



## CHEMISTRY

### BOOKS - PRADEEP CHEMISTRY (HINGLISH)

### P-BLOCK ELEMENTS (NITROGEN FAMILY)

#### Curiosity Question

1. How do the airbags installed in the dashboard of your car work ?

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#### Test Your Grip Multiple Choice Questions I

1. Which of the following does not form a pentachloride?

A. P

B. As

C. Sb

D. N

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

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2. Which of the following on heating does not give nitrogen gas?

A.  $NH_4NO_3$

B.  $NH_4NO_2$

C.  $Ba(N_3)_2$

D.  $(NH_4)_2Cr_2O_7$

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

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

A. N

B. P

C. As

D. Sb

**Answer: A**



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4. Which of the following elements is kept in water?

A. White P

B. Na

C. S

D. Si

**Answer: A::C**

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5. For  $H_3PO_3$  and  $H_3PO_4$  the correct choice is

A.  $H_3PO_3$  is dibasic and reducing

B.  $H_3PO_4$  is dibasic and non-reducing

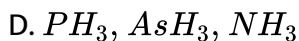
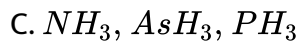
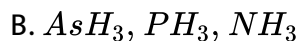
C.  $H_3PO_4$  is tribasic and reducing

D.  $H_3PO_3$  is tribasic and non-reducing

**Answer: A**

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6. Which of the following is arranged in the increasing order of enthalpy of vaporization?



Answer: A::C



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7. The number of  $P - O - P$  bridge in the structure of phosphorous pentoxide and phosphorus trioxide are respectively

A. 6,6

B. 5,5

C. 5,6

D. 6,5

**Answer: A**

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## Test Your Grip II Fill In The Blanks

1. Nitrogen does not form pentahalides as it does not have .....

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2. Conc.  $HNO_3$  on dehydration with  $P_4O_{10}$  gives.....

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3. Aqua regia is

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4. In gaseous state, nitric oxide is ..... While in the liquid or solid state it is .....

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5. The formula of acidic nitrogen hydride is .....

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6. Nitric acid containing ..... Is called fuming nitric acid.

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7. Laughing gas is obtained when a mixture of  $NH_4Cl$  and .....is heated while nitrogen gas is obtained when a mixture of  $NH_4Cl$  and .....is heated.

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8. In the ring test of  $\text{NO}_3^-$  ion,  $\text{Fe}^{2+}$  ion reduces nitrate ion to nitric oxide, which combines with  $\text{Fe}^{2+}$  (aq) ion to form brown complex .

Write the reactions involved in the formation of brown ring.

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9. The products of oxidation of phosphorus acid by hot concentrated sulphuric acid are .....and ..... .

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10. The P-P-P angle in  $\text{P}_4$  molecule is .....degree while S-S-S angle in  $\text{S}_8$  is .....degree.

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11. The molecule of  $PCl_5$  in the solid state is .....in nature consisting of tetrahedral .....cation and octahedral.....anion.

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12. ....is obtained when yellow phosphorus is heated with an aqueous solution of NaOH in an inert atmosphere.

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13. ....and.....are neutral oxides of nitrogen.

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14.  $As_2O_5$  is .....while  $Sb_2O_5$  is..... .

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15. Red phosphorus is .....reactive than white phosphorus as red phosphorus is polymeric and consists of ..... the of  $P_4$  units.

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## Conceptual Questions

1.  $PCl_5$  is known but  $NCl_5$  is not known.

Or Nitrogen does not form pentahalide.

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2. Explain the difference between covalency and oxidation state by taking the example of  $N_2O_5$ .

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3. The stability of +5 oxidation state decreases down the group 15 of the periodic table. Explain this observation giving appropriate reasons.

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4. Tendency to form pentahalides decreases down the group 15 of the periodic table. Account for this observation.

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5. Give the chemical reaction to support that +5 oxidation state of *Bi* is less stable than +3 state.

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6. Bismuth is a strong oxidizing agent in the pentavalent state. Or pentavalent bismuth is a strong oxidizing agent.

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

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

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9.  $NH_3$  has higher proton affinity than  $PH_3$ . Explain. Or  $NH_3$  is more basic than  $PH_3$ .

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10. You have the following substances :  $NH_3$ ,  $O_2$ , and  $H_2O$ . Write equations for the preparation  $N_2O$  from these substances.

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11. Although nitrogen and chlorine have very nearly same electronegativity yet nitrogen forms hydrogen bonding while chlorine does not. Why?

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12. Although fluorine is much more electronegative than hydrogen yet the dipole moment of  $NF_3$  (0.24 D) is much lower than that of  $NH_3$  (1.46 D). Explain.

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13. Unlike phosphorus, nitrogen show little tendency for catenation.

Or Phosphorus shows greater tendency for catenation than nitrogen.

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14. Ammonia is a good complexing agent. Give reasons.

Or Ammonia acts as a ligand. Explain.

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15. Why is  $N_2O_5$  more acidic than  $N_2O_3$  ?

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16. Give reasons for the following :

(i) NO (Nitric oxide) is paramagnetic in the gaseous state but diamagnetic

in the liquid and solid states. Why?

(ii) Nitric oxide becomes brown when released in air.

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

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18. Why is nitrous acid oxidant as well as reductant?

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19. Draw the structure of white phosphorus and red phosphorus. Which one of these two types of phosphorus, is more reactive and why ?

Or Which allotrope of phosphorus is more reactive and why?

Or Why is red phosphorus less reactive than white phosphorus.

Or Draw the structural difference between white and red phosphorus.

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20.  $PCl_5$  is ionic in nature in the solid state. Give reasons.

Or Solid phosphorus pentachloride behaves as an ionic compound.

Explain.

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21. Draw the structure of  $PCl_5$ .

Or Solid  $PCl_5$  is ionic in nature.

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22. Given chemical reaction in support of the statement that all the bonds in  $PCl_5$  molecule are not equivalent.



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23.  $H_3PO_3$  is diprotic (or dibasic). Why ?

Or What is the basicity of  $H_3PO_3$  and why ?

Or Draw the structure of dibasic oxoacid of phosphour.

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24.  $H_3PO_3$  undergoes disproportionation reaction but  $H_3PO_4$  does not ? Explain.

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**Ncert Questions And Exercises With Answers Ncert Intext Solved Questions**

1. Though nitrogen exhibits +5 oxidation state, it does not form pentahalide. Give reason.

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2.  $PH_3$  has lower boiling point than  $NH_3$ . Why ?

