) Argon d) Krypton
26. Which member of oxygen family has the highest catenation ability?
 a) Oxygen b) Sulphur c) Selenium d) Tellurium
27. The bond angle in Cl_2O molecule is:
 a) 180° b) 105° c) 90° d) 111°
28. Nitrolim, a nitrogeous fertilizer, is:
 a) Ca_3H_2 b) $Ca(CN)_2$ c) $CaCN_2$ d) $CaCN_2 + C$
29. On passing H_2S through acidified $FeCl_3$ solution, $FeCl_3$ is converted into:
 a) $FeCl_2$ b) $Fe_2(SO_4)_3$ c) FeS d) $FeSO_4$
30. Increasing order of acid strengths of hydrogen halides is:
 a) $HF < HCl < HBr < HI$
 b) $HCl < HI < HBr < HF$
 c) $HCl < HBr < HI < HF$
 d) None of these
31. The bond angle in H_2S is:



- a) $109^{\circ}28'$ b) $104^{\circ}51'$ c) 120° d) 92.5°
32. Concentrated hydrochloric acid when kept in open air sometimes produces a cloud of white fumes. The explanation for it is that
- Concentrated hydrochloric acid emits strongly smelling HCl gas all the time
 - Oxygen in air reacts with the emitted HCl gas to form a cloud of chlorine gas
 - Strong affinity of HCl gas for moisture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.
 - Due to strong affinity for water, concentrated hydrochloric acid pulls moisture of air towards itself. This moisture forms droplets of water and hence the cloud.
33. 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_3 is tribasic and reducing
 - H_3PO_3 is tribasic and non reducing
35. Most electropositive halogen is:
- F
 - Cl
 - Br
 - I
36. Conc. HNO_3 reacts with iron to:
- Render iron passive
 - Give ferrous nitrate and nitric oxide
 - Give ferric nitrate and ammonium nitrate
 - Give ferric nitrate and nitrogen dioxide
37. The bonds present in pernitric acid are:
- Ionic bonds
 - Covalent bonds
 - Semipolar bonds or dative bonds
 - Coordinate and covalent bonds
38. Among the properties (a) reducing, (b) oxidising and (c) complexing, the set of properties shown by CN^- ion towards metal species is:
- a, b, c
 - b, c
 - c, a
 - a, b
 - They are insoluble
 - They bear electrostatic charge
39. XeF_6 on complete hydrolysis gives:
- XeO_3
 - XeO
 - XeO_2
 - Xe
40. Pure N_2 can be obtained by:
- Heating barium azide
 - NH_3 and CuO
 - Both (a) and (b)
 - None of these
41. Select the correct statement.
- Sodium metal is stored under kerosene
 - One of the oxides of carbon is a basic oxide
 - Metals can form only basic oxides
 - To prevent combination of white phosphorus with oxygen it is kept in kerosene
42. Which reaction cannot be used for the preparation of the halogen acid?
- $2\text{KBr} + \text{H}_2\text{SO}_4 \xrightarrow{\text{Conc.}} \text{K}_2\text{SO}_4 + 2\text{HBr}$
 - $\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow{\text{Conc.}} \text{NaHSO}_4 + \text{HCl}$
 - $\text{NaHSO}_4 + \text{NaCl} \rightarrow \text{Na}_2\text{SO}_4 + \text{HCl}$
 - $\text{CaF}_2 + \text{H}_2\text{SO}_4 \xrightarrow{\text{Conc.}} \text{CaSO}_4 + 2\text{HF}$
43. In nitrogen family, the H—M—H bond angle in the hydrides gradually becomes closer to 90° on going from N to Sb. This shows that gradually:

- a) The basic strength of the hydrides increases
b) Almost pure p -orbitals are used for $M-H$ bonding
c) The bond energies of $M-H$ bond increase
d) The bond pair-lone pair of electrons show lesser repulsion due to decreasing electronegativity trend
44. The least stable anion of oxo-acids of chlorine is
a) ClO^- b) ClO_2^- c) ClO_3^- d) ClO_4^-
45. Phosgene is the name of:
a) A phosphorus compound
b) A phosphonium compound
c) Carbonyl chloride
d) Phosphorus halide
46. Bromine can be liberated from potassium bromide solution by:
a) Iodine solution b) Chlorine water c) Sodium chloride d) Potassium iodide
47. Amphoteric oxide is:
a) Sb_4O_6 b) N_2O_5 c) Bi_2O_3 d) Na_2O
48. The metallic form of phosphorus is:
a) White P b) Red P c) β -black P d) α -black P
49. Noble gases are:
a) Colourless
b) Odourless
c) Tasteless and non-inflammable
d) All of the above
50. Which halogen does not show bleaching property?
a) F_2 b) Cl_2 c) Br_2 d) I_2
51. The oxide which is solid at room temperature is:
a) N_2O b) NO c) N_2O_4 d) N_2O_5
52. Arrange the acids (I) H_2SO_3 , (II) H_3PO_3 , and (III) HClO_3 in the decreasing order of acidic nature.
a) $\text{I} > \text{III} > \text{II}$ b) $\text{I} > \text{II} > \text{III}$ c) $\text{III} > \text{I} > \text{II}$ d) $\text{II} > \text{III} > \text{I}$
53. Oxygen is not readily reacted with
a) P b) Cl c) Na d) S
54. Which is incorrect for bleaching powder?
a) Highly soluble in water
b) Light yellow coloured powder
c) Oxidizing agent
d) Reacts with dilute acid to release chlorine
55. In P_4O_6 the number of oxygen atoms bonded to each P atom is:
a) 1.5 b) 2 c) 3 d) 4
56. The correct order of reducing abilities of hydrides of V group elements is
a) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$ b) $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{BiH}_3$
c) $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$ d) $\text{SbH}_3 > \text{BiH}_3 > \text{AsH}_3 > \text{NH}_3 > \text{PH}_3$
57. The oxidation number of S in S_8 , S_2F_2 and H_2S are respectively:
a) 0, +1, and -2 b) -2, +1, and -2 c) 0, +1 and +2 d) -2, +1, and +2
58. In the manufacture of bromine from sea water, the mother liquor containing bromide is treated with
a) Carbon dioxide b) Chlorine c) Iodine d) Sulphur dioxide
59. Sulphur on boiling with NaOH solution gives
a) $\text{Na}_2\text{SO}_3 + \text{H}_2\text{S}$ b) $\text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{S}$ c) $\text{Na}_2\text{S}_2\text{O}_3 + \text{NaHSO}_3$ d) $\text{Na}_2\text{SO}_3 + \text{SO}_2$
60. The noble gas forming maximum number of compound is



