



# CHEMISTRY

## BOOKS - U-LIKE CHEMISTRY (HINGLISH)

### THE P-BLOCK ELEMENTS

#### Ncert Intext Questions

1. Why are pentahalides more covalent than trihalides?



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



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8. What happens when white phosphorus is heated with concentrated 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 a balance equation of the hydrolytic reaction of  $PCl_5$  in 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 of thermal stability of the hydrides of Group 16 elements.



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15. Why is  $H_2O$  a liquid and  $H_2S$  a gas ?



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16. Which of the following does not react with oxygen directly?

*Zn, Ti, Pt, Fe*



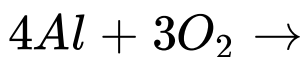
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**17.** Complete the following reactions :



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**18.** Complete the following reactions :



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19. Why does  $O_3$  act as a powerful oxidising agent ?



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20. How is  $O_3$  estimated quantitatively?



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21. What happens when sulphur dioxide is passed through an aqueous solution of Fe(III) salt ?



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22. Comment on the nature of two S-O bonds formed in  $SO_2$  molecule. Are the two S-O bonds in this molecule equal ?



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23. How is the presence of  $SO_2$  detected ?



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24. Mention three areas in which  $H_2SO_4$  plays an important role.



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25. Write the conditions to maximise the yield of  $H_2SO_4$  by Contact process.





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26. Why is  $K_{a_2} \ll K_{a_1}$  for  $H_2SO_4$  in water ?



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27. Considering the parameters such as bond dissociation enthalpy, electron gain enthalpy and hydration enthalpy, compare the oxidising power of  $F_2$  and  $Cl_2$ .



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**28.** Give two examples to show the anomalous behaviour of fluorine.



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**29.** Sea is the greatest source of some halogens. Comment.



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**30.** Give the reason for bleaching action of  $Cl_2$



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31. Name two poisonous gases which can be prepared from chlorine gas.



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32. Why is ICl more reactive than  $I_2$  ?

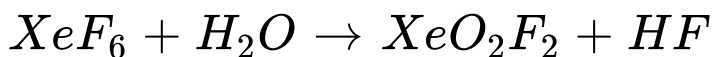


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33. Why is helium used in diving apparatus?

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34. Balance the following equations :



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



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## Ncert Textbook Exercises

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



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2. Why does  $NH_4$  form hydrogen bond but  $PH_3$  does not ?





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3. How is nitrogen prepared in the laboratory ?

Write the chemical equations of the reactions involved.



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4. How is ammonia manufactured industrially?



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

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

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7. The HNH angle value is higher than HPH, HAsH and HsbH angles. Why?



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



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



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10. Nitrogen exists as diatomic molecule and phosphorus as  $P_4$ .

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

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12. Why does nitrogen show catenation properties less than phosphorus ?



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13. Give the disproportionation reaction of  $H_3PO_3$ .



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14. Can  $PCl_5$  act as an oxidising as well as a reducing agent ? Justify.



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15. Justify the placement of O, 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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16. Why is dioxygen a gas but sulphur a solid ?



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17. Knowing the electron gain enthalpy values for  $O \rightarrow O^-$  and  $O \rightarrow O^{2-}$  as  $-141$  and  $702 \text{ kJ mol}^{-1}$  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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18. Which aerosols deplete ozone ?

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19. Describe the manufacture of  $H_2SO_4$  by contact process

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20. How is  $SO_2$  an air pollutant ?

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21. Why are halogens strong oxidising agents ?



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22. Explain why fluorine forms only one oxoacid, HOF.



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23. Explain why in spite of nearly the same electronegativity, oxygen forms hydrogen bonding while chlorine does not.



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24. Write two uses of  $ClO_2$  .



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25. Why are halogens coloured ?



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26. Write the reactions of  $F_2$  and  $Cl_2$  with water.



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27. How can you prepare  $Cl_2$  from  $HCl$  and  $HCl$  from  $Cl_2$  ? Write reactions only .



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28. What inspired N. Bartlett for carrying out reaction between Xe and  $PtF_6$  ?



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29. What are the oxidation states of phosphorous in the following :

- (i)  $H_3PO_3$  (ii)  $PCl_3$  (iii)  $Ca_3P_2$  (iv)  $Na_3PO_4$   
(v)  $POF_3$  ?



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**30.** Write balanced equations for the following

:

$NaCl$  is heated with sulphuric acid in presence of  $MnO_2$



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**31.** Write balanced equations for the following

:

Chlorine gas is passed into a solution of  $NaI$  in water .





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32. How are xenon fluorides  $XeF_2$ ,  $XeF_4$  and  $XeF_6$  obtained ?



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33. With what neutral molecules is  $ClO^-$  isoelectronic ? Is that molecule a Lewis base ?



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34. How are  $XeO_3$  and  $XeOF_4$  prepared ?

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35. Arrange the following in the order of property indicated for set :

$F_2, Cl_2, Br_2, I_2$ - increasing bond dissociation enthalpy .

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**36.** Arrange the following in the order of property indicated for set :

HF, HCl, HBr, HI - increasing acid strength.



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**37.** Arrange the following in the order of property indicated for set :

$NH_3$ ,  $PH_3$ ,  $AsH_3$ ,  $SbH_3$ ,  $BiH_3$  - increasing base strength .



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38. Which one of the following does not exist ?

(i)  $XeOF_4$  (ii)  $NeF_2$  (iii)  $XeF_4$  (iv)  $XeF_6$



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39. Give the formula and describe the structure of a noble gas species which is isostructural with  $ICl_4^-$



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40. Give the formula and describe the structure of a noble gas species which is isostructural with  $IBr_2^-$



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41. Give the formula and describe the structure of a noble gas species which is isostructural with  $BrO_3^-$



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42. Why do noble gases have comparatively large atomic sizes ?



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## Case Based Source Based Integrated Questions

1. Read the given passage and answer the questions that follow :

Molecular nitrogen comprises 78% by volume of the atmosphere. In the earth's crust, it

occurs as sodium nitrate,  $NaNO_3$  (called Chile saltpetre) and potassium nitrate (Indian saltpetre). It is found in the form of proteins in plants and animals. Phosphorus occurs in minerals of the apatite family,  $Ca_9(PO_4)_6 \cdot CaX_2$  ( $X = F, Cl$  or  $OH$ ) (for example, fluorapatite  $Ca_9(PO_4)_6 \cdot CaF_2$ ) which are the main components of phosphate rocks. Phosphorus is an essential constituent of animal and plant matter. It is present in bones as well as in living cells. Phosphoproteins are present in milk and eggs. Arsenic, antimony and bismuth are found

mainly as sulphide minerals. Moscovium is a synthetic radioactive element. Its symbol is Mc, atomic number 115, atomic mass 289 and electronic configuration  $[Rn]5f^{15}6d^{10}7s^27p^3$ .

What is the difference between Indian saltpetre and Chile saltpetre?



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2. Read the given passage and answer the questions that follow :

Molecular nitrogen comprises 78% by volume

of the atmosphere. In the earth's crust, it occurs as sodium nitrate,  $NaNO_3$  (called Chile saltpetre) and potassium nitrate (Indian saltpetre). It is found in the form of proteins in plants and animals. Phosphorus occurs in minerals of the apatite family,  $Ca_9(PO_4)_6 \cdot CaX_2$  ( $X = F, Cl$  or  $OH$ ) (for example, fluorapatite  $Ca_9(PO_4)_6 \cdot CaF_2$ ) which are the main components of phosphate rocks. Phosphorus is an essential constituent of animal and plant matter. It is present in bones as well as in living cells. Phosphoproteins are present in milk and eggs.

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What is the composition of apatite family compounds ?



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3. Read the given passage and answer the questions that follow :

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Phosphoproteins are present in milk and eggs.

Arsenic, antimony and bismuth are found mainly as sulphide minerals. Moscovium is a synthetic radioactive element. Its symbol is Mc, atomic number 115, atomic mass 289 and electronic configuration  $[Rn]5f^{15}6d^{10}7s^27p^3$ .

Name the natural substances that contain phosphorus.



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4. Read the given passage and answer the questions that follow :

Molecular nitrogen comprises 78% by volume of the atmosphere. In the earth's crust, it occurs as sodium nitrate,  $NaNO_3$  (called Chile saltpetre) and potassium nitrate (Indian saltpetre). It is found in the form of proteins in plants and animals. Phosphorus occurs in minerals of the apatite family,  $Ca_9(PO_4)_6 \cdot CaX_2$  ( $X = F, Cl$  or  $OH$ ) (for example, fluorapatite  $Ca_9(PO_4)_6 \cdot CaF_2$ ) which are the main components of phosphate

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Phosphoproteins are present in milk and eggs.

