



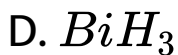
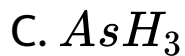
# CHEMISTRY

## BOOKS - ARIHANT PUBLICATION

### ELEMENTS : NITROGEN FAMILY

#### Questions For Practice Multiple Choice Type Questions

1. The least stable hydride of 15th group elements is

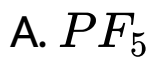


**Answer: B::C**



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2. Which one of the following pentafluorides cannot be formed ?

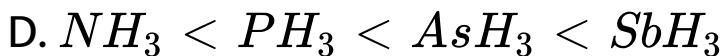
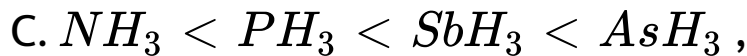
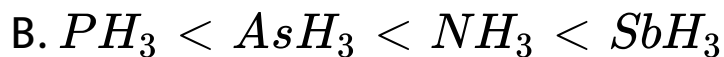
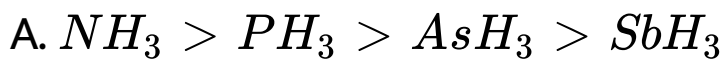


**Answer:**



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**3.** The correct order of boiling points of the hydrides of nitrogen family is



**Answer: A::B::C**



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4. Which element is used in the preparation of pesticides?

A. Arsenic

B. Bismuth

C. Antimony

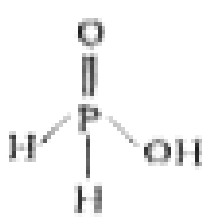
D. Nitrogen

**Answer: A::C**

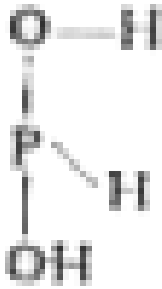


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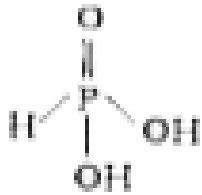
**5. The structural formula of hypophosphorus acid is**



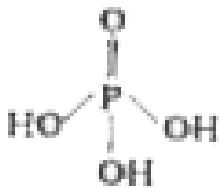
A.



B.



C.



D.

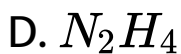
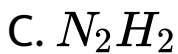
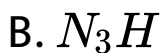
**Answer: A**





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6. A hydride of nitrogen which is acidic is

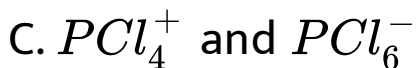


**Answer: C**



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7. Solid  $PCl_5$  , exists as



**Answer: A::C::D**



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# Questions For Practice Very Short Answer Type Questions

1.  $PH_3$  , forms bubbles when passed slowly in water but  $NH_3$  , dissolves. Explain why?



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2. Nitrogen does not form pentahalides. Why?



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3. Why does  $R_3P=O$  exist but  $R_3N=O$  does not (R = alkyl group)?

Give reason for the following:

$(CH_3)_3P=O$  exists but  $(CH_3)_2N=O$  does not



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4. Why is  $N_2$ , less reactive at room temperature?



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



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



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7. The products obtained when ammonia is reacted with excess of chlorine are .....



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8. Why is  $NO_2$  paramagnetic in gaseous state but the solid obtained on cooling is diamagnetic?



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9. Most stable form of phosphorus is .....



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10. Write the structural difference between white phosphorus and red phosphorus.



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11. Which allotrope of phosphorus is more reactive and why?



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

Or Complete the following reaction .



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13. Why does  $PCl_3$ , fumes in moist air ?





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14. What happens when

$PCl_5$  is heated ?



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15. What is the basicity of  $H_3PO_3$  ?



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**16.** What happens when

$H_3PO_3$  is heated ?



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**17.** Complete the following chemical reaction.

$Ca_3P_2 + H_2O \rightarrow$



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**18.** Account for the following.

$H_3PO_2$  is a stronger reducing agent than  $H_3PO_3$ .



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**19.** What is the basicity of  $H_3PO_4$  ?