- a) Xe b) Ne c) Ar d) He
61. Which has the highest molar heat of vaporization?
a) HBr b) HCl c) HF d) HI
62. Most acidic oxide is:
a) As_2O_3 b) P_2O_3 c) Sb_2O_3 d) Bi_2O_3
63. Red phosphorus is chemically unreactive because:
a) It does not contain P—P bonds
b) It does not contain tetrahedral P_4 molecules
c) It does not catch fire in air even upto $400^\circ C$
d) It has a polymeric structure
64. When plants and animals decay the organic nitrogen is converted into inorganic nitrogen .The inorganic nitrogen in the form of
a) Ammonia b) Elements of nitrogen c) Nitrates d) Nitrides
65. Oxygen gas can be prepared from solid $KMnO_4$ by:
a) Dissolving the solid in dil. HCl
b) Dissolving the solid in dil. H_2SO_4
c) Treating the solid with H_2 gas
d) Strongly heating the solid
66. If two litre of air is passed repeatedly over heated copper and heated Mg till no further reduction in volume takes place, the volume finally obtained will be approximately:
a) 200 mL b) 20 mL c) Zero d) 10 mL
67. The blue coloured gas is:
a) F_2 b) O_3 c) NO d) Cl_2
68. The poisson's ratio for inert gases is:
a) 1.40 b) 1.66 c) 1.34 d) None of these
69. The substance used in smoke screen is
a) Sodium chloride b) Sodium phosphate c) Calcium fluoride d) Calcium phosphide
70. The Nessler's reagent contains:
a) Hg_2^{2+} b) Hg^{2+} c) Hg_2^- d) Hg_4^{2-}
71. Which of the following acids does not attack Cu and Ag?
a) Dilute HNO_3 b) Dilute HCl c) Conc. H_2SO_4 d) Aqua regia
72. The brown yellow colour often shown by nitric acid can be removed by:
a) Bubbling air through the warm acid
b) Boiling the acid
c) Passing ammonia through acid
d) Adding a little Mg powder
73. Density of nitrogen gas prepared from air is slightly greater than that of nitrogen prepared by chemical reaction from a compound of nitrogen because aerial nitrogen contains:
a) CO_2
b) Argon
c) Some N_2 molecules analogous to O_2
d) Greater amount of N_2 molecules derived from N^{15} isotope
74. Bones glow in the dark, because:
a) They contain a shining material
b) They contain red phosphorus
c) White phosphorus changes into red phosphorus
d) White phosphorus undergoes slow combustion with air

75. The anhydride of nitrous acid is:
 a) N_2O_3 b) NO c) N_2O d) N_2O_4
76. There is no S – S bond in
 a) $S_2O_4^{2-}$ b) $S_2O_3^{2-}$ c) $S_2O_5^{2-}$ d) $S_2O_7^{2-}$
77. Xenon directly combines with:
 a) Oxygen b) Rubidium c) Fluorine d) Chlorine
78. The sulphur molecule (S_8) possesses:
 a) Cubical structure
 b) Spherical structure
 c) Tetrahedral structure
 d) W-shaped ring structure
79. Which is correct statement?
 a) Nitric oxide is isoelectronic with CO_2
 b) Nitric oxide is diamagnetic
 c) Nitric oxide is an endothermic compound
 d) Nitric oxide gas is used as general anaesthetic
80. Sulphur does not exist as S_2 molecule because
 a) It is less electronegative b) It is not able to constitute $p\pi-p\pi$ bonds
 c) It has ability to exhibit catenation d) Of tendency to show variable oxidation states.
81. The percentage of available chlorine in a commercial sample of bleaching powder is:
 a) 12% b) 35% c) 58% d) 85%
82. Reaction of PCl_3 and $PhMgBr$ would give
 a) Bromobenzene b) Chlorobenzene
 c) Triphenylphosphite d) Dichlorobenzene
83. Orthophosphoric acid is ionized in.....steps.
 a) 1 b) 2 c) 3 d) 4
84. Rain water sometimes contains NH_4NO_3 because lightening in the sky causes the air to react and produce oxides of nitrogen and:
 a) H_2 b) NH_3 c) CO_2 d) Noble gases
85. An element forms a gaseous oxide which on dissolving in water gives an acid solution. The element is:
 a) S b) Na c) P d) H
86. Fluorine oxidises HSO_4^- to:
 a) $S_2O_3^{2-}$ b) $S_2O_8^{2-}$ c) $S_4O_6^{2-}$ d) SO_2
87. Normality of pure sulphuric acid is:
 a) 4 N b) 12 N c) 24 N d) 36 N
88. A person working with phosphorus suffers from a disease in which bones decay. It is known as
 a) Arthritis b) Phossy jaw c) Rickets d) cancer
89. Which statement is not correct about $(CN)_2$?
 a) It is poisonous gas
 b) It is called pseudohalogen
 c) It is named as cyanogen
 d) None of the above
90. Which halide does not hydrolyse?
 a) $SbCl_3$ b) $AsCl_3$ c) PCl_3 d) NF_3
91. Which of the following compounds gives chlorine dioxide when it reacts with SO_2 in the presence of acid?
 a) Sodium chloride b) Sodium chlorate c) Sodium perchlorate d) Sodium chlorite