Arsenic, antimony and bismuth are found mainly as sulphide minerals. Moscovium is a

synthetic radioactive element. Its symbol is Mc,

atomic number 115, atomic mass 289 and

electronic configuration  $[Rn]5f^{15}6d^{10}7s^27p^3$ .

Give the electronic configuration of

Moscovium.



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5. Read the given passage and answer the questions that follow :

Molecular nitrogen comprises 78% by volume of the atmosphere. In the earth's crust, it occurs as sodium nitrate,  $NaNO_3$  (called Chile saltpetre) and potassium nitrate (Indian saltpetre). It is found in the form of proteins in plants and animals. Phosphorus occurs in minerals of the apatite family,  $Ca_9(PO_4)_6 \cdot CaX_2$  ( $X = F, Cl$  or  $OH$ ) (for example, fluorapatite  $Ca_9(PO_4)_6 \cdot CaF_2$ ) which are the main components of phosphate

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Phosphoproteins are present in milk and eggs.

Arsenic, antimony and bismuth are found mainly as sulphide minerals. Moscovium is a

synthetic radioactive element. Its symbol is Mc,

atomic number 115, atomic mass 289 and

electronic configuration  $[Rn]5f^{15}6d^{10}7s^27p^3$ .

Give the names of third, fourth and fifth members of nitrogen family.



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6. Read the passage given below and answer the questions that follows:

Nitrogen differs from the rest of the members of this group due to its small size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals. Nitrogen has unique ability to form  $p\pi - p\pi$  multiple bonds with itself and with other elements having small size and high electronegativity (For example, C, O). Heavier elements of this group do not form  $p\pi - p\pi$  bonds as their atomic orbitals are so large and diffuse that they

cannot have effective overlapping. Thus, nitrogen exists as a diatomic molecule with a triple bond (one s and two p) between the two atoms. Consequently, its bond enthalpy ( $941.4 \text{ kJ mol}^{-1}$ ) is very high. On the contrary, phosphorus, arsenic and antimony form single bonds as P-P, As-As and Sb-Sb while bismuth forms metallic bonds in elemental state, However, the single N-N bond is weaker than the single P-P bond because of high interelectronic repulsion of the non-bonding electrons, owing to the small bond length.

Why does nitrogen differ from rest of the members of the Group ?



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7. Read the passage given below and answer the questions that follows:

Nitrogen differs from the rest of the members of this group due to its small size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals. Nitrogen has unique ability to form  $p\pi - p\pi$  multiple bonds



with itself and with other elements having small size and high electronegativity (For example, C, O). Heavier elements of this group do not form  $p\pi - p\pi$  bonds as their atomic orbitals are so large and diffuse that they cannot have effective overlapping. Thus, nitrogen exists as a diatomic molecule with a triple bond (one s and two p) between the two atoms. Consequently, its bond enthalpy ( $941.4 \text{ kJ mol}^{-1}$ ) is very high. On the contrary, phosphorus, arsenic and antimony form single bonds as P-P, As-As and Sb-Sb while bismuth forms metallic bonds in elemental state,

However, the single N-N bond is weaker than the single P-P bond because of high interelectronic repulsion of the non-bonding electrons, owing to the small bond length.

What kind of bond is formed in the molecule of nitrogen ?



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**8.** Read the passage given below and answer the questions that follows:

Nitrogen differs from the rest of the members

of this group due to its small size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals. Nitrogen has unique ability to form  $p\pi - p\pi$  multiple bonds with itself and with other elements having small size and high electronegativity (For example, C, O). Heavier elements of this group do not form  $p\pi - p\pi$  bonds as their atomic orbitals are so large and diffuse that they cannot have effective overlapping. Thus, nitrogen exists as a diatomic molecule with a triple bond (one s and two p) between the two atoms. Consequently, its bond enthalpy (941.4

$\text{kJ mol}^{-1}$ ) is very high. On the contrary, phosphorus, arsenic and antimony form single bonds as P-P, As-As and Sb-Sb while bismuth forms metallic bonds in elemental state. However, the single N-N bond is weaker than the single P-P bond because of high interelectronic repulsion of the non-bonding electrons, owing to the small bond length.

Give two examples of compounds that nitrogen forms with oxygen using  $p\pi - p\pi$  bond.



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9. Read the passage given below and answer the questions that follows:

Nitrogen differs from the rest of the members of this group due to its small size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals. Nitrogen has unique ability to form  $p\pi - p\pi$  multiple bonds with itself and with other elements having small size and high electronegativity (For example, C, O). Heavier elements of this group do not form  $p\pi - p\pi$  bonds as their atomic orbitals are so large and diffuse that they

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Heavier elements of Group 15 do not form  $p\pi - p\pi$  bonds.



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**10.** Read the passage given below and answer the questions that follows:

Nitrogen differs from the rest of the members of this group due to its small size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals. Nitrogen has unique ability to form  $p\pi - p\pi$  multiple bonds

with itself and with other elements having small size and high electronegativity (For example, C, O). Heavier elements of this group do not form  $p\pi - p\pi$  bonds as their atomic orbitals are so large and diffuse that they cannot have effective overlapping. Thus, nitrogen exists as a diatomic molecule with a triple bond (one s and two p) between the two atoms. Consequently, its bond enthalpy ( $941.4 \text{ kJ mol}^{-1}$ ) is very high. On the contrary, phosphorus, arsenic and antimony form single bonds as P-P, As-As and Sb-Sb while bismuth forms metallic bonds in elemental state,



However, the single N-N bond is weaker than the single P-P bond because of high interelectronic repulsion of the non-bonding electrons, owing to the small bond length.

Why is the single N- N bond weaker than the single P - P bond ?



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**11.** Read the given passage and answer the questions that follow :

The anomalous behaviour of oxygen, like other

members of p-block present in second period is due to its small size and high electronegativity. One typical example of effects of small size and high electronegativity is the presence of strong hydrogen bonding in  $H_2O$  which is not found in  $H_2S$ . The absence of d-orbitals in oxygen limits its covalency to four and in practice, rarely exceeds two. On the other hand, in case of other elements of the group, the valence shells can be expanded and covalence exceeds four.

First element of the groups in p-block shows

anomalous behaviour from other elements of the group. Explain.



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**12.** Read the given passage and answer the questions that follow :

The anomalous behaviour of oxygen, like other members of p-block present in second period is due to its small size and high electronegativity. One typical example of effects of small size and high electronegativity

is the presence of strong hydrogen bonding in  $H_2O$  which is not found in  $H_2S$ . The absence of d-orbitals in oxygen limits its covalency to four and in practice, rarely exceeds two. On the other hand, in case of other elements of the group, the valence shells can be expanded and covalence exceeds four.

$H_2O$  is a water at room temperature whereas  $H_2S$  is a gas.



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**13.** Read the given passage and answer the questions that follow :

The anomalous behaviour of oxygen, like other members of p-block present in second period is due to its small size and high electronegativity. One typical example of effects of small size and high electronegativity is the presence of strong hydrogen bonding in  $H_2O$  which is not found in  $H_2S$ . The absence of d-orbitals in oxygen limits its covalency to four and in practice, rarely exceeds two. On the other hand, in case of other elements of

the group, the valence shells can be expanded and covalence exceeds four.

Give the names of third and fourth members of the group to which O and S belong.



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**14.** Read the given passage and answer the questions that follow :

The anomalous behaviour of oxygen, like other members of p-block present in second period is due to its small size and high

electronegativity. One typical example of effects of small size and high electronegativity is the presence of strong hydrogen bonding in  $H_2O$  which is not found in  $H_2S$ . The absence of d-orbitals in oxygen limits its covalency to four and in practice, rarely exceeds two. On the other hand, in case of other elements of the group, the valence shells can be expanded and covalence exceeds four.

How can we expand the valency shell in the case of elements lying lower in the group of oxygen ?



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15. Read the given passage and answer the questions that follow :

The anomalous behaviour of oxygen, like other members of p-block present in second period is due to its small size and high electronegativity. One typical example of effects of small size and high electronegativity is the presence of strong hydrogen bonding in  $H_2O$  which is not found in  $H_2S$ . The absence of d-orbitals in oxygen limits its covalency to four and in practice, rarely exceeds two. On



the other hand, in case of other elements of the group, the valence shells can be expanded and covalence exceeds four.

Name the fifth member of the group of oxygen.