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3. Write the reaction of thermal decomposition of sodium azide.

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4. Why does  $NH_3$  act as a Lewis base ?

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5. Why does  $NO_2$  dimerise ?

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

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7. Why does  $PCl_3$  fume in moisture ?

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8. Are all the five bonds in  $PCl_5$  equivalent ? Justify.

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9. How do you account for the reducing behaviour of  $H_3PO_2$  ?

Or (i) Draw the structure of phosphinic acid ( $H_3PO_2$ ).

(ii) Write a chemical reaction for its use as a reducing agent.

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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 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 phosphorous 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 balanced equation for 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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1. Discuss the general characteristics of Group 15 elements with reference to their electronic configuration, oxidation state, atomic size, ionisation enthalpy and electronegativity.

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

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

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

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5. How is nitrogen prepared in the laboratory? Write the chemical equations of the reactions involved.

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6. How is ammonia manufactured industrially?

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

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

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

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

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

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12. Nitrogen exists as diatomic molecule and phosphorus as  $P_4$ . Why ?

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

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14. Why does nitrogen show catenation properties less than phosphorus.

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15. Give the disproportionation reaction of  $H_3PO_3$ .

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16. Can  $PCl_5$  act as oxidising as well as reducing agent ? Justify.

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## Ncert Exemplar Problems With Answers Hints And Solutions Multiple Choice Questions I

1. In qualitative analysis when  $H_2S$  is passed through an aqueous solution of salt acidified with dil. HCl, a black precipitate is obtained. On boiling the precipitate with dil.  $HNO_3$ , it forms a solution of blue colour. Addition of excess of aqueous solution of ammonia to this solution gives

- A. deep blue precipitate of  $Cu(OH)_2$
- B. deep blue solution of  $[Cu(NH_3)_4]^{2+}$
- C. deep blue solution of  $Cu(NO_3)_2$
- D. deep blue solution of  $Cu(OH)_2 \cdot Cu(NO_3)_2$

**Answer: B**

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2. In a cyclotrimetaphosphoric acid molecule, how many single and double bonds are present ?

- A. 3 double bonds , 9 single bonds
- B. 6 double bonds , 6 single bonds
- C. 3 double bonds , 12 single bonds
- D. Zero double bonds , 12 single bonds

**Answer: A**

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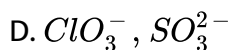
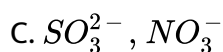
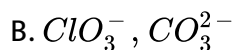
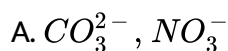
3. Which of the following elements can be involved in  $p\pi - d\pi$  bonding?

- A. Carbon
- B. Nitrogen
- C. Phosphorus
- D. Boron

**Answer: C**

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4. Which of the following pairs of ions are isoelectronic and isostructural ?



Answer: A

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5. Bond dissociation enthalpy of E-H(E= element ) bonds is given below.

Which of the compounds will act as strongest reducing agent

Compound	$NH_3$	$PH_3$	$AsH_3$	$SbH_3$
$\Delta_{\text{diss}}(E - H) / kJmol^{-1}$	289	322	279	255



B.  $PH_3$

C.  $AsH_3$

D.  $SbH_3$

**Answer: D**



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6. On heating with concentrated NaOH solution in an inert atmosphere of  $CO_2$ , white phosphorus gives a gas. Which of the following statements is incorrect about the gas ?

A. It is highly poisonous and has smell like rotten fish

B. It's solution in water decomposes in the presence of light

C. It is more basic than  $NH_3$

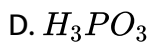
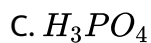
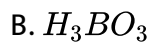
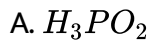
D. It is less basic than  $NH_3$

**Answer: D**



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7. Which of the following acids forms three series of salts ?



Answer: C



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8. Strong reducing behaviour of  $H_3PO_2$  is due to

A. Low oxidation state of phosphorus

B. Presence of two - OH groups and one P-H bond

C. Presence of one - OH group and two P-H bonds

D. High electron gain enthalpy of phosphorus

**Answer: C**

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9. On heating lead nitrate forms oxides of nitrogen and lead. The oxides formed are :

A.  $N_2O$ ,  $PbO$

B.  $NO_2$ ,  $PbO$

C.  $NO$ ,  $PbO$

D.  $NO$ ,  $PbO_2$

**Answer: B**

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10. Which of the following elements does not show allotropy ?

A. Nitrogen

B. Bismuth

C. Antimony

D. Arsenic

**Answer: A**



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11. Maximum covalency of nitrogen is ..... .

A. 3

B. 5

C. 4

D. 6

**Answer: C**



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**12.** Which of the following statement is wrong ?

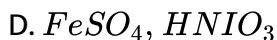
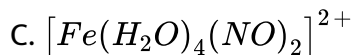
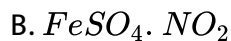
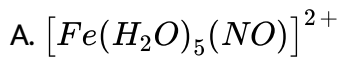
- A. Single N-N bond is stronger than the single P-P bond
- B.  $PH_3$  can act as a ligand in the formation of coordination compound with transition elements
- C.  $NO_2$  is paramagnetic in nature
- D. Covalency of nitrogen in  $N_2O_5$  is four

**Answer: A**



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**13.** A brown ring is formed in the ring test for  $NO_3^-$  ion. It is due to the formation of

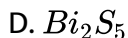
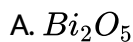


**Answer: A**



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14. Elements of group 15 form compounds in +5 oxidatin state. However, bismuth forms only one well characterised compound in +5 oxidation state. The compound is



**Answer: B**



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15. On heating ammonium dichromate and barium azide separately we get

- A.  $N_2$  in both cases
- B.  $N_2$  with ammonium dichromate and NO with barium azide
- C.  $N_2O$  with ammonium dichromate and  $N_2$  with barium azide
- D.  $N_2O$  with ammonium dichromate and  $N_2O$  with barium azide

**Answer: A**



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16. In the preparation of  $HNO_3$ , we get NO gas by catalytic oxidation of ammonia. The moles of NO produced by the oxidation of two moles of

$NH_3$  will be.

A. 2

B. 3

C. 4

D. 6

**Answer: A**



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17. The oxidation state of central atom in the anion of compound

$NaH_2PO_2$  will be.

A. +3

B. +5

C. +1

D. -3

**Answer: C**

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

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**19.** Write the structure of pyrophosphoric acid.