92. When fluoride is heated with conc. H_2SO_4 and MnO_2 the gas evolved is:
 a) HF b) MnF_2 c) F_2 d) None of these
93. Substance used in Holme's signal is:
 a) NH_3 b) PH_3 c) PH_5 d) P_2O_5
94. Which is bad conductor of electricity?
 a) H_2F_2 b) HCl c) HBr d) HI
95. Which of the following is known as Berthelot's salt?
 a) $(\text{NaPO}_3)_6$ b) NaOCl c) KClO_3 d) KHF_2
96. The equation, $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ indicates all of the following, except:
 a) New compounds are formed
 b) The reaction is exothermic
 c) The law of conservation of mass is obeyed
 d) The amount of KClO_3 decomposes
97. Oxygen is gas but sulphur is solid because:
 a) Oxygen is composed of discrete molecules while sulphur is polymeric
 b) Molecular weight of sulphur is much higher than that of oxygen
 c) Oxygen is a stronger oxidizing agent than sulphur
 d) Boiling point of sulphur is much higher than that of oxygen
98. Which of the element of nitrogen family produce maximum number of oxy-acids?
 a) N b) P c) As d) Sb
99. Which one of the following cations does not form a complex with ammonia?
 a) Ag^+ b) Cu^{2+} c) Cd^{2+} d) Pb^{2+}
100. Coconut charcoal at -100°C adsorbs a mixture of:
 a) He and Kr b) Ar, Kr and Xe c) Kr and Xe d) He and Ne
101. Iodine solution stained on clothes can be removed by:
 a) NaCl b) NaBr c) $\text{Na}_2\text{S}_2\text{O}_3$ d) $\text{Na}_2\text{S}_4\text{O}_6$
102. Light blue colour of nitrous acid is due to dissolved:
 a) O_2 b) N_2 c) N_2O d) N_2O_3
103. Which of the following is not hydrolysed?
 a) PF_3 b) SbCl_3 c) AsCl_3 d) NF_3
104. The most reactive allotropic form of phosphorus is:
 a) Red phosphorus b) Yellow phosphorus c) Black phosphorus d) Violet phosphorus
105. Which of the following causes damage to the building containing calcium and responsible for cough and choking in human?
 a) Sulphur b) Carbon c) Nitrogen dioxide d) Sulphur dioxide
106. Anhydride of nitric acid is:
 a) NO b) N_2O_3 c) N_2O_4 d) N_2O_5
107. Which is not true for ozone?
 a) It oxidizes lead sulphide
 b) It oxidizes potassium iodide
 c) It oxidizes mercury
 d) It cannot act as bleaching agent
108. Mixture used on tips of matchsticks is:
 a) $\text{S} + \text{K}$ b) Antimony sulphide c) $\text{K}_2\text{Cr}_2\text{O}_7 + \text{S} + \text{red P}$ d) $\text{K}_2\text{Cr}_2\text{O}_7 + \text{K} + \text{S}$
109. The pale-yellow coloured gas is:
 a) Cl_2 b) F_2 c) Br_2 d) I_2
110. By the action of concentrated hydrochloric acid on potassium chlorate we get this mixture of gases:

- a) $\text{CO}_2 + \text{Cl}_2$ b) $\text{O}_2 + \text{ClO}_2$ c) $\text{Cl}_2 + \text{ClO}_2$ d) $\text{O}_2 + \text{Cl}_2 + \text{ClO}_2$
111. F_2 on treatment with methane gives:
a) CH_2F_2 b) CH_3F c) CHF_3 d) All of these
112. Which blue liquid is obtained on reacting equimolar amounts of two gases at -30°C ?
a) N_2O_4 b) N_2O c) N_2O_3 d) N_2O_5
113. Fuming nitric acid is:
a) Conc. $\text{HNO}_3 + \text{NO}_2$ b) Conc. $\text{HNO}_3 + \text{NO}_3$ c) Conc. $\text{HNO}_3 + \text{N}_2\text{O}_3$ d) Conc. $\text{HNO}_3 + \text{NO}$
114. The gas which does not show oxidizing and bleaching properties is:
a) Chlorine b) Ozone c) Sulphur dioxide d) Nitrous oxide
115. Cl_2 gas is evolved as byproduct in the manufacture of all the following elements except:
a) Mg b) Na c) Al d) K
116. Iron sulphide is heated in air to form *A*. an oxide of sulphur. *A* is dissolved in water to give an acid. The basicity of this acid is....
a) 2 b) 3 c) 1 d) zero
117. Welding of magnesium can be done in an atmosphere of:
a) O_2 b) He c) N_2 d) All of these
118. When water is added in conc. H_2SO_4 the reaction is exothermic because:
a) H_2SO_4 is viscous
b) Hydrates of H_2SO_4 are formed
c) H_2SO_4 is corrosive
d) None of the above
119. Which is called stranger gas?
a) Kr b) Xe c) He d) Ne
120. Sulphur hepto oxide is an anhydride of
a) $\text{H}_2\text{S}_2\text{O}_8$ b) $\text{H}_2\text{S}_2\text{O}_7$ c) H_2SO_4 d) H_2SO_5
121. The strongest acid amongst the following is
a) HClO b) HClO_2 c) HClO_3 d) HClO_4
122. At room temperature, H_2O is liquid while H_2S is a gas. The reason is
a) Electronegativity of O is greater than S
b) Difference in the bond angles of both the molecules
c) Association takes place in H_2O due to H-bonding while no H-bonding in H_2S
d) O and S belong to different periods
123. Which one of the following reacts with glass?
a) H_2SO_4 b) HF c) HNO_3 d) $\text{K}_2\text{Cr}_2\text{O}_7$
124. Which reaction represents the oxidizing behaviour of H_2SO_4 ?
a) $2\text{PCl}_5 + \text{H}_2\text{SO}_4 \rightarrow 2\text{POCl}_3 + 2\text{HCl} + \text{SO}_2\text{Cl}_2$
b) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
c) $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$
d) $2\text{HI} + \text{H}_2\text{SO}_4 \rightarrow \text{I}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$
125. Nitric oxide is prepared by the action of cold dil. HNO_3 on :
a) Fe b) Cu c) Sn d) Zn
126. Which halogens oxidises water to oxygen exothermally?
a) Fluorine b) Chlorine c) Bromine d) Iodine
127. The group 15 or VA group elements are commonly known as:
a) Halogens b) Normal elements c) Pnictogens d) None of these
128. Sulphurous anhydride is:
a) SO_2 b) SO_3 c) HSO_3^- d) SO_3^{2-}