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**16.** Read the given passage and answer the questions that follow :

Fluorine and chlorine are fairly abundant while bromine and iodine less so. Fluorine is present

mainly as insoluble fluorides [fluorspar,  $CaF_2$ , cryolite  $Na_3AlF_6$ , and fluoroapatite  $3Ca_3(PO_4)_2 \cdot CaF_2$ ] and small quantities are present in soil, river water plants and bones and teeth of animals. Sea water contains chlorides, bromides and iodides of sodium, potassium, magnesium and calcium, but is mainly sodium chloride solution (2.5% by mass). The deposits of dried up seas contain these compounds, for example, sodium chloride and carnallite,  $KCl \cdot MgCl_2 \cdot 6H_2O$ . Certain forms of marine life contain iodine in their systems, various seaweeds, for example,

contain upto 0.5% of iodine and Chile saltpetre contains upto 0.2% of sodium iodate. Tennessine is a synthetic radioactive element. Its symbol is Ts, atomic number 117, atomic mass 294 and electronic configuration  $[Rn]5f^{14}6d^{10}7s^27p^5$ .

Name the elements of Group 17 of the Periodic Table.



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17. Read the given passage and answer the questions that follow :

Fluorine and chlorine are fairly abundant while bromine and iodine less so. Fluorine is present mainly as insoluble fluorides [fluorspar,  $CaF_2$ , cryolite  $Na_3AlF_6$ , and fluoroapatite  $3Ca_3(PO_4)_2 \cdot CaF_2$ ] and small quantities are present in soil, river water plants and bones and teeth of animals. Sea water contains chlorides, bromides and iodides of sodium, potassium, magnesium and calcium, but is mainly sodium chloride solution (2.5% by

mass). The deposits of dried up seas contain these compounds, for example, sodium chloride and carnallite,  $KCl \cdot MgCl_2 \cdot 6H_2O$ .

Certain forms of marine life contain iodine in their systems, various seaweeds, for example, contain upto 0.5% of iodine and Chile saltpetre contains upto 0.2% of sodium iodate. Tennessine is a synthetic radioactive element. Its symbol is Ts, atomic number 117, atomic mass 294 and electronic configuration  $[Rn]5f^{14}6d^{10}7s^27p^5$ .

Name the main substances in the deposits of dried up seas.

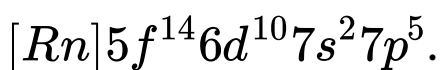


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**18.** Read the given passage and answer the questions that follow :

Fluorine and chlorine are fairly abundant while bromine and iodine less so. Fluorine is present mainly as insoluble fluorides [fluorspar,  $CaF_2$ , cryolite  $Na_3AlF_6$ , and fluoroapatite  $3Ca_3(PO_4)_2 \cdot CaF_2$ ] and small quantities are present in soil, river water plants and bones and teeth of animals. Sea water contains chlorides, bromides and iodides of sodium,

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Name the last element of Group 17, its atomic mass and electronic configuration.



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**19.** Read the given passage and answer the questions that follow :

Fluorine and chlorine are fairly abundant while bromine and iodine less so. Fluorine is present mainly as insoluble fluorides [fluorspar,  $CaF_2$ , cryolite  $Na_3AlF_6$ , and fluoroapatite  $3Ca_3(PO_4)_2 \cdot CaF_2$ ] and small quantities are



present in soil, river water plants and bones and teeth of animals. Sea water contains chlorides, bromides and iodides of sodium, potassium, magnesium and calcium, but is mainly sodium chloride solution (2.5% by mass). The deposits of dried up seas contain these compounds, for example, sodium chloride and carnallite,  $KCl \cdot MgCl_2 \cdot 6H_2O$ . Certain forms of marine life contain iodine in their systems, various seaweeds, for example, contain upto 0.5% of iodine and Chile saltpetre contains upto 0.2% of sodium iodate. Tennessine is a synthetic radioactive

element. Its symbol is Ts, atomic number 117, atomic mass 294 and electronic configuration  $[Rn]5f^{14}6d^{10}7s^27p^5$ .

Write the formula of fluorapatite.



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## Multiple Choice Questions

1. Zinc reacts with dilute  $HNO_3$  to evolve

A.  $N_2O$

B.  $NO$

C.  $NO_2$

D.  $N_2O_5$

**Answer: A**



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2. Which allotropic form of phosphorus is used in the preparation of phosphine ?

A. Red phosphorus

B. Black phosphorus

C. White phosphorus

D. Yellow phosphorus

**Answer: C**



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**3. The formula for hypochlorous acid is**

A. HOCl

B. *HOCLO*

C.  $\text{HOClO}_2$

D.  $\text{HOClO}_3$

**Answer: A**



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**4. Aqua regia has the composition :**

A. 1 part conc.  $\text{HNO}_3$  + 2 parts conc. HCl

B. 1 part conc.  $\text{HNO}_3$  + 3 parts conc. HCl

C. 1 part conc.  $\text{HNO}_3$  + 1 part conc. HCl

D. 2 parts conc.  $HNO_3$  + 3 parts conc. HCl

**Answer: B**



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5.  $XeO_3$  has the structure

A. square

B. square pyramidal

C. pyramidal

D. distorted octahedral

**Answer: C**



**View Text Solution**

**6.** In going down from top to bottom in Group 16.

A. Stability of +6 oxidation state decreases and that of +4 increases.

B. Stability of both +6 and +4 oxidation state increases.

C. Stability of both +6 and +4 oxidation state decreases.

D. Stability of +6 oxidation state increases and that of +4 decreases.

**Answer: A**



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7. Which of the following oxygen containing salts on heating will not produce oxygen ?



A. Chlorates

B. Sulphates

C. Nitrates

D. Permanganates

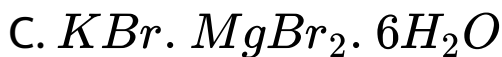
**Answer: B**



**View Text Solution**

**8. The formula for carnallite is**

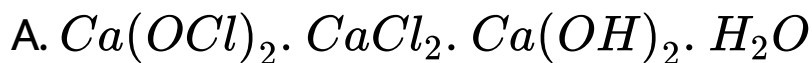
A.  $KCl \cdot MgCl_2 \cdot 6H_2O$

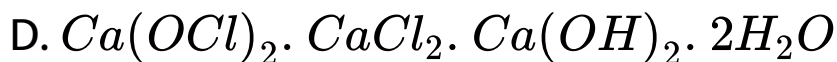
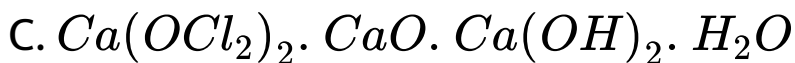


**Answer: A**

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**9. Composition of bleaching powder is**





**Answer: D**



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**10.** The molecule  $XeF_6$  has the following structure :

A. square pyramidal

B. Pyramidal

C. distorted octahedral

D. Square planar

**Answer: C**



**View Text Solution**

**11.** Atomic numbers of Ar and Xe respectively are

A. 36 and 54

B. 18 and 54

C. 10 and 36

D. 10 and 54

**Answer: B**



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**12.** A molecule of sulphur may be represented

as

A. S

B.  $S_2$

C.  $S_4$

D.  $S_8$

**Answer: D**



**View Text Solution**

**13.** Anomalous behaviour of oxygen in group

16 is due to

A. combustible nature.

B. its support for combustion.

C. its gaseous state.

D. small size and high electronegativity.

**Answer: D**



**View Text Solution**

**14.** Fluorspar, cryolite and fluoroapatite are the minerals containing

A. P

B. Cl

C. F

D. Ba

**Answer: C**



**View Text Solution**

**15. Noble gases have**

A. high ionisation enthalpy and more negative electron gain enthalpy.



B. low ionisation enthalpy and more negative electron gain enthalpy.

C. high ionisation enthalpy and more positive electron gain enthalpy.

D. low ionisation enthalpy and more positive electron gain enthalpy.

**Answer: C**



**View Text Solution**

16. Hydrogen bond is formed in HF due to

A. small size and low electronegativity of F.

B. small size and high electronegativity of

F.

C. big size and high electronegativity of F.

D. big size and low electronegativity of F.

**Answer: B**



**View Text Solution**

17. Which is the last member of Group 17 ?

A. Iodine

B. Astatine

C. Tennessine

D. None of these

**Answer: C**



**View Text Solution**

18. Bond dissociation enthalpy of the halogens shows the trend

A.  $F - F < Cl - Cl > Br - Br > I - I$

B.  $F - F > Cl - Cl > Br - Br > I - I$

C.  $F - F > Cl - Cl < Br - Br > I - I$

D.  $F - F > Br - Br > Cl - Cl > I - I$

**Answer: A**



**View Text Solution**

19. The structure of  $ClF_5$  molecule is

- A. square pyramidal.
- B. pentagonal bipyramidal.
- C. bent T-shaped.
- D. trigonal bipyramidal.