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Questions For Practice Short Answer Type Questions

1. Explain why  $NH_3$ , is basic, while  $BiH_3$  , is only feebly basic?



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2. Account for the

Bi(V) is a stronger oxidising agent than Sb(V).



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3. Account for the

N-N single bond is weaker than P-P bond.



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4. Why does  $NH_3$  form hydrogen bond but

$PH_3$  does not ?



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5. Why  $PH_3$ , has lower boiling point than  $NH_3$ ?



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6. Why is  $PCI_5$ , more covalent than  $PCI_3$  ?



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7. Explain, why all the bonds In  $PCI_5$  are not identical.



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8. Why does nitrogen show catenation property less than phosphorus?



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9. Unlike phosphorus, nitrogen shows little tendency for catenation. Why?



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10. Bond angle in  $PH_4^+$  is higher than that in  $PH_3$ . Why?



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11. Illustrate how copper metal can give different products on reaction with  $HNO_3$ ?



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**12.** Nitric oxide becomes brown when released in air. Why?



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**13.**  $BiCl_3$ , is more stable than  $BiCl_5$  Why?



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**14.** In the ring test of  $NO_3^-$  ion, nitrate ion reduces to nitric oxide, which combines with

$Fe^{2+}$  (aq) ion to form brown complex. Write the reactions involved in the formation of brown ring.



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15. On reaction with  $Cl_2$ , phosphorus forms two types of halides 'A' and 'B'. Halide A is yellowish-white powder but halide 'B' is colourless oily liquid. Identify A and B and write the formulae of their hydrolysis products.





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16. What happens when

$PCl_5$  is heated ?



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17. What happens when

$H_3PO_3$  is heated ?



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# Questions For Practice Short Answer Type II Questions

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



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2. How is ammonia manufactured industrially?



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3. Account for the

$H_3PO_2$ , has reducing nature.



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4. Account for the

Phosphorous shows high tendency for catenation



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5. Account for the

Nitrogen found in gaseous state.



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6. Write the main differences between the properties of white phosphorous and red phosphorous.



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7. Why does the reactivity of nitrogen differ from phosphorous?



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8. Can  $PCl_5$  act as an oxidising as well as reducing agent?



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**9.** Account for the

$PC_1$ , does not exist. table. (ii) Complete the following chemical equations:



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**10.** Account for the

Tendency to form pentahalides decreases down the group in group 15 of the periodic table.



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**11.** Complete the following chemical equations:



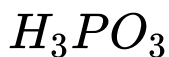
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**12.** Discuss the general characteristics of group 15 elements with reference to their electronic configuration, atomic size, ionisation enthalpy and electronegativity?



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**13.** What are the oxidation states of phosphorus in the compounds?



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**14.** What are the oxidation states of phosphorus in the compounds?

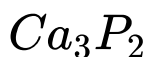






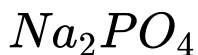
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15. What are the oxidation states of phosphorus in the compounds?



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16. What are the oxidation states of phosphorus in the compounds?



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17. What are the oxidation states of phosphorus in the compounds?



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Questions For Practice Long Answer Type  
Questions

1. On heating compound A gives a gas B which is a constituent of air. This gas when treated with 3 moles of hydrogen ( $H_2$ ) in the presence of a catalyst gives another gas C which is basic in nature. Gas C on further oxidation in moist condition gives a compound D which is a part of acid rain. Identify compounds A to D and also give necessary equations of all the steps involved.



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# Odisha Bureau S Textbook Solutions Multiple Choice Type Questions A

1. Elements of Group 15 belong to

A. s-block

B. p-block

C. d-block

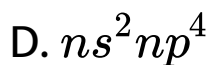
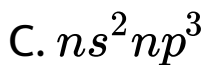
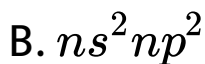
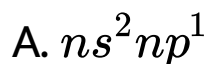
D. f-block

**Answer: B**



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2. The outer electronic configuration of 15 group  
group



**Answer: C**



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3. In the reduction of  $HNO_3$  to  $N_2O$  the number of moles of electrons involved per mole of  $HNO_3$  is

A. 8

B. 4

C. 2

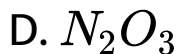
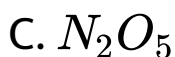
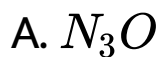
D. 3

**Answer: B**



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4. Which of the following oxides combines with Fe(II) ions to form a brown complex?