129. Which acid on keeping for long time acquires brown colour?
 a) HF b) HCl c) HBr d) HI
130. The essential element of nitrogen fixation is:
 a) Zn b) Cu c) Mo d) B
131. The electron affinity of halogens shows the order:
 a) $I > Cl > F > Br$ b) $Cl > F > Br > I$ c) $F > Cl > I > Br$ d) $F > I > Cl > Br$
132. Formula of calcium chlorite is:
 a) $CaClO_2$ b) $Ca(ClO_2)_2$ c) $Ca(ClO_3)_2$ d) $Ca(ClO_4)_2$
133. Which of the following is more acidic in nature?
 a) HClO b) HClO₂ c) HClO₃ d) HClO₄
134. Liquid ammonia is used in refrigeration because of its
 a) High dipole moment b) High heat of vaporisation
 c) High basicity d) All of the above
135. Ammonia on reaction with hypochlorite anion, can form
 a) NO b) N₂H₄ c) NH₄Cl d) HNO₂
136. Fertilizer having the highest nitrogen percentage is:
 a) Calcium cyanamide b) Urea c) Ammonium nitrate d) Ammonium sulphate
137. The word neon signifies:
 a) New b) Old c) Strange d) None of these
138. Acetic acid is added while preparing a standard solution of $CuSO_4 \cdot 5H_2O$ to prevent:
 a) Hydration b) Reduction c) Hydrolysis d) Complex formation
139. In the isolation of fluorine, a number of difficulties were encountered. Which statement is correct?
 a) The potential required for the discharge of the fluoride ions is the lowest
 b) Fluorine reacts with most glass vessels
 c) Electrolysis of aqueous HF gives ozonized oxygen
 d) All of the above
140. The correct order of bond angles and stability of hydrides given below is:
 a) $NH_3 > PH_3 > AsH_3 > SbH_3$
 b) $NH_3 > AsH_3 > PH_3 > SbH_3$
 c) $SbH_3 > AsH_3 > PH_3 > NH_3$
 d) $PH_3 > NH_3 > AsH_3 > SbH_3$
141. Calcium carbide when heated with nitrogen forms:
 a) Ca_3N_2 b) $Ca(CN)_2$ c) $CaCN_2$ d) $Ca(CNO)_2$

: ANSWER KEY :

1)	a	2)	a	3)	b	4)	a	5)	a	6)	a	7)	d	8)	a
9)	a	10)	b	11)	a	12)	a	13)	a	14)	b	15)	c	16)	c
17)	a	18)	c	19)	d	20)	b	21)	c	22)	b	23)	b	24)	b
25)	a	26)	b	27)	b	28)	d	29)	a	30)	a	31)	d	32)	b
33)	a	34)	d	35)	d	36)	a	37)	d	38)	c	39)	a	40)	a
41)	a	42)	a	43)	d	44)	a	45)	c	46)	b	47)	a	48)	d
49)	d	50)	d	51)	d	52)	c	53)	b	54)	a	55)	c	56)	a
57)	a	58)	b	59)	b	60)	a	61)	d	62)	b	63)	d	64)	a
65)	d	66)	b	67)	b	68)	b	69)	d	70)	d	71)	b	72)	a
73)	b	74)	d	75)	a	76)	d	77)	c	78)	d	79)	c	80)	b
81)	b	82)	c	83)	c	84)	b	85)	a	86)	b	87)	d	88)	b
89)	d	90)	d	91)	b	92)	d	93)	b	94)	a	95)	c	96)	b
97)	a	98)	b	99)	d	100)	b	101)	c	102)	d	103)	d	104)	b
105)	d	106)	d	107)	d	108)	c	109)	b	110)	c	111)	d	112)	c
113)	a	114)	d	115)	c	116)	a	117)	b	118)	b	119)	b	120)	a
121)	d	122)	c	123)	b	124)	d	125)	b	126)	a	127)	c	128)	a
129)	d	130)	c	131)	b	132)	b	133)	d	134)	b	135)	b	136)	b
137)	a	138)	c	139)	d	140)	a	141)	c						