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**20.**  $PH_3$  forms bubbles when passed slowly in water but  $NH_3$  dissolves.

Explain why ?

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21. In  $PCl_5$  phosphorus is in  $sp^3 d$  hybridised state but all its five bonds are not equivalent. Justify your answer with reason.

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

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23. On reaction with  $Cl_2$  phosphorus forms two types of halides 'A' and 'B'.

Halide 'A' is yellowish- white powder but halide 'B' is colourless oily liquid.

Identify A and B and write the formulae of their hydrolysis products.

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24. In the ring test of  $\text{NO}_3^-$  ion,  $\text{Fe}^{2+}$  ion reduces nitrate ion to nitric oxide, which combines with  $\text{Fe}^{2+}$  (aq) ion to form brown complex .

Write the reactions involved in the formation of brown ring.

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25.  $\text{P}_4\text{O}_6$  reacts with water according to equation  $\text{P}_4\text{O}_6 \rightarrow 4\text{H}_3\text{PO}_3$ .

Calculate the volume of  $0.1\text{MNaOH}$  solution required to neutralise the acid formed by dissolving 1.1g of  $\text{P}_4\text{O}_6$  in  $\text{H}_2\text{O}$ .

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26. White phosphorus reacts with chlorine and the product hydrolyses 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.

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27. Name three oxoacids of nitrogen . Write the disproportionation reaction of that oxoacid of nitrogen is in +3 oxidation state.

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28. 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.

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29. (i) white phosphorus (ii) red phosphorus and (iii) black phosphorus. Write the difference between white red and black phosphorus on the basis of their structure and reactivity.

Phosphorus has three allotropic forms \_\_

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30. Given an example to show the effect of concentration of nitric acid on the formation of oxidation product.

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31.  $PCl_5$  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.

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32. Phosphorus forms a number of oxoacids. Out of these oxoacids, phosphinic acid has strong reducing property. Write its structure and also write a reaction its reducing behaviour.

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1. Which of the following is correct for  $P_4$  molecule of white phosphorus ?

- A. It has 6 lone pairs of electrons
- B. It has six P-P single bonds
- C. It has three P-P single bonds
- D. It has four lone pairs of electrons

**Answer: B::D**



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**Ncert Exemplar Problems With Answers Hints And Solutions Assertion And Reason Type Questions**

1. Assertion :  $N_2$  is less reactive than  $P_4$ .

Reason : Nitrogen has more electron gain enthalpy than phosphorus.

- A. Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
- B. Both assertion is and reason are correct statements, but reason is not the correct explanation of the assertion.
- C. Assertion is correct, but reason is wrong statement.
- D. Assertion is wrong but reason is correct statement.

**Answer:**



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2. Assertion :  $HNO_3$  makes iron passive.

Reason :  $HNO_3$  forms a protective layer of ferric nitrate on the surface of iron.

- A. Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.

- B. Both assertion is and reason are correct statements, but reason is not the correct explanation of the assertion.
- C. Assertion is correct, but reason is wrong statement.
- D. Assertion is wrong but reason is correct statement.

**Answer:**

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## Ncert Exemplar Problems With Answers Hints And Solutions Long Answers Questions

1. 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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2. 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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3. On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with 3 moles of hydrogen ( $H_2$ ) in the presence of a catalyst gives another gas (C ) which is basic in nature. Gas C on further oxidation in moist condition gives a compound (D) which is a part of acid rain. Identify compounds (A) to (D) and also give necessary equations of all the steps involved .

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1. Why the element of second period shows a number of difference in properties from other members of their respective families?

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2. INERT PAIR EFFECT

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3.  $Bi(V)$  and  $Sb(V)$  which may be a stronger oxidizing agent and why ?

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4. Give reasons for the least reactivity of nitrogen molecule.

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5. Nitrogen is much less reactive than phosphorus. Explain.

Or Phosphorus is much more reactive than nitrogen. Explain.

Or Nitrogen is relatively inert as compared to phosphorus. Why?

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6. Arrange the following in decreasing order of basic strength of 15 group hydrides

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7. Which is least acidic ?  $SbH_3$ ,  $PH_3$ ,  $NH_3$ ,  $AsH_3$

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8. Which is least basic ?  $SbH_3$ ,  $PH_3$ ,  $NH_3$ ,  $AsH_3$  ?

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

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10. Why  $BiH_3$  is strongest reducing agent amongst group 15 hydrides?

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11. Which of the following is/are not known?

$PCl_3$ ,  $AsCl_3$ ,  $SbCl_3$ ,  $NCl_5$ ,  $BiCl_5$ .

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12. Which of the following is more covalent:  $SbCl_5$  or  $SbCl_3$ ?

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13. Write balanced equation when  $NH_3$  is dissolved in water.

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14. ON adding NaOH to ammonium sulphate, a colourless gas with pungent odour is evolved which forms a blue coloured complex with  $Cu^{2+}$  ions. Identify the gas.

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15. Write chemical equation for thermal decomposition of ammonium dichromate.

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16. How is nitrogen prepared from ammonia ?

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17. What is laughing gas ? How is it prepared ?

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18. What happens when a mixture of ammonium sulphate and sodium nitrate is heated. Write the equation.

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19.  $Pb(NO_3)_2$  on heating gives a brown gas which undergoes dimerization on cooling? Identify the gas.

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20. What is fuming nitric acid ? What colour is it ?

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21. Write one reducing property of nitrous acid. Also give equation.

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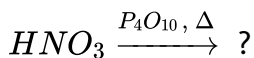
22. Concentrated nitric acid renders aluminium passive. Give reasons.

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23. The N-O bond in  $NO_2^-$  is shorter than N-O bond in  $NO_3^-$ . Account for this observation.

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24. Complete the following reaction ?



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25. Write balanced equation when powdered aluminium is boiled with caustic soda solution in presence of sodium nitrite.

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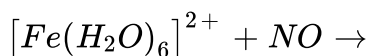
26. Write the formula of the compound of iodine which is obtained when conc.  $HNO_3$  oxidises  $I_2$ .

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27. Write the formula of the compound of phosphorus which is obtained when conc.  $HNO_3$  oxidises  $P_4$ .

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28. Complete the equation :



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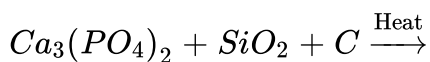
29. In the ring test for identification of nitrate ion, what is the formula of the compound responsible for the brown ring formed at the interface of the two liquids ?