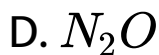
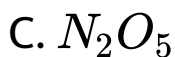
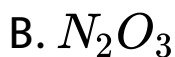
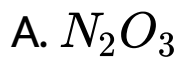


**Answer: B**



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5. Which of the following is neutral?



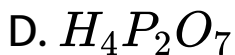
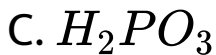
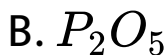
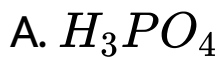
**Answer: D**



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6. Conc.  $HNO_3$  , oxidises phosphorus to





**Answer: A**



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7. Which of the following liberates  $H_2$ , with nitric acid?

A. Zn

B. Cu

C. Mg

D. Hg

**Answer: C**



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**8. Which of the following is least basic?**

A.  $NF_3$

B.  $NCI_3$

C.  $NI_3$

D.  $NBr_3$

**Answer: A**



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**9. Which of the following is most explosive?**

A.  $NCI_3$

B.  $PCI_3$

C.  $AsCl_3$

D. All of these

**Answer: A**



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**10.** In the manufacture of safety match sticks

we use

A. white P

B. black P

C. violet P

D. red P

**Answer: D**



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**11. Which is oxidised in air?**

A. white P

B.  $CH_4$

C.  $H_2O$

D.  $SO_2$

**Answer: A**



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**12.** When conc.  $H_2SO_4$ , is added to dry  $KNO_3$ , brown fumes are evolved. These fumes are

A.  $SO_2$

B.  $SO_3$

C.  $N_2O$

D.  $NO_2$

**Answer: D**



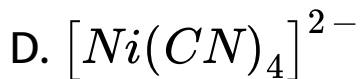
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**13.** Which of the following has tetrahedral structure?

A.  $NH_3$

B.  $NH_4^+$

C.  $K_4[Fe(CN)_6]$



**Answer: B**



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**14.** Phosphine is prepared by the reaction of

A. P and  $H_2SO_4$

B. P and NaOH

C. P and  $H_2S$

D. P and  $HNO_3$

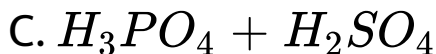
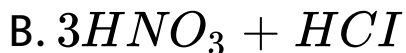
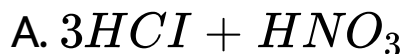


**Answer: B**



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**15. Aqua regia is a mixture of**



**Answer: A**



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16. With excess of  $Cl_2$ , ammonia gives

A.  $NCI_3$

B. HCl

C.  $NH_4Cl$

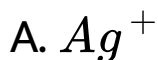
D.  $N_2O$

**Answer: A**



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17.  $NH_3$  , is a Lewis base. It forms complexes with cations. Which one of the following cations does not form complex with  $NH_3$ ?



**Answer: D**



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18. Which of the following forms of phosphorus is most stable?

A. Red P

B. White P

C. Black P

D. All of these

**Answer: C**



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19.  $FeSO_4$  , forms brown ring with

A.  $NO_3$

B.  $NO_2$

C. NO

D.  $N_2O_3$

**Answer: C**



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20. In Birkland and Eyde process, the temperature of electric arc is about?

A.  $1500^{\circ}C$

B.  $4000^{\circ}C$

C.  $3000^{\circ}C$

D.  $2000^{\circ}C$

**Answer: C**



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21. The anhydride of  $HNO_2$ , is

A. NO

B.  $N_2O_3$

C.  $N_2O$

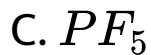
D.  $N_2O_5$

**Answer: B**



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22. Which of the following does not exist?