: HINTS AND SOLUTIONS :

- 1 (a)
It is a fact.
- 2 (a)
In Fischer Ringe's method, air free from moisture and CO_2 is passed over a heated mixture of (800°C) of 90% CaC_2 + 10% CaCl_2 in an iron tube, when following reactions take place

$$\text{CaC}_2 + \text{N}_2 \xrightarrow{800^\circ\text{C}} \text{CaCN}_2 + \text{C}$$

$$2\text{C} + \text{O} \rightarrow 2\text{CO}$$

$$\text{C} + \text{O}_2 \rightarrow \text{CO}_2$$

$$2\text{CaC}_2 + 3\text{CO}_2 \rightarrow 2\text{CaCO}_3 + 5\text{C}$$

$$\text{CuO} + \text{CO} \rightarrow \text{Cu} + \text{CO}_2$$
 CO_2 gas is now absorbed by KOH solution. Thus, a mixture inert gases is obtained.
- 3 (b)
Ramsay discovered many (Kr , Xe , Ne) of these gases.
- 4 (a)
 HI is strongest acid because $\text{H} - \text{I}$ bond is weakest bond
- 5 (a)
Acidic character of oxides increases along the period.
- 6 (a)
 PH_3 is basic in nature.
- 7 (d)
 SO_2 acts as an oxidising agent particularly when treated with stronger reducing agents. SO_2 oxidises H_2S into S

$$\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 2\text{H}_2\text{O} + \text{S}$$
- 8 (a)
Ammonium dichromate on heating gives nitrogen, chromic oxide and water.

$$(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$$
- 10 (b)
 FeCl_3 acts as oxidant whereas H_2SO_3 acts as reductant.
- 11 (a)
The number of lone pairs of electron on Xe atom in XeF_2 , XeF_4 and XeF_6 are 3, 2 and 1 respectively
- 12 (a)
 O_2 has two unpaired electrons.
- 13 (a)
$$\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl} \uparrow$$
- 14 (b)
 CN^- is polar and anionic species. N_2 is non - polar molecule with high bond energy.
- 15 (c)

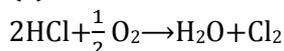
$$\text{Pb}(\text{CH}_3\text{COO})_2 + \text{H}_2\text{S} \rightarrow \text{PbS} + 2\text{CH}_3\text{COOH}$$

$$\text{PbS} + 2\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 2\text{H}_2$$
- 16 (c)
Follow methods of preparation of Xe fluorides.
- 17 (a)
Red p is obtained from white p by heating it with a catalyst in an inert atmosphere.
- 18 (c)
$$2\text{HNO}_2 \rightarrow \text{H}_2\text{O} + \text{N}_2\text{O}_3$$
- 19 (d)
 P^{32} is radioactive.



32

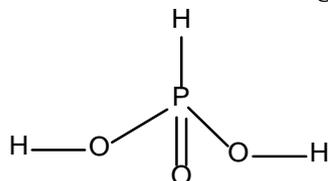
(b)



33

(a)

The structure of H_3PO_3 is given as



In this structure two —OH group are present, so it is dibasic acid. In it one P—H bond is present, so it provides hydrogen and due to such hydrogen it acts as reducing agent.

34

(d)

It is a fact.

35

(d)

The electropositive character increases down the group, eg., $\text{I}(\text{CH}_3\text{COO})_3$, IPO_4 , etc., are ionic.

36

(a)

Due to the formation of thin oxide film on iron surface.

37

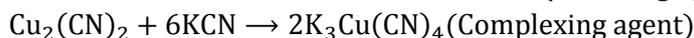
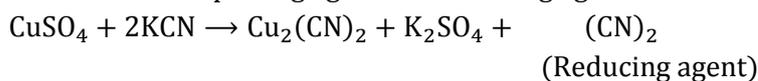
(d)

Pernitric acid is HNO_4 .

38

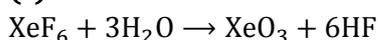
(c)

CN^- acts as complexing agent and reducing agent.



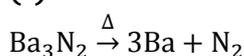
39

(a)



40

(a)



41

(a)

Some metals form amphoteric oxides, e. g., ZnO ; white P is kept in water. Carbon forms neutral (CO) and acidic oxides (CO_2).

42

(a)

HBr is strong reducing agent and will be oxidized by H_2SO_4 , an oxidant.

43

(d)

As the electronegativity decreases from N to Sb, the repulsion between bond pair-lone pair decreases.

44

(a)

The thermal stability of the anions of oxo-acids of chlorine increase with increasing oxidation number of halogen

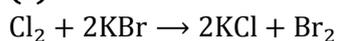
45

(c)

COCl_2 is called phosgene.

46

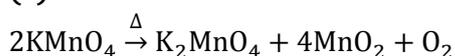
(b)





The inorganic nitrogen exists in the form of ammonia which may be lost as gas to atmosphere or may be acted upon by nitrifying bacteria or may be taken up directly by plants.

65 (d)



66 (b)

About 1/100th part of air is mixture of inert gases.

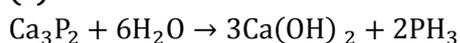
67 (b)

O_3 is a blue coloured gas.

68 (b)

Poisson's ratio $\gamma = \frac{C_p}{C_v} = 1.66$, because inert gases are monoatomic.

69 (d)



PH_3 contains P_2H_4 as an impurity which on burning gives P_2O_5 and white smoke

70 (d)

Nessler's reagent is K_2HgI_4 .