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30. Important allotropic forms of phosphorus are white phosphorus, red phosphorus and black phosphorus. Among these which allotropic form is more reactive ? Why ?

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31. Write the chemical equation for the following :



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32. Why is white phosphorus kept under water ?

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33. How will you obtain phosphine from phosphorus ?

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

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35. Give the chemical equation for the reaction that occurs between iron and copper sulphate solution.

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36. Which is more stable  $PCl_5$  or  $PCl_3$  ?

Or What happens when  $PCl_5$  is heated ?

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37. Why is  $PCl_5$  more covalent than  $PCl_3$  ?

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38. Why does  $PCl_5$  fume in moisture ?

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39. Complete the following reactions :



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40. Suggest a method for the laboratory preparation of DCl.

Write a balanced equation for the reaction.

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41. What is the oxidation number of phosphorus in  $H_3PO_2$  molecule ?

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42.  $H_3PO_2$  and  $H_3PO_3$  act as good reducing agents but  $H_3PO_4$  does not. Explain.

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43. Why does  $H_3PO_3$  act as a reducing agent but  $H_3PO_4$  does not ?

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44. Why does orthophosphoric acid exist as a syrupy liquid ?

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45. How is pyrophosphoric acid related to orthophosphoric acid ?

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46. What kind of molecules show disproportionation reactions ?

Give one example of a compound each of nitrogen and phosphorus which show disproportionation reactions.

Write chemical equation in each case.

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47.  $CN^-$  ion is known but  $CP^-$  ion is not known.

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## Additional Questions Short Answer Questions

1. Name the elements of group 15. What is their valence shell electronic configuration ?

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2. List the various oxidation states of nitrogen and give an example of a compound or ion for each case.

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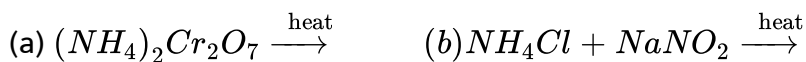
3. Write the shapes of the hydrides of group 15 elements. Arrange them in order of (i) decreasing basic strength (ii) increasing bond angle (iii) decreasing character.

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4. Discuss the anomalous behaviour of nitrogen ?

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5. Complete the following reactions :



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6. Explain Ostwald process for manufacture of nitric acid.

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7. (a) Draw the structure of nitric acid and write its uses.

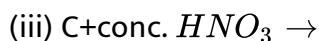
(b) Draw the structure of  $NO_3^-$ ,

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8. What happens when (i) zinc and (ii) copper react with (a) conc.  $HNO_3$  and (b) dil.  $HNO_3$ .

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9. Complete the following reactions :



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10. Write three differences between the properties of red and white phosphours.

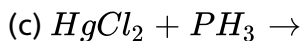
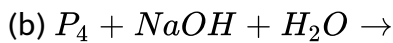
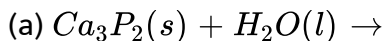
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11. How is phosphine prepared in the laboratory ? Write its balanced equation. How does it react with

(i)  $Cl_2$  (ii) acidified  $CuSO_4$  solution (iii)  $O_2$  (iv)  $AgNO_3$  solution (v) HI ?

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12. Complete the following chemical equations :



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13. How is  $PCl_3$  prepared from white phosphorus ? How does it react with (i)  $SO_3$  (ii)  $S_2Cl_2$  ?

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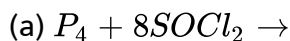
14. Write balanced equation for the formation of  $NCl_3$  and  $PCl_3$ . Give equations for hydrolysis reactions of  $NCl_3$  and  $PCl_3$ .

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15. Give two methods of preparation of  $PCl_5$  and discuss its structure.

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16. Complete the following chemical equations :

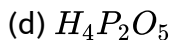
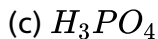
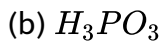
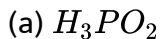


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17. Give structures of  $P_4O_6$  and  $P_4O_{10}$ .

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18. Draw the structures of the following :



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19. (a) Write chemical equation involved in the preparation of  $H_3PO_3$ .

(b) What is basicity of  $H_3PO_2$  ?

(c) What happens when orthophosphorus acid ( $H_3PO_3$ ) is heated ?



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20. Arrange the following in the increasing order of property mentioned :

(i)  $H_3PO_3$ ,  $(H_3PO_4)$ ,  $H_3PO_2$  (Reducing character)



(ii)  $NH_3$ ,  $PH_3$ ,  $AsH_3$ ,  $SbH_3$ ,  $BiH_3$  (Base strength)

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## Additional Questions Long Answer Questions

1. Write the names and formulae of any five oxides of nitrogen.

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2. (a) Describe the favourable conditions for the manufacture of ammonia by Haber's process

(b) Arrange the following in order of increasing basic strength :

$BiH_3$ ,  $SbH_3$ ,  $PH_3$ ,  $NH_3$ ,  $AsH_3$ .

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1. A certain element is a metalloid that forms an acidic oxide with the formula  $R_2O_5$ . Identify the elements

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2. Considering the fact that  $N_2$  makes up about 79% of the atmosphere, why don't animals use the more abundant  $N_2$  instead of  $O_2$  for biological reactions.

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3.  $NCl_3$  gets readily hydrolysed while  $NF_3$  does not. Why?

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4.  $NCl_3$  gets hydrolysed to form  $NH_3$  and  $HOCl$  while  $PCl_3$  on hydrolysis gives  $H_3PO_3$  and  $HCl$ . Explain why?



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5.  $NCl_3$  is an endothermic compound while  $NF_3$  is an exothermic compound.

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6. Among the hydrides of Group - 15 elements , which have the :

- (a) lowest boiling point ?      (ii) maximum basic character ?  
(iii) highest bond angle ?      (d) maximum reducing character ?

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## Analytical Questions And Problems With Answers Solutions Problems

1. When a mixture of ammonium chloride and potassium dichromate was heated, a stable colourless gas (A) was evolved which did not support combustion, but magnesium continued to burn in it. The gas (A) reacted

with calcium carbide in an electric furnace a solid (B) which was slowly hydrolysed by water forming an insoluble substance (C) and the solution of a substance (D) which turned Nessler's reagent brown. Identify substances (A) to (E) and explain all the reactions involved.

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2. A colourless inorganic salt (A) decomposes completely at about  $25^{\circ}C$  to give only two products, (B) and (C), leaving no residue. The product (C) is a liquid at room temperature and neutral to moist litmus paper while the gas (B) is a neutral oxide. White phosphorus burns in excess of (B) to produce a strong white dehydrating agent. Write balanced equations for the reactions involved in the above process.