**Answer: A**



**View Text Solution**

20. Noble gases have

A. low melting points and low solubility in water.

B. low melting points and high solubility in water.

C. high melting points and low solubility in water.

D. high melting points and high solubility in water.

**Answer: A**



**View Text Solution**

21. Which of the following is not colourless crystalline solids and does not sublime readily at 298 K ?



**Answer: B**



**View Text Solution**

22. Which of the following gases is used for providing inert atmosphere for filling electric bulbs?

A. Argon

B. Helium

C. Neon

D. Xenon

**Answer: A**





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## Assertion Reason Questions

1. Assertion (A) : Nitrogen has a tendency to form  $p\pi - p\pi$  bond with itself giving rise to the formation of  $N_2$ .

Reason (R) : Bond enthalpy of  $N_2$  is extremely high.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: A**



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2. Assertion (A) :  $\beta$ -Black phosphorus is formed when red phosphorus is heated in a sealed tube at 803 K.

Reason (R) : Phosphine is a colourless gas with rotten fish smell and is highly poisonous.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: D**



**View Text Solution**

**3.** Assertion (A): Hydrolysis of  $XeF_4$  and  $XeF_6$  with water gives  $XeO_3$ .

Reason (R) : The structures of the three Xenon fluorides can be deduced from VSEPR.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: B**



**View Text Solution**

4. Assertion (A) : Helium is used in diving apparatus.

Reason (R) : Argon is used in discharge tubes and fluorescent bulbs for advertisement display.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.



**Answer: C**



**View Text Solution**

5. Assertion (A) : All the noble gases have  $ns^2np^6$  electronic configuration in their valence shell.

Reason (R) : Atomic radii increase down with increase in atomic number.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: D**



**View Text Solution**

**6. Assertion (A) :** Noble gases have very low boiling points.

**Reason (R) :** Noble gases being monoatomic have no intermolecular forces except weak dispersion forces.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: A**



**View Text Solution**

7. Assertion (A) : Burning of sulphur or sulphide ore generates  $SO_2$ .

Reason (R) : Rhombic sulphur is insoluble in water but dissolves readily in  $CS_2$ .

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: B**



**View Text Solution**

**8. Assertion (A):** The stability of -2 oxidation state in Group 16 decreases down the Group.

**Reason (R) :** The anomalous behaviour of oxygen is due to its large size and low electronegativity.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is

the correct explanation of the Assertion

(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.



**Answer: C**



**View Text Solution**

**9. Assertion (A):** The large difference between the melting and boiling points of oxygen and sulphur may be explained on the basis of their atomicity.

**Reason (R) :** Oxygen gas can be obtained by heating salts such as chlorates, nitrates and permanganates.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion  
(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion  
(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: B**



**View Text Solution**

**10.** Assertion (A): Electrolysis of water leads to release of hydrogen at the anode and oxygen at the cathode.

Reason (R) : All elements of Group 16 except oxygen form dischlorides and dibromides.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion  
(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion  
(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: D**



**View Text Solution**

**11.** Assertion (A) : Ozone is prepared from oxygen in a silent electrical discharge.

Reason (R) : Formation of ozone from oxygen is an endothermic process.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion  
(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion  
(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: A**



**View Text Solution**

**12. Assertion (A) :** Industrially, sulphur dioxide is produced as a byproduct of roasting of sulphide ores.

**Reason (R) :** In the reaction of  $SO_2$  with water

and alkalies, the behaviour of  $SO_2$  is very similar to that of  $CO_2$ .

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion  
(A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion  
(A)



C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement.

**Answer: C**



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**Fill In The Blanks**

1. Metals like Cr and Al do not dissolve in concentrated nitric acid because of the formation of a \_\_\_\_\_ film of oxide on the surface.



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2. The formula for copper pyrites is \_\_\_\_\_



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3. At elevated temperatures,  $S_2$  is the dominant species and is \_\_\_\_\_like  $O_2$



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4. The elements of Group 16 are oxygen, sulphur, \_\_\_\_\_, tellurium and polonium



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5. Chlorine water on standing loses its yellow colour due to the formation of \_\_\_\_\_ and \_\_\_\_\_



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6. Chlorine, bromine and iodine form oxides in which the oxidation states of these halogens range from \_\_\_\_\_



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7.  $[Kr]4d^{10}5s^25p^4$  is the electronic configuration of \_\_\_\_\_.



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8. Fluorspar and cryolite have the formula \_\_\_\_\_ and \_\_\_\_\_ respectively.



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9. Because of the compact nature of oxygen atom, it has \_\_\_\_\_ electron gain enthalpy than sulphur.



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10. A nation's industrial strength can be judged by the quantity of \_\_\_\_\_ its produces and consumes.



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## True Or False

1. The valence shell electronic configuration of Group 15 elements is  $ns^2np^2$  ?



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2. The elements of Group 16 have  $ns^2np^3$  general electronic configuration in the outermost shell.



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3. Helium is an inflammable and light gas.



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4.  $XeF_2$  has a bent shape.



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5. Most of the reactions of  $F_2$  are endothermic due to small and strong bond formed by it with other elements.





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## Very Short Answer Questions

1. What is the basicity of  $H_3PO_4$  ?



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2. Write the formulae of any two oxoacids of sulphur.



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3. Which allotrope of sulphur is thermally stable at room temperature ?

 [View Text Solution](#)

4. Name two poisonous gases which can be prepared from chlorine gas.

 [View Text Solution](#)

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



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6. Which one of  $PCl_4^+$  and  $PCl_4^-$  is not likely to exist and why?



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7. Draw the structure of  $XeF_2$  molecule.



[View Text Solution](#)

8. Draw the structure of  $XeF_4$  molecule.



[View Text Solution](#)

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



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10. Why does  $NO_2$  dimerise ?



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11. Fluorine does not exhibit any positive oxidation state. Why?



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12. What is the covalence of nitrogen in  $N_2O_5$  ?



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13. Why is Bi (V) a stronger oxidant than Sb (V)?



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14. In which one of the following two structures  $NO_2^+$  and  $NO_2^-$  the bond angle has a higher value ?



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15. Why is bond angle in  $PH_3$  molecule lesser than in  $NH_3$  ?



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16. Assign reason for the following: In solid state,  $PCl_5$  behaves as an ionic species.



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17. Draw the structure of  $XeF_2$  molecule.



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18. Give reason for the following:

Among the noble gases only xenon is well known to form chemical compounds.



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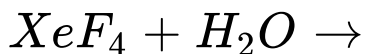
19. Why do noble gases form compounds with oxygen and fluorine only ?



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20. Complete the following chemical equation

:



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21. Write one chemical equation to show that  $SO_2$  acts as a reducing agent.



[View Text Solution](#)

22. Write one chemical equation to show that chlorine gas can be obtained from bleaching powder.



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**23.** Write one chemical reaction equation to show that conc.  $H_2SO_4$  is a strong oxidising agent.



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**24.** Give a chemical equation or name of the reaction to support the following statement :  
Sodium chlorate ( $NaClO_3$ ) is an oxidant.



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25. Give chemical evidence for the following:

Fluorine is a stronger oxidising agent than chlorine.



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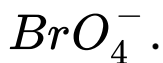
26. Which of the two is more covalent:

$SbCl_3$  and  $SbCl_5$  ?



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27. Draw the structure of the following species



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28. Write the chemical equation for the reactions which occur when sodium iodate  $[\text{NaIO}_3]$  is reduced with sodium hydrogen sulphite.



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29. Draw the structure of  $XeF_4$ .



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30. What type of hybridisation is associated with N in  $NH_3$  ? What is the expected bond angle in  $NH_3$  ?



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31. Which is the strongest oxidising agent among  $ClO_4^-$ ,  $BrO_4^-$  and  $IO_3^-$  ?



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32. Name one ion whose central atom has the  $sp^3d^3$  type of hybrid orbitals



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**33.** Why is bond dissociation energy of fluorine molecule less than that of chlorine molecule ?



**View Text Solution**

**34.** Which name is given to the elements which are neither metals nor non-metals ?



**View Text Solution**



**35.** Account for the following:

Tendency to show -2 oxidation state diminishes from sulphur to polonium in Group 16.



**View Text Solution**

**36.** Why is  $H_2S$  more acidic than water ?



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37. Why is  $H_2S$ , with greater molar mass, a gas, while water a liquid at room temperature ?



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38. Noble gases are mostly chemically inert. Give reason.



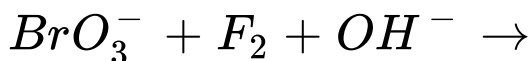
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39. Nitrogen does not form pentahalides. Give reason.