71 (b)

Rest all acids act as oxidant and oxidise Cu and Ag. Note Cu and Ag are placed below H in electrochemical series and do not liberate H_2 from acids.

72 (a)

NO_2 is given out during the process which is responsible for yellow colour of HNO_3 .

73 (b)

Air contains 1% argon which is heavier than N_2 .

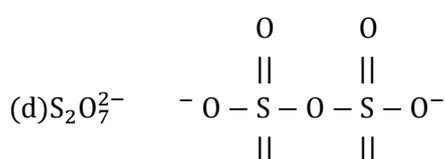
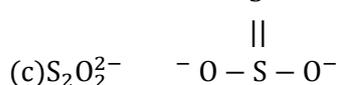
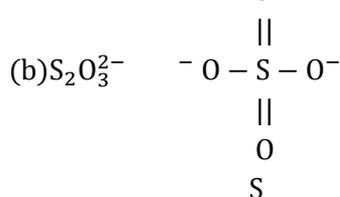
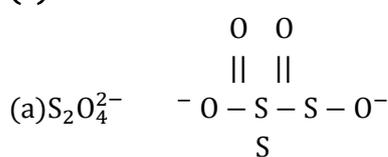
74 (d)

$\text{P} + \text{O}_2 \rightarrow$ phosphorus oxide + light, the phenomenon is called chemiluminescence, *i. e.*, the phenomenon of emitting light as a result of chemical change.

75 (a)

N in N_2O_3 and HNO_2 has +3 oxidation state.

76 (d)



0 0

77 (c)
Xe reacts directly with fluorine to form fluorides.

78 (d)
S₈ has puckered ring structure.

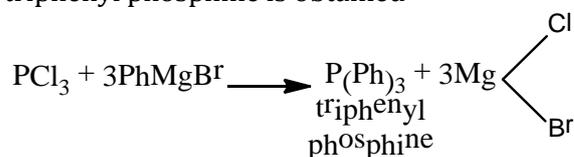


79 (c)
 $N_2 + O_2 \xrightarrow{\text{Arc}} 2NO; \Delta H = +ve.$

80 (b)
Sulphur does not form $p\pi - p\pi$ bond due to its larger size, hence does not exist as S₂ molecules.

81 (b)
It is a fact.

82 (c)
When phosphorus trichloride reacts with phenyl magnesium bromide (Grignard's reagent), all the three chlorine atoms of PCl₃ are replaced by phenyl group of phenyl magnesium bromide and triphenyl phosphine is obtained



83 (c)
 $H_3PO_4 \rightleftharpoons H^+ + H_2PO_4^-$
 $H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+$
 $HPO_4^{2-} \rightleftharpoons H^+ + PO_4^{3-}$

84 (b)
It is a fact.

85 (a)
SO₂ is a gas anhydride of H₂SO₃; P₂O₃ and P₂O₅ are solids.

86 (b)
 $F_2 + 2HSO_4^- \rightarrow S_2O_8^{2-} + 2HF$

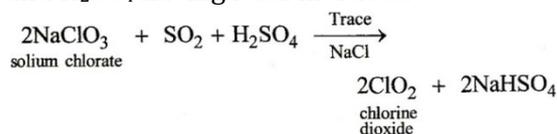
87 (d)
Analytical reagent grade H₂SO₄ has normality = 36 N.

88 (b)
The disease caused by the constant touch with white phosphorus is called phossy jaw

89 (d)
All are the characteristics of (CN)₂.

90 (d)
NF₃ is not hydrolysed because neither N nor F has *d*-orbitals.

91 (b)
Commercially chlorine dioxide is prepared by passing SO₂ gas into a mixture of sodium chlorate and H₂SO₄ having NaCl in traces.





- 92 (d)
HF is formed which is liquid.
- 93 (b)
The spontaneous inflammability of phosphine with smoky rings (vortex rings) at the time of preparation is due to the presence of highly inflammable P_2H_4 . This property is used in Holme's signal.
- 94 (a)
 H_2F_2 being weak acid is slightly ionized.
- 95 (c)
 $KClO_3$ is known as Berthelot's salt
- 97 (a)
It is a reason for the given fact.
- 98 (b)
Phosphorus, element of nitrogen family (V group), produces maximum number of oxy acids.
e.g., H_3PO_2 , HPO_2 , H_3PO_3 , $H_4P_2O_5$, HPO_3 , H_3PO_4 , $H_4P_2O_7$
- 99 (d)
Rest all form complex with NH_3 , e. g., $Ag(NH_3)_2^+$; $Cu(NH_3)_4^{2+}$; $Cd(NH_3)_4^{2+}$.
- 100 (b)
It is a fact.
- 101 (c)
 $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$
- 102 (d)
 N_2O_3 is blue coloured.
- 103 (d)
Due to absence of *d*-orbitals in N-atom, it cannot accept electrons from H_2O for hydrolysis of NF_3
- 104 (b)
The reactivity of yellow or white phosphorus is maximum.
- 105 (d)
 SO_2 dissolves in H_2O in presence of oxygen to give H_2SO_4
 $2SO_2 + 2H_2O + O_2 \rightarrow 2H_2SO_4$
 H_2SO_4 or H_2SO_3 (solution of SO_2 in H_2O) reacts with marble to damage it as well as responsible for cough and choking in human body.
- 106 (d)
Nitrogen in both N_2O_5 and HNO_3 possesses + 5 oxidation state.
- 107 (d)
 O_3 is used as dry bleaching agent.
- 108 (c)
It is a fact.
- 109 (b)
 F_2 is pale-yellow; Cl_2 is green-yellow; Br_2 is dark yellow-brown; I_2 is violet .
- 110 (c)
 $2KClO_3 + 4HCl \rightarrow 2KCl + Cl_2 + 2ClO_2 + 2H_2O$
- 111 (d)
 F_2 reacts with CH_4 even in dark to show substitution reactions giving all possible products.
- 112 (c)
 $NO(g) + NO_2(g) \rightarrow N_2O_3(l)$
- 113 (a)
It is a fact.