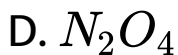
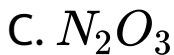
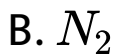
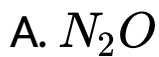
**Answer: A**



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**23.** The gas obtained on heating ammonium nitrite is





**Answer: B**



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**24.** The gas not having oxidising and bleaching property is

A. chlorine

B. ozone

C.  $SO_2$

D.  $N_2O$

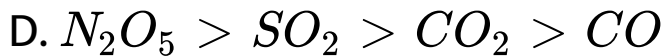
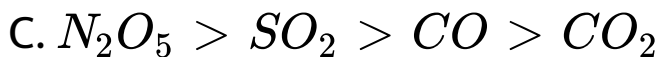
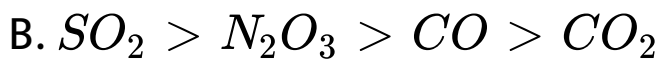
**Answer: D**



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**25. Sequence of acidic character is**

A.  $SO_2 > CO_2 > CO > N_2O_5$

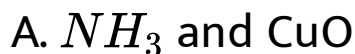


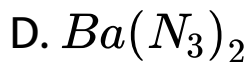
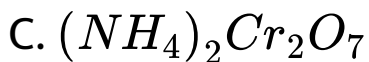
**Answer: D**



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**26.** Extra pure  $N_2$ , can be obtained by heating





**Answer: D**



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27. An inorganic salt (A) is decomposed on heating to give two products (B) and (C). Compound (C) is a liquid at room temperature and is neutral to litmus, while compound (B) is

a colourless neutral gas. Compounds (A), (B) and (C) are

A.  $NH_4$ ,  $NO_3$ ,  $N_2O$  and  $H_2O$

B.  $NH_4NO_2$ ,  $NO$  and  $H_2O$

C.  $CaO$ ,  $H_2O$   $NO$  and  $H_2O$

D.  $Ba(NO_3)_2$ ,  $H_2$  and  $NO_2$

**Answer: A**



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28. With excess of  $Cl_2$ , ammonia gives

- A. nitrogen
- B. nitrosyl chloride
- C. ammonium chloride
- D. nitrogen trichloride

**Answer: D**



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29. Which statement is wrong for NO?

A. It is anhydride of  $HNO_2$

B. Its dipole moment is 0.22D

C. It forms dimer

D. It is paramagnetic

**Answer: A**



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30. The brown ring test for nitrates depends upon

A. the reduction of nitrate 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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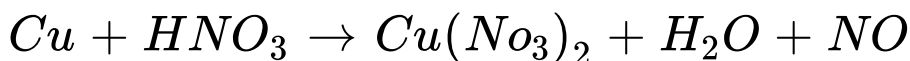


## Odisha Bureau S Textbook Solutions Very Short Answer Type Questions B

1. What is anhydride of nitric acid?

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2. Balance the following equation :



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3. What happens when ammonium chloride is heated with quick lime?



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4. Name two elements of Group VA of periodic table.



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5. How can you get nitric acid from potassium nitrate?



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6. Which catalyst is used for synthesis of  $NH_3$  by haber's process ?



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7. Which of the following gas is evolved when

$NH_4NO_3$  is strongly heated?

(a) NO (b)  $N_2O$  (c)  $NH_3$  (d)  $N_2$



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8. What substance is used for dying ammonia gas ?



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9. Write the formula of nitric anhydride.



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10. Phosphine catches fire because of the presence of ..... as impurity in it.



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11. What is producer gas?



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**12.** Name the catalyst used in the manufacture of nitric acid by Ostwald process.



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**13.** Write the reaction of thermal decomposition of sodium azide.



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14. What is the basicity of  $H_3PO_4$  ?



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Odisha Bureau S Textbook Solutions Short  
Answer Type I Questions C

1. What happens when ammonia reacts with chlorine?



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2. What happens when ammonia gas is passed through copper sulphate solution? Give reactions.



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3. How ammonia is prepared in the laboratory?



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4. What is the action of conc.  $HNO_3$  , on copper? Give equation.





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5. Why ammonia is not dried by conc.  $H_2SO_4$  ?



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6. Why ammonia gas is not collected by the displacement of water?



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7. What happens when ammonium chloride is heated with slaked lime?



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8. What is the best substance for drying ammonia and why?



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9. What happens when ammonia is passed over red hot copper oxide?



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10. State the reaction of conc.  $HNO_3$  , with sulphur. Give equation.