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40. Complete and balance the chemical equation :



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**41.** Which compound led to the discovery of compounds of noble gases ?



**View Text Solution**

**42.** Give reason for the difference in the following:

Reactivity of nitrogen and phosphorus.



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**43.** Draw the structure of xenon fluoride molecule which is isoelectronic with  $IF_5$ .



**View Text Solution**

**44.** Nitrogen and phosphorus are elements in the same group but property of catenation is shown only by phosphorus, why?



**View Text Solution**

**45.** Fluorine provides the largest variety of interhalogen compounds among halogens, why?



**View Text Solution**

**46.** Which has the larger bond angle  $H_2S$  or  $H_2O$  and why?



**View Text Solution**

47. Draw and name the molecular shape of  $SF_6$ .



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48.  $PCl_5$  acts as an oxidising agent. Justify .



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49. Why are fluorine and oxygen compounds more aptly called oxygen fluoride ?



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50. Give the reason which prompted Bartlett to prepare first noble gas compound.



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51. What is the difference between nature of pi-bonds present in  $H_3PO_3$  and  $HNO_3$  molecules ?



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**52.** Give reason for the following:

$PH_3$  is a weaker base than  $NH_3$



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**53.** Mention one property of hydrazine.



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54. On being slowly passed through water,  $PH_3$  forms bubbles but  $NH_3$  dissolves. Why is it so ?



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55. Bond enthalpy of fluorine is lower than that of chlorine. Why?



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**56.** Answer the following question :

Why is it that nitrogen exists as gas whereas phosphorus exists as a solid ?



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**57.** Name the state of hybridisation of orbitals in  $XeF_2$  molecule.



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**58.** In the preparation of  $H_2SO_4$  by contact process, why is  $SO_3$  not absorbed directly in water to form  $H_2SO_4$  ?



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**59.** Write the balanced chemical equation for the reaction showing catalytic oxidation of  $NH_3$  by atmospheric oxygen.



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60. Write the structure of pyrophosphoric acid.



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



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**62.** Give reason to explain why  $ClF_3$  exists but  $FCl_3$ , does not.



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**63.** Write an example of a neutral molecule which is isoelectronic with  $ClO^-$ .



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**64.** Which colour is obtained when an ammonia solution is added to a solution of copper salt?



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**65.** Give the name of the compound  $CuFeS_2$ .



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**66.** Give the name of element which is synthetic radioactive element having atomic number 116.



**View Text Solution**

**67.** Which other substance than oxygen is formed when  $KClO_3$ , is heated ?



**View Text Solution**



**68.** Name the chemicals that pose a threat to ozone layer.



**View Text Solution**

**69.** Name a substance which is manufactured by using ozone as an oxidising agent.



**View Text Solution**

70. Which allotropic form of sulphure is insoluble in water but dissolves readily in  $CS_2$  ?



[View Text Solution](#)

71. Which gas is used in refining petroleum and sugar ?



[View Text Solution](#)

**72.** A nation's industrial strength can be judged by the quantity of a chemical produced and consumed by it. What is that?



**View Text Solution**

**73.** Name the halogen present in Cryolite.



**View Text Solution**

74. Name a process used for the manufacture of chlorine by the oxidation of HCl.



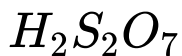
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75. What is obtained when three parts of concentrated HCl and one part of concentrated  $HNO_3$  ?



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1. Write the structure of the following



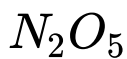
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2. Write the structure of the following



[View Text Solution](#)

3. Write the structure of the following



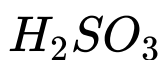
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4. Write the structure of the following



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5. Write the structure of the following molecules :



[View Text Solution](#)

6. Write the structure of the following molecules :



[View Text Solution](#)

7. Complete the following reaction :



[View Text Solution](#)

8. Complete the following reaction :



[View Text Solution](#)



9. What happens when

(i)  $PCl_5$  is heated ? (ii)  $H_3PO_3$  is heated ?

Write the reaction involved.



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10. Explain the following giving an appropriate reason in case :

$O_2$  and  $F_2$  both stabilise higher oxidation states of metals but  $O_2$  exceeds  $F_2$  in doing so.





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**11.** Explain the following giving an appropriate reason in case :

Structures of Xenon fluorides cannot be explained by Valence Bond approach.



[View Text Solution](#)

**12.** State reasons for the following:

The N - O bond in  $NO_2^-$  is shorter than the N - O bond in  $NO_3^-$ .



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**13.** State reasons for the following:

$SF_6$  is kinetically an inert substance.



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**14.** State reasons for each of the following:

All the P-Cl bonds in  $PCl_5$  molecule are not equivalent.



[View Text Solution](#)

**15.** State reasons for each of the following:

Sulphur has greater tendency for catenation than oxygen.



**View Text Solution**

**16.** Draw the structure of phosphinic acid ( $H_3PO_2$ ).



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17. Write a chemical reaction for its use as reducing agent.



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18. Suggest a quantitative method for estimation of the gas which protects us from UV rays of the sun.



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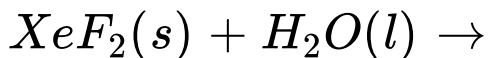
19. Nitrogen oxides emitted from the exhaust system of supersonic jet aeroplanes slowly deplete the concentration of ozone layer in upper atmosphere. Comment.



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20. Complete the following reaction equations

:



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21. Complete the following reaction equations

:



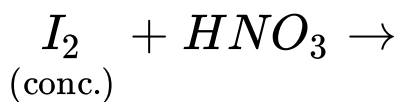
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22. Draw the structures of white phosphorus and red phosphorus. Which one of these two types of Phosphorus is more reactive and why?



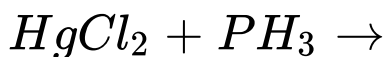
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23. Complete the following chemical reaction equations :



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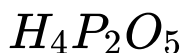
24. Complete the following chemical reaction equations :



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25. Draw the structural formulae of the following compounds :



[View Text Solution](#)

26. Draw the structural formulae of the following compounds :



[View Text Solution](#)

27. What is the covalence of nitrogen in  $N_2O_5$ ?



[View Text Solution](#)

28. Explain why both N and Bi do not form pentahalides while phosphorus does.



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29. When conc.  $H_2SO_4$  was added into an unknown salt present in a test tube, a brown

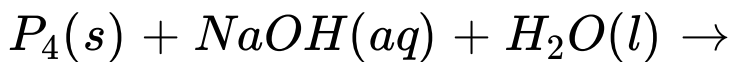
gas (A) was evolved. This gas intensified when copper turnings were also added into this test tube. On cooling, the gas (A) changed into a colourless gas (B). (a) Identify the gases (A) and (B).

(b) Write the equations for the reactions involved.



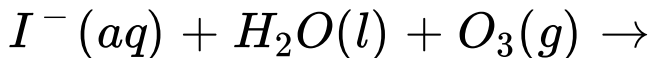
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**30.** Complete the following chemical reaction equations :



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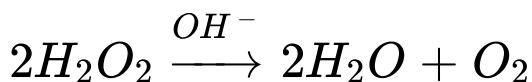
**31.** Complete the following chemical reaction equations :



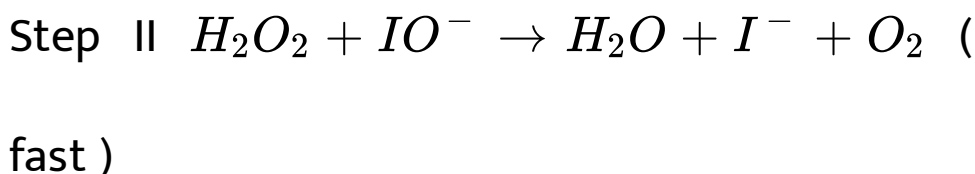
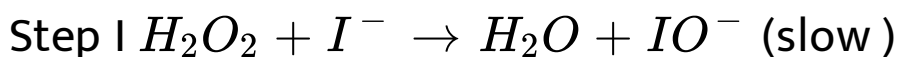
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**32.** Consider the decomposition of hydrogen peroxide in alkaline medium which is catalysed

by iodide ions.



This reaction takes place in two steps as given below :



(a) Write the rate law expression and determine the order of reaction w.r.t.  $H_2O_2$ .

(b) What is the molecularity of each individual step ?



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**33.** Predict the shape of  $ClF_3$  on the basis of VSEPR theory.



**View Text Solution**

**34.** Give chemical reactions in support of the following observations:

Sulphuric acid has low volatility.



**View Text Solution**

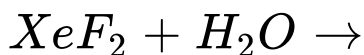
**35.** Give chemical reactions in support of the following observations:

Iodide ions can be oxidised by oxygen in acidic medium.