- 114 (d)
N₂O has neither oxidant nor reductant nature.
- 115 (c)
Electrolysis of MgCl₂, NaCl, KCl in fused state gives Cl₂ as byproduct. Electrolysis of Al₂O₃ in fused state gives O₂ as byproduct.
- 116 (a)

$$4\text{FeS} + 7\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 + 4\text{SO}_2$$

$$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$$
 H₂SO₃ is dibasic acid.
- 117 (b)
In N₂ and O₂, Mg will react on heating with them and welding is not possible.
- 118 (b)
On hydration, energy is given out.
- 120 (a)

$$\text{S}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{S}_2\text{O}_8$$
- 121 (d)

$$\overset{+7}{\text{HClO}_4} > \overset{+5}{\text{HClO}_3} > \overset{+3}{\text{HClO}_2} > \overset{+1}{\text{HClO}}$$
 As the oxidation number of halogen increases, acidic character increases
- 122 (c)
H₂O contain hydrogen bond while no hydrogen bonding is present in H₂S
- 123 (b)
Silica(SiO₂) is present in the glass. This silica reacts with hydrofluoric acid.

$$\text{SiO}_2 + 4\text{HF} \rightarrow \text{SiF}_4 + 2\text{H}_2\text{O}$$

$$\text{SiF}_4 + 2\text{HF} \rightarrow \text{H}_2\text{SiF}_6$$
fluorosilicic acid
- Note: HF is used for the etching of glass.
- 124 (d)

$$2\text{I}^- \rightarrow \text{I}_2 + 2e$$

$$2e + \text{S}^{6+} \rightarrow \text{S}^{4+}$$
- 125 (b)

$$3\text{Cu} + 8\text{HNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 2\text{NO} + 4\text{H}_2\text{O}$$
- 126 (a)
Fluorine reacts with water liberating O₂ exothermally

$$2\text{F}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{HF} + \text{O}_2$$
- 127 (c)
Group 15 members are called pnictogens, a collective name for this family.
- 128 (a)
SO₂ is anhydride of H₂SO₃.
- 129 (d)
HI being least stable decomposes with time to yield H₂ + I₂. The I₂ is dissolved in HI to develop brown colour in solution.
- 130 (c)
It is a fact.
- 131 (b)
Notice that electron affinity of Cl is more than F.
- 132 (b)



- Salts of HClO_2 (ClO_2^- is chlorite) are called chlorite.
- 133 (d)
The acidity of oxyacids of halogens increases with increase in oxidation state of halogen.
Oxidation state of Cl in $\text{HClO} = +1$
Oxidation state of Cl in $\text{HClO}_2 = +3$
Oxidation state of Cl in $\text{HClO}_3 = +5$
Oxidation state of Cl in $\text{HClO}_4 = +7$
Hence, HClO_4 has highest acidity among oxyacids of chlorine.
- 134 (b)
Liquid ammonia helps in cooling of things due to its high heat of vaporisation. Therefore, it is used in refrigeration.
- 135 (b)
 $3\text{NH}_3 + \text{OCl}^- \rightarrow \text{NH}_2 - \text{NH}_2 + \text{NH}_4\text{Cl} + \text{OH}^-$
- 136 (b)
About 46% N is present in urea.
- 137 (a)
Neon is Greek language signifies 'new'.
- 138 (c)
 $\text{CuSO}_4 + 2\text{H}_2\text{O} \rightarrow \text{Cu}(\text{OH})_2 + \text{H}_2\text{SO}_4$;
Addition of CH_3COOH reverses the hydrolysis of CuSO_4 .
- 139 (d)
All were difficulties in isolation of F_2 .
- 140 (a)
The bond angles and stability in hydrides decrease from N to Sb due to decreasing electronegativity of central atom.
- 141 (c)
 $\text{CaC}_2 + \text{N}_2 \rightarrow \text{CaCN}_2 + \text{C}$

Assertion - Reasoning Type

This section contain(s) 15 questions numbered 1 to 15. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

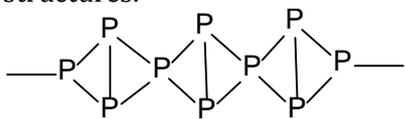
- a) Statement 1 is True, Statement 2 is True; Statement 2 is correct explanation for Statement 1
b) Statement 1 is True, Statement 2 is True; Statement 2 is **not** correct explanation for Statement 1
c) Statement 1 is True, Statement 2 is False
d) Statement 1 is False, Statement 2 is True