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3. When conc.  $H_2SO_4$  was added to an unknown salt present in a test which was heated, a brown gas (A) was evolved. The gas intensified when copper turnings were also added into the test tube. On cooling, the gas

(A) changed into a colourless liquid (B).

(a) Identify the gases A and B

(b) Write equations for the reactions involved.

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4. A translucent white waxy solid (A) on heating in an inert atmosphere is converted to its allotropic form (B). The solid (A) on reaction with very dilute aqueous KOH liberates a highly poisonous gas (C) having rotten fish smell. With excess of chlorine, (A) forms (D) which hydrolyses to compound (E). Identify compounds (A) to (E).

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Competition Focus Jee Main And Advanced Medical Entrance Special I  
Multiple Choice Questions With One Correct Answer

1. Which is true regarding nitrogen ?

- A. Less electronegativity
- B. Has low ionisation enthalpy
- C. d-orbitals are available
- D. Ability to form  $p\pi - p\pi$  bonds with itself

**Answer: D**

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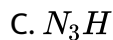
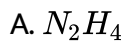
2. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen ?

- A.  $HNO_3, NO, NH_4Cl, N_2$
- B.  $HNO_3, NO, N_2, NH_4Cl$
- C.  $HNO_3, NH_4Cl, NO, N_2,$
- D.  $NO, HNO_3, NH_4Cl, N_2$

**Answer: B**

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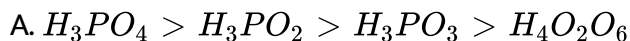
3. In which of the following compounds nitrogen exhibits highest oxidation state

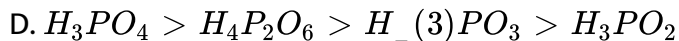
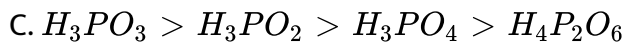
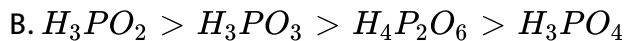


**Answer: C**

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4. The order of the oxidation state of the phosphorus atom in  $H_3PO_2$ ,  $H_3PO_4$ ,  $H_3PO_3$  and  $H_4P_2O_6$  is





**Answer: D**

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5. The following are some statements related to VA group hydrides.

I. Reducing property increases from  $NH_3$  to  $BiH_3$ .

II. Tendency to donate lone pair decreases from  $NH_3$  to  $BiH_3$ .

III. Thermal stability of hydrides decreases from  $NH_3$  to  $BiH_3$ .

IV. Bond angle of hydrides decreases from  $NH_3$  to  $BiH_3$ .

The correct statements are

A. I, II, III and IV

B. I, III and IV

C. I, II and IV



D. I and IV

**Answer: A**

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6. The molecule having smallest bond angle is

A.  $AsCl_3$

B.  $SbCl_3$

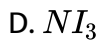
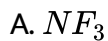
C.  $PCl_3$

D.  $NCl_3$

**Answer: B**

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7. Among the trihalides of nitrogen, which one is the least basic ?

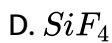
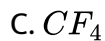
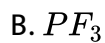
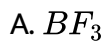


**Answer: A**



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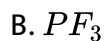
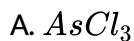
8. Which of the of the following fluoro -compouds is most likely to beahve as a Lewis base?



**Answer: B**

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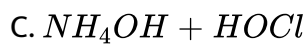
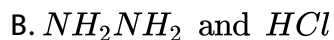
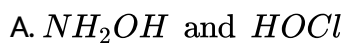
9. Which of the following is not hydrolysed



Answer: D

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10. The hydrolysis of  $NCl_3$  by  $H_2O$  produces



D.  $NH_2Cl$  and  $HOCl$

**Answer: C**

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11. Extra pure  $N_2$  can be obtained by heating

A.  $Ba(N_3)_2$

B.  $(NH_4)_2Cr_2O_7$

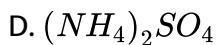
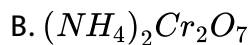
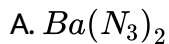
C.  $NH_4NO_2$

D.  $(NH_4)_2SO_4$

**Answer: D**

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12. The compound that does not produce nitrogen gas by the thermal decomposition is



**Answer: D**



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13. Very pure nitrogen can be obtained by :

A. thermal decomposition of ammonium dichromate

B. treating aqueous solution of  $NH_4Cl$  and  $NaNO_2$

C. liquefaction and fractional distillation of liquid air

D. thermal decomposition of sodium azide

**Answer: D**

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**14.** Thermal decomposition of ammonium dichromate gives

- A.  $N_2$ ,  $H_2O$  and  $Cr_2O_3$
- B.  $N_2$ ,  $NH_3$  and  $CrO$
- C.  $(NH_4)_2CrO_4$  and  $H_2O$
- D.  $N_2$ ,  $H_2O$  and  $CrO$

**Answer: A**

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**15.** The orange solid on heating gives a colourless gas and a green solid which can be reduced to metal by aluminium powder. The orange and the green solids are respectively

A.  $(NH_4)_2Cr_2O_7$  and  $Cr_2O_3$

B.  $Na_2Cr_2O_7$  and  $CrO_3$

C.  $K_4Cr_2O_7$  and  $CrO_3$

D.  $(NH_4)_2CrO_4$  and  $CrO_3$

**Answer: A**

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

A.  $NH_4NO_3$ ,  $N_2O$ ,  $H_2O$

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

C.  $CaO$ ,  $H_2O$ ,  $CaCl_2$

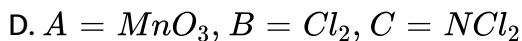
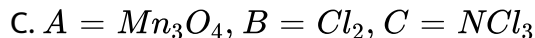
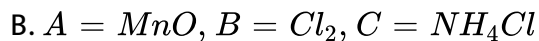
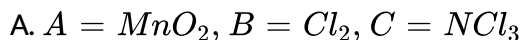
D.  $Ba(NO_3)_2$ ,  $H_2O$ ,  $NO_2$

**Answer: A**



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17. When a brown compound of Mn (A) is treated with HCl, it gives a gas (B). The gas (B) taken in excess reacts with  $NH_3$  to give an explosive compound (C). The compounds A, B and C are



**Answer: A**



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18. The gases produced in the reaction,  $Pb(NO_3)_2 \xrightarrow{\Delta}$  and  $NH_4NO_3 \xrightarrow{\Delta}$  are respectively

- A.  $N_2O$ ,  $NO$
- B.  $N_2O$ ,  $NO_2$
- C.  $NO$ ,  $NO_2$
- D.  $NO_2$ ,  $N_2O$

**Answer: D**

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19. The reaction between  $NH_2^-$  and  $N_2O$  gives

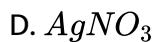
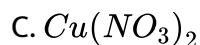
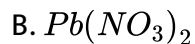
- A.  $NO$
- B.  $N_3^-$
- C.  $N_2O_5$
- D.  $NH_2NH_2$

**Answer: B**



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**20.** Nitrogen dioxide is not produced on heating



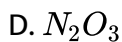
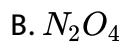
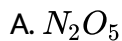
**Answer: A**



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**21.** A colourless gas  $X$  forms a brown coloured gas when mixed with air.