[View Text Solution](#)

**36.** Complete the following chemical reaction equations :



[View Text Solution](#)

**37.** Complete the following chemical reaction equations :



**View Text Solution**

**38.** What prompted Bartlett to the discovery of noble gas compounds ?



**View Text Solution**



**39.** State two important uses of noble gases.



**View Text Solution**

**40.** Assign a reason for each of the following:

(i) Ammonia is a stronger base than phosphine.

(ii) Sulphur in vapour state exhibits a paramagnetic behaviour.



**View Text Solution**

**41.** Answer the following questions :

Which neutral molecule would be isoelectronic with  $ClO^-$  ?



[View Text Solution](#)

**42.** Answer the following questions :

Of Bi(V) and Sb(V), which may be a stronger oxidising agent and why?



[View Text Solution](#)

43. Apply VSEPR theory to deduce the structures of  $XeF_4$  and  $XeF_6$



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44. Write the structures of the following species :

(i)  $H_3PO_2$  (ii)  $H_2SO_5$



[View Text Solution](#)

**45.** How would you account for the following ?

(i) Hydrogen fluoride is much less volatile than hydrogen chloride.

(ii) Interhalogen compounds are strong oxidising agents.



[View Text Solution](#)

**46.** Compare the structural shapes of the following species :  $SF_4$  and  $SF_6$  .



[View Text Solution](#)

**47.** How would you account for the following:

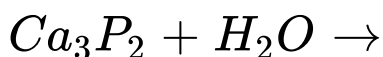
(i) Sulphur hexafluoride is less reactive than sulphur tetrafluoride.

(ii) Of the noble gases only xenon forms known chemical compounds.



**View Text Solution**

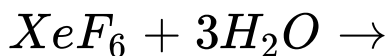
**48.** Write balanced chemical equations for the following reactions :





[View Text Solution](#)

**49.** Write balanced chemical equations for the following reactions :



[View Text Solution](#)

**50.** Give reasons for the following:

(a) Nitric oxide becomes brown when released

in air.

(b)  $PCI_5$  is ionic in nature in the solid state.



[View Text Solution](#)

**51.** Assign reason for the following:

(a) Noble gases are mostly inert

(b) Bismuth is a strong oxidising agent in pentavalent state.



[View Text Solution](#)

52. Write chemical reactions to show that conc.  $H_2SO_4$  can be an oxidising agent.



[View Text Solution](#)

53. Write the chemical formula of  $PCI_5$  (s).



[View Text Solution](#)

54. Give reasons for the following:

(a) Ammonia acts as a ligand.



(b) Sulphur disappears when boiled with an aqueous solution of sodium sulphite.



[View Text Solution](#)

**55.** Account for the following :

Thermal stability of water is much higher than that of  $H_2S$ .



[View Text Solution](#)

**56.** Account for the following :

White phosphorus is more reactive than red phosphorus.



**View Text Solution**

**57.** Write the chemical equations involved in the preparation of the following:

(a)  $XeF_4$  (b)  $H_3PO_3$



**View Text Solution**

**58.** Give reason for the following :

Sugar gets charred on addition of concentrated sulphuric acid.



**View Text Solution**

**59.** Give reason for the following :

All five bonds in  $PCl_5$  molecule are not equivalent.



**View Text Solution**

**60.** Give reasons for the following:

HF is least volatile, whereas HCl is the most volatile.



**View Text Solution**

**61.** Give reasons for the following:

Concentrated nitric acid turns yellow on exposure to sunlight.



**View Text Solution**

62. What happens when chlorine is passed through a hot concentrated solution of an alkali like  $Ba(OH)_2$  ?



[View Text Solution](#)

63. What happens when  $XeF_4$  undergoes hydrolysis ?



[View Text Solution](#)

**64.** Find the oxidation states of halogens in the following :

(a)  $Cl_2O$  (b)  $KBrO_3$  (c)  $NaClO_4$  (d)  $ClO_2$



[View Text Solution](#)

**65.** How would you account for the following:

Enthalpy of dissociation for  $F_2$  is much less than that for  $Cl$  .



[View Text Solution](#)

**66.** How would you account for the following:

Sulphur in vapour state exhibits paramagnetism.



**View Text Solution**

**67.** Explain the following observations:

Bismuth oxide is not acidic in any of its reactions.



**View Text Solution**

**68.** Explain the following observations:

HF is a weaker acid than HI in aqueous solutions.



[View Text Solution](#)

**69.** Assign a reason for the following statements :

Perchloric acid is a stronger acid than sulphuric acid.



[View Text Solution](#)



70. Assign a reason for the following statements :

Of all the noble gases only xenon is known to form established chemical compounds.

 [View Text Solution](#)

71. Write structural formulae for the following :

(i)  $IF_5$  (ii)  $XeOF_2$

 [View Text Solution](#)

72. Assign a reason for the following statements :

All the bonds in a molecule of  $PCl_5$  are not equal.



[View Text Solution](#)

73. Assign a reason for the following statements :

Hydrogen fluoride is a weaker acid than hydrogen chloride in aqueous solution.





[View Text Solution](#)

**74.** Assign a reason for the following:

In Group 15, the bond angle H-M-H decreases  
in the following order

$NH_3(107.8^\circ)$ ,  $PH_3(93.6^\circ)$ ,  $AsH_3(91.8^\circ)$



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**75.** Assign a reason for the following:

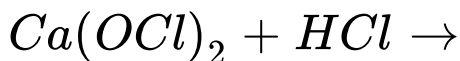
Sulphur hexafluoride is used as a gaseous  
electrical insulator.



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**76.** Complete the following reaction equations

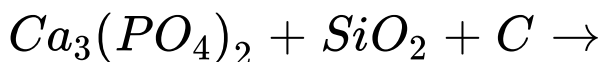
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**77.** Complete the following reaction equations

:





[View Text Solution](#)

**78.** Assign a reason for the following statements :

$SF_6$  is not easily hydrolysed.



[View Text Solution](#)

**79.** Assign a reason for the following statements :

Hydrogen fluoride has a much higher boiling point than hydrogen chloride.



[View Text Solution](#)

**80.** Why is it that nitric oxide is paramagnetic in gaseous state but the solid obtained on cooling it is diamagnetic ?



[View Text Solution](#)

**81.** Out of  $H_2O$  and  $H_2S$  which has higher bond angle and why?



[View Text Solution](#)

82.  $SF_6$  is known but  $SCI_6$  is not. Why?

 [View Text Solution](#)

83. In the ring test of  $NO_3^-$  ion,  $Fe^{2+}$  ion reduces nitrate ion to nitric oxide, which combines with  $Fe^{2+}$  complex. Write the reactions involved in the formation of brown ring.

 [View Text Solution](#)

**84.** Nitric acid forms an oxide of nitrogen on reaction with  $P_4O_{10}$ . Write the reaction involved. Also write the resonating structures of the oxide of nitrogen formed.



**View Text Solution**

**85.**  $PCl_5$  reacts with finely divided silver on heating and a white silver salt is obtained, which dissolves on adding excess aqueous



$NH_3$  solution. Write the reactions involved to explain what happens.



[View Text Solution](#)

**86.** Assign an appropriate reason for the following:

More metal fluorides are ionic in nature than metal chlorides.



[View Text Solution](#)

87. Assign an appropriate reason for the following:

$SCI_6$  is not known but  $SF_6$  is known.



[View Text Solution](#)

## Long Answer Question I

1. Give reasons for the following:

Dinitrogen is a gas but phosphorus is a solid.



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2. Give reasons for the following:

Bond angle decreases from  $H_2O$  to  $H_2Te$ .



[View Text Solution](#)

3. Give reasons for the following:

Halogens have the maximum negative electron gain enthalpy.



[View Text Solution](#)

4. Give reasons for the following:

$NH_3$  has a higher boiling point than  $PH_3$ .



[View Text Solution](#)

5. Give reasons for the following:

$H_2Te$  is more acidic than  $H_2S$ .



[View Text Solution](#)

6. Give reasons for the following:

Chlorine water on standing loses its yellow

colour.



[View Text Solution](#)

7. Give reason for the following :

$(CH_3)_3P = O$  exists but  $(CH_3)_3N = O$

does not.



[View Text Solution](#)

8. Give reason for the following :

Oxygen has less electron gain enthalpy with

negative sign than sulphur.

 [View Text Solution](#)

9. Give reason for the following :

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

 [View Text Solution](#)

10. Why is dioxygen a gas but sulphur a solid ?

 [View Text Solution](#)

**11.** Give reasons for the following:

Where R is an alkyl group ,  $R_3P = O$  exists but  $R_3N = O$  does not .