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11. In the ring test for nitrate, which complex compound is formed?



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12. Why ammonia is not dried by conc.  $H_2SO_4$  ?



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**13.** How ammonia gas is tested with Nessler's reagent?



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**14.** What happens when very dilute nitric acid reacts with zinc?



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**15.** Write the equation for the preparation of phosphine.



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**16.** How does magnesium react with very dilute nitric acid?



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17. What happens when phosphine is passed through silver nitrate solution? Give equation?



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18. Why does  $NH_3$  form hydrogen bond but  $PH_3$  does not ?



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19. Give the resonating structures of  $NO_2$  and  $N_2O_5$  .



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20. Explain why  $NH_3$ , is basic, while  $BiH_3$  , is only feebly basic?



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21. Why does Nitrogen exist as  $N_2$  white phosphorus as  $P_4$  ?



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22. The HCC bond angle in acetylene is:



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23. Why does the reactivity of nitrogen different from phosphorous?



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24. Why nitrogen does not form pentahalide, but „phosphorus pentahalide exists?



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25. Explain, why bismuth is a strong oxidising agent in the pentavalent state?



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**26.** Explain, why stability of +5 oxidation state decreases down the group 15 of the periodic table?



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**27.** Why does nitrogen show catenation property less than phosphorus?



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28. Why is  $N_2$  , less reactive at room temperature?



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29. Explain why  $NH_3$  is a ligand while  $NH_4^+$  is not.



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1. Why is  $BiH_3$ , the strongest reducing agent among all hydrides of group-15 elements?



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2. Give the resonating structures of  $NO_2$  and  $N_2O_5$ .



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3. Why does  $R_3P=O$  exist but  $R_3N=O$  does not (R = alkyl group)?

Give reason for the following:

$(CH_3)_3P=O$  exists but  $(CH_3)_2N=O$  does not



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4. Give the disproportionation reaction of  $H_3PO_3$ .



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5. Arrange the following in the order of increasing bond strength :  
 $NH_3$ ,  $PH_3$ ,  $AsH_3$ ,  $SbH_3$ ,  $BiH_3$ . Give suitable explanation for your answer.



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6. Write three difference in properties of white phosphorus and red phosphorus



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# Odisha Bureau S Textbook Solutions Long Answer Type Questions E

1. How is ammonia prepared in the laboratory?

Write with equation what happens when it reacts with (i) cupric oxide (ii) insufficient quantity of chlorine (iii)  $CuSO_4$  solution (iv) excess of chlorine.



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2. Discuss briefly the principle involved in the manufacture of nitric acid by Ostwald's process.



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3. Write the equation for the preparation of phosphine.



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4. Name important oxides and oxyacids of nitrogen and phosphorus and write their formula.



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## Chapter Practice Multiple Choice Type Questions

1. Nitrous oxide is

A. acidic

B. basic

C. amphoteric

D. neutral

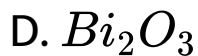
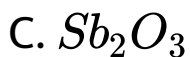
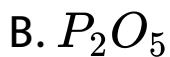
**Answer: D**



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2. Of the following compounds, the most acidic is

A.  $As_2O_3$



**Answer: B**



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**3.** Thermodynamically, most stable form of phosphorus is

A. red

B. black

C. white

D. yellow

**Answer: B**



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4.  $H_3PO_3$  is

A. dibasic acid

B. tribasic acid

C. monobasic

D. Neutral

**Answer: A**



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## Chapter Practice Very Short Answer Type Questions

1. The oxidation number of Fe in brown ring

$[Fe(H_2O)_5NO]^{2+}$  is..



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2. Why is nitrogen a gas, whereas phosphorus is a solid?



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3. Arrange the following in order of the increasing basic strength:

$PH_3$ ,  $NH_3$ ,  $SbH_3$ ,  $AsH_3$



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4. Which is a stronger reducing agent,  $SbH_3$  or  $BiH_3$ , and why?



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5. Why is  $N_2$ , less reactive at room temperature?



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6. Ammonia has greater affinity for proton than phosphine ( $PH_3$ ). Give reason.