The gas  $X$  is



**Answer: C**

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**22. Which statement is wrong for NO ?**

A. It is anhydride of nitrous acid

B. Its dipole moment is 0.22 D

C. It forms dimer

D. It is paramagnetic

**Answer: A**

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23. Which of the following properties is not shown by  $NO$  ?

- A. Its bond order is 2.5
- B. It is diamagnetic in the gaseous state.
- C. It is a neutral oxide.
- D. It combines with oxygen to form nitrogen dioxide.

**Answer: B**



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24. A gaseous substance dissolve in water giving a pale blue solution which decolourises  $KMnO_4$  and oxidises  $KI$  to  $I_2$  in acidic medium :

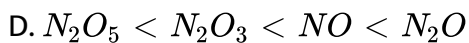
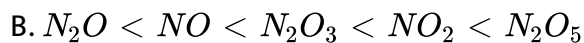
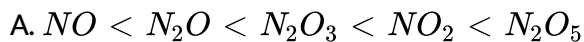
- A.  $N_2O_5$
- B.  $NH_3$
- C.  $N_2O_3$

D.  $HNO_3$

Answer: C

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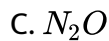
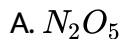
25. The correct order of the acidic nature of oxides is in the order



Answer: B

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26. Which oxide of nitrogen is not a common pollutant introduced into the atmosphere both due to natural and human activity?



**Answer: A**



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27. Nitric acid can be obtained from ammonia via the formation of intermediate compounds

A. nitric oxide and nitrogen dioxide

B. nitrogen and nitric oxide

C. nitric oxide and dinitrogen pentoxide

D. nitrogen and nitrous oxide

**Answer: A**



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**28.** Concentrated nitric acid upon long standing turns yellowish-brown due to the formation of :

A. NO

B.  $NO_2$

C.  $N_2O$

D.  $N_2O_4$

**Answer: B**



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29. The reaction of zinc with dilute and concentrated nitric acid, respectively, produce

A.  $N_2O$  and  $NO_2$

B.  $NO_2$  and  $NO$

C.  $NO$  and  $N_2O$

D.  $NO_2$  and  $N_2O$

**Answer: A**



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30. When copper is heated with conc.  $HNO_3$  it produces

A.  $Cu(NO_3)_2$ ,  $NO$  and  $NO_2$

B.  $Cu(NO_3)_2$  and  $N_2O$

C.  $Cu(NO_3)_2$  and  $NO_2$

D.  $Cu(NO_3)_2$  and  $NO$



**Answer: C**



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31. Which of the following metal Fe, Zn, Pb, Ag and Pt do not give a metal nitrate on treatment with concentrated  $HNO_3$ ?

A. Fe and Zn

B. Fe and Pt

C. Pb, Ag and Pt

D. Fe, Ag and Pt

**Answer: B**



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32. The brown ring test for nitrates depends on

- A. the reduction of nitrate to nitric oxide
- B. oxidation of nitric to nitrogen dioxide
- C. reduction of ferrous sulphate to iron
- D. oxidising action of sulphuric acid

**Answer: A**

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**33.** The oxidation number of Fe in brown ring  $[Fe(H_2O)_5NO]^{2+}$  is

- A. 0
- B. +1
- C. +2
- D. +3

**Answer: B**

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34.  $[Fe(H_2O)_5NO]^{2+}$  is a complex formed during the brown ring test for  $NO_3^-$  ion. In this complex.

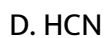
- A. there are there unpaired electrons so that its magnetic moment is 3.87 B.M.
- B. NO transfers its electron to  $Fe^{2+}$  so that iron exists as Fe (I) and NO as  $NO^+$
- C. the colour is because of charge transfer
- D. all of the above statements are correct

**Answer: D**

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35. Out of the following acids, the one which has the capability to form complex compound and also possesses oxidising and reducing properties

is



**Answer: B**



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**36.** Maximum number of covalent bonds formed by N and P are

A. 3,5

B. 3,6

C. 3,4,5

D. 3, 4, 6

**Answer: A**



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37. The percentage of p-character in the orbitals forming  $p - p$  bonds in

$P_4$  is

A. 25

B. 33

C. 50

D. 75

Answer: D

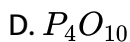


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38. Which one of the following forms vortex ring

A.  $P_2O_5$

B.  $PH_3$



**Answer: B**

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39. The reaction of white phosphorus with aqueous  $NaOH$  gives phosphine along with another phosphorus containing compound. The reaction type, the oxidation states of phosphorus in phosphine and the other product are respectively:

A. redox reaction , -3 and -5

B. redox reaction , +3 and +5

C. disproportionation reaction , -3 and -5

D. disproportionation reaction , -3 and +1

**Answer: D**

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40. The reaction of  $P_4$  with X leads selectively to  $P_4O_6$ . The X is :

- A. Dry  $O_2$
- B. A mixture of  $O_2$  and  $N_2$
- C. Moist  $O_2$
- D.  $O_2$  in the presence of aqueous NaOH

**Answer: B**



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41.  $P_4O_{10}$  is the anhydride of

- A.  $H_3PO_2$
- B.  $H_3PO_3$
- C.  $H_3PO_4$

D.  $H_4P_2O_7$

**Answer: C**



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**42.** How many bridging atoms are present in  $P_4O_{10}$  ?