- 1 **Statement 1:** Helium and beryllium have similar outer electronic configuration of the type ns^2
Statement 2: Helium and beryllium both are chemically inert
- 2 **Statement 1:** PCl_5 and PbCl_4 are thermally unstable
Statement 2: They produce same gas on thermal decomposition
- 3 **Statement 1:** Among chalcogens, tendency of catenation is maximum for sulphur.
Statement 2: S-S bond dissociation energy is higher than O-O bond dissociation energy.
- 4 **Statement 1:** Oxygen is more electronegative than sulphur, yet H_2S is acidic, while H_2O is neutral
Statement 2: H – S bond is weaker than O – H bond
- 5 **Statement 1:** Liquid NH_3 is used for refrigeration.
Statement 2: Liquid NH_3 does not vaporize quickly.
- 6 **Statement 1:** White phosphorus is more reactive than red phosphorus.
Statement 2: red phosphorus consists of P_4 tetrahedral units linked to one another to form linear chains.
- 7 **Statement 1:** All the noble gases have ns^2np^6 electronic configuration in their outermost shell
Statement 2: In noble gases all the energy levels which are occupied are completely filled
- 8 **Statement 1:** Helium is the only substance that can't be solidified at atmospheric pressure
Statement 2: The zero point energy of helium is very high
- 9 **Statement 1:** OF_2 is named as oxygen difluoride.
Statement 2: OF_2 is oxygen is less electronegative than fluorine.
- 10 **Statement 1:** The van der Waals' forces are directly proportional to the ionisation potentials
Statement 2: Van der Waals' forces increases as the size and diffuseness of the electron clouds increases
- 11 **Statement 1:** The aqueous solution of XeF_2 is powerful oxidizing agent
Statement 2: The hydrolysis of XeF_2 is slow in dilute acid but rapid in basic solution
- 12 **Statement 1:** Red phosphorus is less volatile than white phosphorus
Statement 2: Red phosphorus has a discrete tetrahedral structure
- 13 **Statement 1:** The ionization energy of gallium remains nearly same as that of aluminium.
Statement 2: This is due to shielding of outer shell electrons from the nucleus by the d electrons of gallium.
- 14 **Statement 1:** Ozone is a powerful oxidizing agent in comparison to O_2
Statement 2: Ozone is diamagnetic but O_2 is paramagnetic
- 15 **Statement 1:** PCl_5 is covalent in gaseous and liquid states but ionic in solid state
Statement 2: PCl_5 in solid state consists of tetrahedral PCl_5^+ cation and octahedral PCl_6^- anion

: ANSWER KEY :

1)	c	2)	b	3)	a	4)	a
5)	a	6)	b	7)	d	8)	a
9)	a	10)	d	11)	b	12)	c
13)	a	14)	b	15)	b		

: HINTS AND SOLUTIONS :

- 1 (c)
Helium is a noble gas but beryllium is a member of alkaline earth metal. Thus, beryllium is chemically active and helium is inactive
- 2 (b)
 $\text{PCl}_5 \xrightarrow{\Delta} \text{PCl}_3 + \text{Cl}_2$
 PCl_5 decomposes into PCl_3 and Cl_2 as in its structure two P – Cl axial bonds are longer than other three P – Cl equatorial bonds
- 3 (a)
Catenation means the tendency of an element to form chains of identical atoms which is pronounced in sulphur among chalcogens.
- 4 (a)
H – S bond is weaker than H – O bond hence, H_2S is more acidic than H_2O
- 5 (a)
Liquid ammonia has a large heat of vaporization (0.327 cal/g). It is therefore used in ice plants.
- 6 (b)
White P exists as discrete P_4 tetrahedral molecule having P-P-P bond angle 60° . Hence, molecule is under strain and more reactive while red P exists as P_4 tetrahedral joined together through covalent bonds giving polymeric structure.
- 7 (d)
All the noble gases except He, have ns^2np^6 electronic configuration in their outermost shell
- 8 (a)
Zero point energy of helium is so high that it outweighs the weak interatomic forces which are not strong enough to bind the helium atoms into the crystalline state
- 9 (a)
The compound of oxygen and fluorine is more electronegative than oxygen fluorides as fluorine is more electronegative than oxygen
- 10 (d)
Van der Waals' forces or London forces are inversely proportional to the ionisation potential of the atoms
- 11 (b)
 XeF_2 oxidise HCl to Cl_2 and Ce(III) to Ce (IV). Its oxidation potentials is +2.64 V
- 12 (c)
Red phosphorus is less volatile than white phosphorus because it exists in linked tetrahedral structures.
- 
- 13 (a)
In Ga, 10-d electrons in penultimate shell shield the nucleus change less effectively, the outer electrons is held firmly by the nucleus. As result, the ionisation energy remains nearly the same as that of aluminium in spite of the fact that atomic size increase.
- 14 (b)
Due to the ease with which it can liberate nascent oxygen, O_3 acts as a powerful oxidising agent.
 $\text{O}_3 \rightarrow \text{O}_2 + \text{O}$
 $\text{O}_2 \rightarrow$ Paramagnetic due to presence of two unpaired electrons
 $\text{O}_3 \rightarrow$ Diamagnetic molecules
- 15 (b)
 PCl_5 is trigonal bipyramidal containing sp^3d hybridised P atom in liquid and gaseous state. Whereas, in solid state it consists of tetrahedral PCl_4^+ cation and octahedral PCl_6^- anions

Matrix - Match Type

This section contain(s) 1 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

1. Match list I (Molecules) with list II (Boiling points) and select the correct answer

Column-I		Column- II	
(A) NH_3		(p) 290K	
(B) PH_3		(q) 211K	
(C) AsH_3		(r) 186K	
(D) SbH_3		(s) 264K	
(E) BiH_3		(t) 240K	

CODES :

	A	B	C	D	E
a)	r	q	t	s	p
b)	t	r	q	r	p
c)	p	s	t	q	p
d)	p	q	r	s	p



: ANSWER KEY :

1)	b
----	---

: HINTS AND SOLUTIONS :

- 1 (b)
Except ammonia the boiling point generally increases down, the group due to increase in magnitude of van der Waals' forces. Ammonia shows intermolecular hydrogen bonding hence its boiling point is higher than AsH_3 but lower than SbH_3 .