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7. Which will act as better reducing agent,  $H_3PO_2$  or  $H_3PO_4$ ?



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**Chapter Practice Short Answer Type Questions**

1.  $MX_5$  (M =P, As, Sb and Bi) are known but  $MH_5$  are not known, why?



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2. Arrange  $PH_3$ ,  $H_2S$  and HCl in order of increasing acidic strength. Give reasons for your answer.



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3. Why  $NCl_5$  is not formed?



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4. Explain the

Phosphine is prepared in an inert atmosphere of  $CO_2$  or  $H_2$ .



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5. Explain the statement:

In most of the oxides of phosphorous, the P-O bond is shorter than the expected value.



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6. In what way can it be proved that  $PH_3$  is basic in nature?



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7. Explain the

Phosphine is treated with an acidified  $CuSO_4$  solution.



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8. Explain the

Water is added to calcium phosphide.



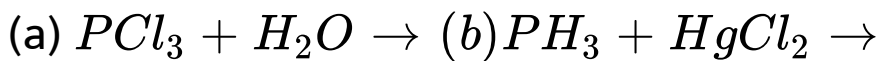
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9. Draw the structures of white phosphorus and red phosphorous. Which one of these two types of phosphorus is less reactive and why?



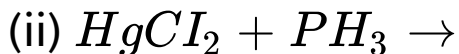
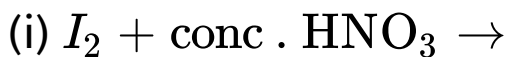
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10. Complete and balance the following chemical reactions.



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11. Complete the following chemical reactions.



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12. Explain why

Nitrogen is much less reactive than phosphorus.



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**13.** Explain, why stability of +5 oxidation state decreases down the group 15 of the periodic table?



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**14.** Explain the

The bond angle in  $PH_3$  is less than that of  $NH_3$ .



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**15.** Account for the fact:

Phosphorus shows variable oxidation states.



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**16.** Account for the

White phosphorus shows chemiluminescence.



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17. Account for the

$\text{BiCl}_3$  is less covalent than  $\text{PCl}_3$  .



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18. Predict the probable structures of (a)  $\text{N}_2\text{O}_3$

(b)  $\text{NO}_2$



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**19.** Discuss the pattern of variation in the oxidation state of the following P to Bi.



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**20.** How is nitrogen prepared in the laboratory? Write the reaction of thermal decomposition of sodium azide.



**Watch Video Solution**

21. Why does the reactivity of nitrogen differ from phosphorous?



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## Chapter Practice Long Answer Type Questions

1. What happens when  $PCl_5$  is heated?



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2. Explain the

The bond angle in  $PH_3$  is less than that of  $NH_3$ .



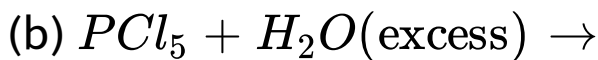
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3.  $NO_2$  dimerises to form  $N_2O_4$ . Why?



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4. Complete the following chemical reactions:



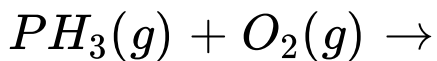
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5. Complete the reactions.



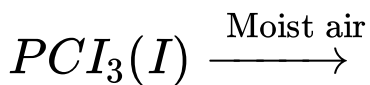
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6. Complete the reactions.



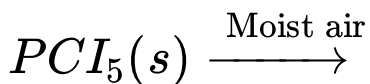
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7. Complete the reactions.



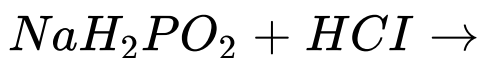
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8. Complete the reactions.



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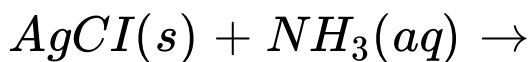
9. Complete the reactions.



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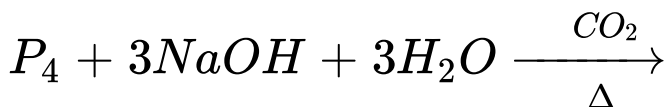


10. Complete the reactions.



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11. Complete the reactions.



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