A. 6

B. 4

C. 2

D. 5

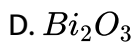
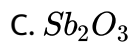
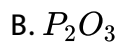
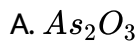
**Answer: A**



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**43.** Of the following compounds, the most acidic is





**Answer: B**

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**44.** Oxidation state of phosphorus in cyclotrimetaphosphoric acid is

A. +3

B. +5

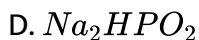
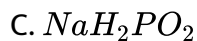
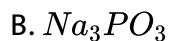
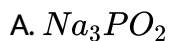
C. -3

D. +2

**Answer: B**

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45. The correct formula of salt formed by the neutraliation of hypophosphorous acid with NaOH is

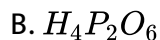
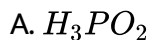


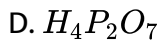
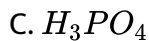
**Answer: C**



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46. The oxoacid of phosphorus that reduces silver nitrate into metallic silver is





**Answer: A**

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47. The pair in which phosphorus atoms have a formed oxidation state of +3 is

A. orthophosphorous acid and pyrophosphorous acids

B. pyrophosphorous acid and hypophosphoric acids

C. orthophosphorous and hypophosphoric acids

D. pyrophosphorus and pyrophosphoric acids

**Answer: A**

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48. Which is the correct statement for the given acids ?

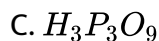
- A. Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid
- B. Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid
- C. Both are diprotic acids
- D. Both are triprotic acids

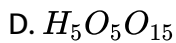
**Answer: A**



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49. Which of the following is a cyclic oxo acid ?

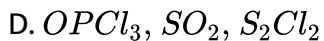
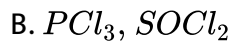
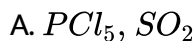




Answer: C

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50. Sulphuryl chloride ( $SO_2Cl_2$ ) reacts with white phosphorus ( $P_4$ ) to give \_\_\_\_\_.



Answer: A

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51.  $Cl - P - Cl$  bond angles in  $PCl_5$  molecule are

A.  $120^\circ$  and  $90^\circ$

B.  $60^\circ$  and  $90^\circ$

C.  $60^\circ$  and  $120^\circ$

D.  $120^\circ$  and  $30^\circ$

**Answer: A**



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52. The compound which has molecular nature in gas phase but ionic in solid state is

A.  $PCl_5$

B.  $CCl_4$

C.  $PCl_3$

D.  $POCl_3$

**Answer: A**



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**53.** What will be the resultant products formed when the phosphorus halide  $PBr_5$  splits up ?

- A.  $[PBr_4]^+$  and  $Br^-$
- B.  $[PBr_6]^-$  and  $[PBr_4]^+$
- C.  $[PBr_4]^+$
- D.  $[PBr_6]^-$

**Answer: A**



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**54.** Excess of  $PCl_5$  reacts with concentrated  $H_2SO_4$  giving :

- A. sulphuryl chloride
- B. sulphurous acid
- C. chlorosulphonic acid
- D. thionyl chloride

**Answer: A**

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**55.** Reaction of  $PCl_3$  and  $PhMgBr$  would give

- A. bromobenzene
- B. chlorobenzene
- C. triphenylphosphine
- D. dichlorobenzene

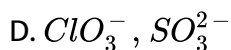
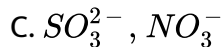
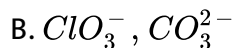
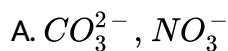
**Answer: C**

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Competition Focus Jee Main And Advanced Medical Entrance Special Ii  
Multiple Choice Questions With One Or More Than One Correct Answers

1. Which of the following pairs of ions are isoelectronic and also isostructural ?

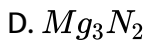
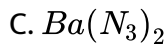
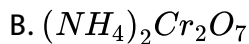


Answer: A:D



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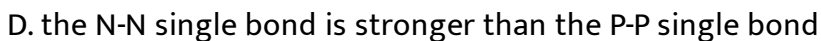
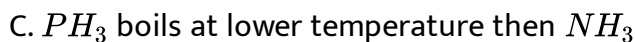
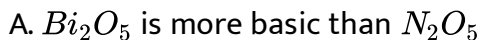
2. The compound (s) which generate (s)  $N_2$  upon thermal decomposition is (are) :



**Answer: B::C**

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3. Based on the compounds of group 15 elements, the correct statement (s) is (are)



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

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4. The nitrogen containing compound produced in the reaction of  $HNO_3$  with  $P_4O_{10}$

A. can be prepared by reaction of  $P_4$  and  $HNO_3$

B. is diamagnetic

C. contains N-N bond

D. reacts with Na-metal producing brown gas

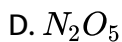
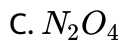
**Answer: B::D**

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5. The nitrogen oxide (s) that contains  $N - N$  bonds is/are

A.  $N_2O$

B.  $N_2O_3$

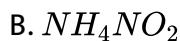


**Answer: A::B::C**



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6. A solution of colourless salt H on boiling with excess  $NaOH$  produces a non-flammable gas. The gas evolution ceases after sometime. Upon addition of Zn dust to the same solution, the gas evolution restarts. The colourless salt(s) H is (are)



**Answer: A::B**



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7. White phosphorus  $P_4$  has the following characteristics.

- A. 6 P-P single bond
- B. 4 P-P single bonds
- C. 4 lone pair of electrons
- D. P-P-P angle of  $60^\circ$

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



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8. Which of the following are correct statements ?

- A. Oxides of phosphorus,  $P_2O_3$  and  $P_2O_5$  exist as monomers
- B. Solid  $PCl_5$  exists as tetrahedral  $[PCl_4]^+$  and octahedral  $[PCl_6]^-$  ions

C. Solid  $PBr_5$  exists as  $[PBr_4]^+ Br^-$

D. Solid  $N_2O_5$  exists as  $NO_2^+ NO_3^-$

Answer: B::C::D



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Competition Focus Jee Main And Advanced Medical Entrance Special Iii  
Multiple Choice Questions Based On The Given Passage Comprehension

1. Upon heating  $KClO_3$  in presence of catalytic amount of  $MnO_2$ , a gas  $W$  is formed. Excess amount of  $W$  reacts with white phosphorus to give  $X$ . The reaction of  $X$  with pure  $HNO_3$  gives  $Y$  and  $Z$ .

$Y$  and  $Z$  are, respectively

A.  $N_2O_5$  and  $HPO_3$

B.  $N_2O_3$  and  $H_3PO_4$

C.  $N_2O_4$  and  $H_3PO_3$

D.  $N_2O_4$  and  $HPO_3$

**Answer: A**

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2. Upon heating  $KClO_3$  in presence of catalytic amount of  $MnO_2$ , a gas  $W$  is formed. Excess amount of  $W$  reacts with white phosphorus to give  $X$ . The reaction of  $X$  with pure  $HNO_3$  gives  $Y$  and  $Z$ .