 [View Text Solution](#)

**12.** Give reasons for the following:

$PbCl_4$  is more covalent than  $PbCl_2$  .

 [View Text Solution](#)

**13.** Give reasons for the following:

At room temperature ,  $N_2$  is much less reactive.



**View Text Solution**

**14.** How would you account for the following:

$H_2S$  is more acidic than  $HP_2O$ .



**View Text Solution**



15. How would you account for the following:

The N-O bond in  $\text{NO}_2^-$  is shorter than the N-O bond in  $\text{NO}_3^-$ .



[View Text Solution](#)

16. How would you account for the following:

Both  $\text{O}_2$  and  $\text{F}_2$  stabilise high oxidation states but the ability of oxygen to stabilise the higher oxidation state exceeds that of fluorine.



[View Text Solution](#)

**17.** How would you account for the following:

$NCI_3$  is an endothermic compound while

$NF_3$  is an exothermic one.



[View Text Solution](#)

**18.** How would you account for the following:

$XeF_2$  is a linear molecule without a bend.



[View Text Solution](#)

**19.** How would you account for the following:

The electron gain enthalpy with negative sign for fluorine is less than that for chlorine, still fluorine is a stronger oxidising agent than chlorine.



**View Text Solution**

**20.** Write balanced chemical equations for the following reactions :

Thermal decomposition of ammonium dichromate.



[View Text Solution](#)

21. Write balanced chemical equations for the following reactions :

Reaction of  $Cl_2$  with cold and dilute NaOH.



[View Text Solution](#)

22. Write balanced chemical equations for the following reactions :

When phosphine is passed through mercuric chloride solution.



[View Text Solution](#)

**23.** Account for the following:

$NH_3$  is a stronger base than  $PH_3$ .



[View Text Solution](#)

**24.** Account for the following:

Sulphur has a greater tendency for catenation than oxygen.



[View Text Solution](#)

**25.** Account for the following:

Bond dissociation energy of  $F_2$  is less than that of  $Cl_2$ .



[View Text Solution](#)

**26.** Explain the following situations :

In the structure of  $HNO_3$  molecule, the N - O bond (121 pm) is shorter than N - OH bond (140 pm).



[View Text Solution](#)

**27.** Explain the following situations :

$SF_4$  is easily hydrolysed whereas SF is not easily hydrolysed.

 [View Text Solution](#)

**28.** Explain the following situations :

$XeF_2$  has a straight linear structure and not a bent angular structure.

 [View Text Solution](#)

**29.** Explain the following observations giving appropriate reasons :

Ozone is thermodynamically unstable with respect to oxygen.



**View Text Solution**

**30.** Explain the following observations giving appropriate reasons :

The HEH bond angle of the hydrides of Group



15 elements decreases as we move down the group.



[View Text Solution](#)

**31.** Explain the following observations giving appropriate reasons :

Bleaching effect of chlorine is permanent.



[View Text Solution](#)

**32.** Account for the following observations:

among the halogens  $F_2$  is the strongest oxidising agent.



[View Text Solution](#)

**33.** Account for the following observations:

fluorine exhibits only -1 oxidation state whereas other halogens exhibit higher positive oxidation states also.



[View Text Solution](#)

**34.** Account for the following observations:

acidity of oxo acid of chlorine is



**View Text Solution**

**35.** Account for the following:

Neon is not known to form compounds.



**View Text Solution**

**36.** Account for the following:

Although the electron gain enthalpy of fluorine is less negative than that of chlorine, fluorine is a stronger oxidising agent than chlorine.

 [View Text Solution](#)

**37.** Account for the following:

$SbF_5$  is much more stable than  $BiF_5$  .

 [View Text Solution](#)

**38.** Account for the following :

Chlorine water has both oxidising and bleaching properties.

 [View Text Solution](#)

**39.** Account for the following :

$H_3PO_2$  and  $H_3PO_3$  act as good reducing agents while  $H_3PO_4$  does not.

 [View Text Solution](#)

**40.** Account for the following :

On addition of ozone gas to KI solution, violet vapours are obtained.



**View Text Solution**

**41.** Write down the equations for the hydrolysis of  $XeF_4$  and  $XeF_6$ . Which of these two reactions is a redox reaction ?



**View Text Solution**

**42.** Write chemical equations for the following processes :

Chlorine reacts with a hot concentrated solution of sodium hydroxide.



**View Text Solution**

**43.** Write chemical equations for the following processes :

Orthophosphorus acid is heated.



**View Text Solution**

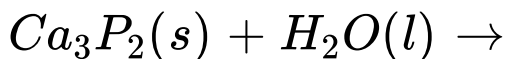
**44.** Write chemical equations for the following processes :

$PtF_6$  and  $Xe$  are mixed together .



[View Text Solution](#)

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

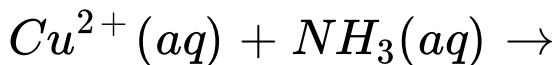


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**46.** Complete the following chemical equations

:



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**47.** Complete the following chemical equations

:



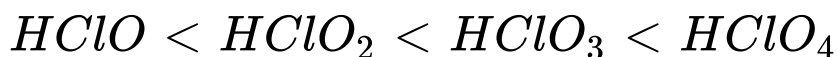
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**48.** On reaction with  $Cl_2$ , phosphorus forms two types of halides A and B. Halide A is yellowish white powder but halide B is colourless oily liquid. Identify A and B and write the formulas of their hydrolysis products.



**View Text Solution**

**49.** Explain why the stability of oxoacids of chlorine increases in the order given below :





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50.  $P_4O_6$  reacts with water according to equation  $P_4O_6 + 6H_2O \rightarrow 4H_3PO_3$  .

Calculate the volume of 0.1 M NaOH solution required to neutralise the acid formed by dissolving 1.1 g of  $P_4O_6$  in  $H_2O$ .



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**51.** White phosphorus reacts with chlorine and the product hydrolysis in the presence of water. Calculate the mass of HCl obtained by the hydrolysis of the product formed by the reaction of 62 g of white phosphorus with chlorine in the presence of water.



**View Text Solution**

**52.** Name three oxoacids of nitrogen. Write the disproportionation reaction of that oxoacid of

nitrogen in which nitrogen is in +3 oxidation state.



[View Text Solution](#)

**53.** Give an example to show the effect of concentration of nitric acid on the formation of oxidation product.



[View Text Solution](#)

**54.** Give reasons for the following:

Addition of  $Cl_2$  to KI solution gives it a brown colour, but excess of  $Cl_2$  turns it colourless.



**View Text Solution**

**55.** Give reasons for the following:

Phosphinic acid behaves as a monoprotic acid.



**View Text Solution**

**56.** Give reasons for the following:

White phosphorus is much more reactive than red phosphorus.



**View Text Solution**

## Long Answer Question II

**1.** Account for the following:

(i) Acidic character increases from HF to HI.

(ii) There is large difference between the

melting and boiling points of oxygen and sulphur.

(iii) Nitrogen does not form pentahalides



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2. Draw the structures of the following:

(i)  $ClF_3$  (ii)  $XeF_4$



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



[View Text Solution](#)

4. How the supersonic jet aeroplanes are responsible for the depletion of ozone layer?



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5.  $F_2$  has lower bond dissociation enthalpy than  $Cl_2$ . Why?



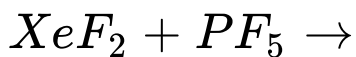
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6. Which noble gas is used in filling balloons for meteorological observations ?



[View Text Solution](#)

7. Complete the equation :



[View Text Solution](#)

8. Account for the following:

Helium is used in diving apparatus.



[View Text Solution](#)

**9.** Account for the following:

Fluorine does not exhibit positive oxidation state.



**View Text Solution**

**10.** Account for the following:

Oxygen shows catenation behaviour less than sulphur.



**View Text Solution**

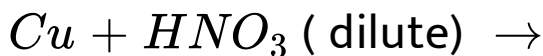
11. Draw the structures of the following molecules :

(i)  $XeF_2$  (ii)  $H_2S_2O_8$



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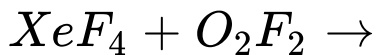
12. Complete the following chemical equations :



[View Text Solution](#)

**13.** Complete the following chemical equations

:



[View Text Solution](#)

**14.** Explain the following observations:

Phosphorus has greater tendency for catenation than nitrogen.



[View Text Solution](#)

**15.** Explain the following observations:

Oxygen is a gas but sulphur is a solid.



**View Text Solution**

**16.** Explain the following observations:

The halogens are coloured. Why?



**View Text Solution**

**17.** Explain the following:

$NF_3$  is an exothermic compound whereas  $NCl_3$  is not.