W and X are, respectively

A.  $O_2$  and  $P_4O_6$

B.  $O_2$  and  $P_4O_{10}$

C.  $O_3$  and  $P_4O_6$

D.  $O_3$  and  $P_4O_{10}$

**Answer: B**

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# Competition Focus Jee Main And Advanced Medical Entrance Special Iv

## Matching Type Questions

1. Match the entries of column I with appropriate entries of column II and choose the correct option out of the four options (a), (b), (c) and (d) given at the end of each question.

Column I	Column II
(A) $PCl_5$	(p) Angular
(B) $IF_7$	(q) Pyramidal
(C) $H_3O^+$	(r) Trigonal bipyramidal
(D) $ClO_2$	(s) Pentagonal bipyramidal

A.  $A - r, B - s, C - q, D - p$

B.  $A - r, B - q, C - p, D - s$

C.  $A - p, B - s, C - q, D - r$

D.  $A - s, B - p, C - r, D - q$

**Answer: A**



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# Competition Focus Jee Main And Advanced Medical Entrance Special V

## Matrix Match Type Questions

1. Match the entries of column I with appropriate entries of column II.

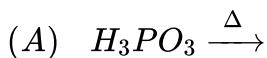
Each entry in column I may have one or more than one correct option

from column II. If the correct matches are A-p, s, B-r, C-p, q, D-s, then the

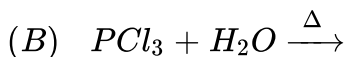
correctly bubbled  $4 \times 4$  matrix should be as follows :

Column I

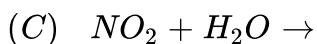
Column II



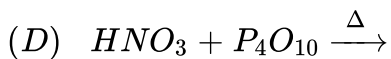
(p) One of the products acts as a reducing agent



(q) One of the products is a tribasic non-reducing acid



(r) Dehydration



(s) In one of the products, central atom has a coordination number of 6



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2. Match each of the reaction given in Column I with the corresponding

product(s) given in Column II.

Column I

Column II

- A. Cu+dil.  $\text{HNO}_3$       p. NO  
B. Cu+cons.  $\text{HNO}_3$     q.  $\text{NO}_2$   
C. Zn+dil. $\text{HNO}_3$         r.  $\text{N}_2\text{O}$   
D. Zn+cons  $\text{HNO}_3$      s.  $\text{Cu}(\text{NO}_3)_2$   
   t.  $\text{Zn}(\text{NO}_3)_2$

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## Competition Focus Jee Main And Advanced Medical Entrance Special Vi Integer Type Questions

1. Maximum number of oxidation states which nitrogen can show in its compound is ....

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2. The total number of lone pair of electrons in  $\text{N}_2\text{O}_3$  is

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3. Amongst the following the metals which become passive when dipped in conc.  $HNO_3$  are Sn, Pb, Fe, Cr, Zn, Ni, Hg, Al, Cu.

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4. What is the basicity of hypophosphorous acid ?

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5. X is a pale yellow solid. It hydrolyses to  $POCl_3$  in moist air and finally gets converted into phosphoric acid. Z exists as an ionic solid. The total number of atoms present in its cation is.

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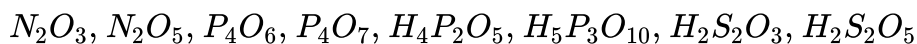
6. Among the following, the number of compounds that can react with  $PCl_5$  to give  $POCl_3$  is  $O_2, CO_2, SO_2, H_2O, H_2SO_4, P_4O_{10}$ .





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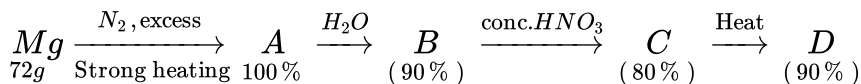
7. The total number of compounds having at least one bridging oxo group among the molecules given below is \_\_\_\_.



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### Competition Focus Jee Main And Advanced Medical Entrance Special Vii Numerical Value Type Questions In Decimal Notation

1. In the following sequence of reactions, the amount of D (in g) formed from 72 g of Mg is..... (The yield (%) corresponding to the product in each step is given in the parenthesis)



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1. Statement -1 : Although  $NaH_2PO_2$  contains two H-atoms, it is not an acid salt.

Statement -2 : It contains two ionisable hydrogens.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True , Statement-2 is not a correct explanation for Statement-1.

C. Statement-1. is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: C**



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2. Assertion. Nitrogen and oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.

Reason. The reaction between nitrogen and oxygen requires high temperature.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: A**



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3. Assertion. Nitrogen is less reactive than molecular oxygen.

Reason. The bond length of  $N_2$  is shorter than that of oxygen.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: B**

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4. Assertion.  $HNO_3$  renders iron passive.

Reason. Iron reacts with  $HNO_3$  to form ferric nitrate.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: C**



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5. Assertion. When NO reacts with  $FeSO_4$ , a brown coloured complex is formed.

Reason. In the complex, the coordination number of Fe is + 6.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.



B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: B**

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6. Assertion  $NF_3$  is weaker ligands than  $N(CH_3)_3$

Reason  $NF_3$  ionises to give  $F^\ominus$  ions in aqueous solution .

A. If both assertion and reason are true, and is the correct explanation of the assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: C**

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7. Assertion: On cooling, the brown colour of nitrogen dioxide disappears.

Reason: On cooling,  $NO_2$  undergoes dimerisation resulting in the pairing of the odd electron in  $NO_2$ .

A. If both assertion and reason are true, and is the correct explanation of the assertion.

B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.

C. If assertion is true, but reason is false.

D. If both assertion and reason are false

**Answer: A**



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8. Assertion :  $P_4$  is more reactive than  $N_2$

Reason: P-P single bond in  $P_4$  is much weaker than  $N \equiv N$  triple bond in  $N_2$

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

Answer: A



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9. Assertion (A) Elementary phosphorus exists in three principal allotropic forms , ie .white (or yellow),red (or violet ) and black.

Reason (R ) Of the three forms, white phosphorus is the most important and most reactive.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: B**



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10. Assertion :  $H_3PO_3$  is a dibasic acid.

Reason: There are two H atoms directly attached to P.

- A. If both assertion and reason are true, and is the correct explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- C. If assertion is true, but reason is false.
- D. If both assertion and reason are false

**Answer: C**



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