**View Text Solution**

**18.** Explain the following:

$F_2$  is most reactive of all the four common halogens.

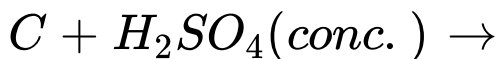


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19. Complete the following chemical equations

:



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20. Complete the following chemical equations

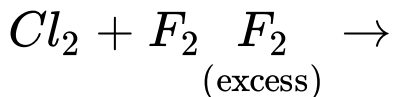
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21. Complete the following chemical equations

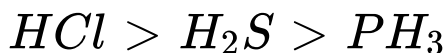
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22. Account for the following:

The acidic strength decreases in the order



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**23.** Account for the following:

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



[View Text Solution](#)

**24.** Complete the following chemical equations

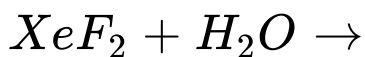
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**25.** Complete the following chemical equations

:



**View Text Solution**

**26.** Complete the following chemical equations

:



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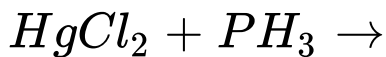
27. Draw the structure of the following molecules:

(a)  $(HPO_3)_3$  (b)  $BrF_3$



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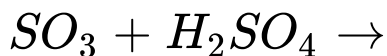
28. Complete the following chemical equations :



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29. Complete the following chemical equations

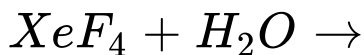
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[View Text Solution](#)

30. Complete the following chemical equations

:



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**31.** What happens, when chlorine gas is passed through a hot concentrated solution of NaOH ?



**View Text Solution**

**32.** What happens, when sulphur dioxide gas is passed through an aqueous solution of a Fe(III) salt



**View Text Solution**

**33.** Answer the following :

What is the basicity of  $H_2SO_4$  and why?



**View Text Solution**

**34.** Answer the following :

Why does fluorine not play the role of a central atom in interhalogen compounds ?



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**35.** Answer the following :

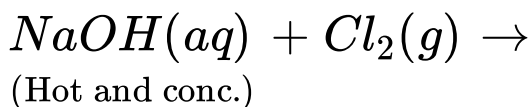
Why do noble gases have very low boiling points ?



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**36.** Complete the following chemical equations

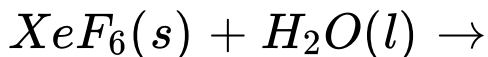
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**37.** Complete the following chemical equations

:



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**38.** How would you account for the following ?

The value of electron gain enthalpy with negative sign for sulphur is higher than that for oxygen.



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**39.** How would you account for the following ?

$NF_3$  is an exothermic compound but  $NI_3$  is an endothermic compound.



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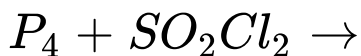
**40.** How would you account for the following ?

$ClF_3$  molecule has a T-shaped structure and not a trigonal planar one.



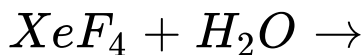
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41. Complete the following chemical reaction equations :



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42. Complete the following chemical reaction equations :



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**43.** Explain the following observations giving appropriate reasons :

The stability of +5 oxidation state decreases down the group in Group 15 of the periodic table.



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**44.** Explain the following observations giving appropriate reasons :

Solid phosphorus pentachloride behaves as an ionic compound.



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**45.** Explain the following observations giving appropriate reasons :

Halogens are strong oxidising agents.



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**46.**  $X_2$  is a greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When  $X_2$  is

passed through NaBr solution,  $Br_2$  is obtained.

Identify  $X_2$ .



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**47.**  $X_2$  is a greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When  $X_2$  is passed through NaBr solution,  $Br_2$  is

obtained.

Name the group to which it belongs.



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**48.**  $X_2$  is a greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When  $X_2$  is passed through NaBr solution,  $Br_2$  is obtained.



Write general electronic configuration of this group.



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**49.**  $X_2$  is a greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When  $X_2$  is passed through NaBr solution,  $Br_2$  is obtained.

What are the products obtained when  $X_2$  reacts with  $H_2O$ ? Write chemical equations.



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50.  $X_2$  is a greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When  $X_2$  is passed through NaBr solution,  $Br_2$  is obtained.

What happens when  $X_2$  reacts with hot and conc. NaOH ? Give equations.



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**51.** An orange solid A on heating gives a colourless gas B. The gas B in dry condition is passed over heated Ca to give a solid C. The solid C further reacts with water to produce gas D, which forms a blue coloured compound E on reaction with copper sulphate solution.

Identify A, B, C, D, E and give the sequence of reactions involved.



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**52.** Arrange the following in order of property indicated for each set:

(i) HCl, HI, HBr, HF - Decreasing thermal stability.

(ii) Xe, He, Kr, Rn, Ne -Decreasing order of electron gain enthalpy.



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**53.** Give reasons :

Solid  $PCl_5$  is an ionic compound.



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**54.** Give reason :

Most of the reactions of fluorine are exothermic .



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55. Give reasons :

Ozone is thermodynamically unstable.

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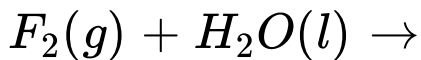
56. Draw the structures of the following :

(i)  $XeOF_4$  (ii)  $H_4P_2O_7$

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57. Complete the following chemical equations

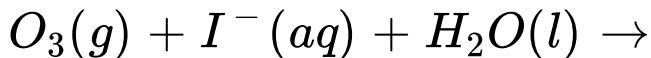
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**58.** Complete the following chemical equations

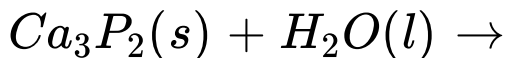
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**59.** Complete the following chemical equations

:



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**60.** Draw the structural formulae of the following molecules :

(i)  $\text{XeF}_4$  (ii)  $\text{H}_2\text{S}_2\text{O}_7$



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**61.** Assign reason for the following:

Sulphur vapour is paramagnetic.





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**62.** Assign reason for the following:

Ammonia ( $NH_3$ ) has greater affinity for protons than phosphine ( $PH_3$ ).



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**63.** Assign reason for the following:

The negative value of electron gain enthalpy of fluorine is less than that of chlorine.



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**64.** Assign reason for the following:

$SF_6$  is much less reactive than  $SF_4$ .



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**65.** Assign reason for the following:

of the noble gas, only xenon is known to form well-established chemical compounds.



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**66.** An amorphous solid "A" burns in air to form a gas "B" which turns lime water milky. The gas is also produced as a by-product during roasting of sulphide ore. This gas decolourises acidified aqueous  $KMnO_4$  solution and reduces  $Fe^{3+}$  to  $Fe^{2+}$ . Identify the solid "A" and the gas "B" and write the reactions involved.



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**67.** On heating lead (II) nitrate gives a brown gas "A". The gas "A" on cooling changes to colourless solid "B". Solid "B" on heating with no changes to a blue solid 'C'. Identify 'A', 'B' and 'C' and also write reactions involved and draw the structures of 'B' and 'C'.



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**68.** On heating compound (A) gives a gas (B) which is a constituent of air. This gas when

treated with 3 mol 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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**Self Assessment Test Section A**

1. Which of the following is not a p-block element ?

A. Barium

B. Nitrogen

C. Selenium

D. Tellurium

**Answer: A**



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2. Choose the correct option:

A. Nitrogen comprises 78% by volume of atmosphere.

B. It occurs in the earth's crust also.

C. It is found as protein in plants and animals.

D. All the above.

**Answer: D**



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3. Oxygen shows anomalous behaviour because

A. it supports combustion.

B. it is found in the atmosphere.

C. because of its large size.

D. because of its small size.

**Answer: D**



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4. Hydrogen peroxide on heating gives

A. hydrogen and oxygen.

B. water and oxygen.

C.  $H_4O_2$

D. HO

**Answer: B**



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5. Which of the following is not a neutral oxide

?

A. CO

B. *NO*

C. *SO<sub>2</sub>*

D. *N<sub>2</sub>O*

**Answer: C**



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6. Assertion (A) : Rhombic sulphur is obtained by evaporating a solution of roll sulphur is  $CS_2$

Reason (R) : Fluorine forms two oxides,  $OF_2$  and  $O_2F_2$ .

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not

the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement

**Answer: B**



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7. Assertion (A): Noble gases show no tendency for chemical reaction.

Reason (R) : Noble gas have complete octet in their outermost shell.

A. Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A)

B. Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not

the correct explanation of the Assertion

(A)

C. Assertion (A) is correct, but Reason (R) is incorrect statement.

D. Assertion (A) is incorrect, but Reason (R) is correct statement

**Answer: A**



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