



CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

VA GROUP ELEMENTS

PROBLEMS

1. Nitrogen is chemically inert. Why?



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2. The tendency to exhibit -3 oxidation state by a group VA element decreases down. Why?

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3. Write the following for a white phosphorus molecule:
(a) oxidation state of P, (b) valency of P, (c) total number of bonds and (d) bond order.

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4. White phosphorus is very reactive, but not the red one. Why?



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5. Nitrogen forms a simple diatomic molecule but other elements of same group do not form. Explain.



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6. Maximum covalency of nitrogen is four. Explain.



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7. What happens when barium azide is heated ?



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8. Phosphorus can expand its valency. Why?



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9. Both PH_3 and NH_3 are Lewis bases, but basic strength of PH_3 is less than that of NH_3 . Explain.



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10. What is the covalency of 'N' in nitrogen pentoxide ?



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11. Both NO and NO_2 have odd number of electrons.

NO is colourless, but NO_2 is coloured. Why?



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12. The magnetic properties of NO_2 and N_2O_4 are different. Why?



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13. PCl_5 is less stable. Why?



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14. PCl_3 is covalent. It fumes in moisture and its aqueous solution is electrical conductor. Why?



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15. What happens when phosphine is absorbed in mercuric chloride solution ?



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16. Pentahalides of phosphorus are known, but not pentahydride. Why?



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17. Mention to which oxyacids N_2O , N_2O_4 and N_2O_5 are anhydrides?

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18. What is the basicity of orthophosphoric acid ? Write the types of salts formed by it.

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19. Based on the structures how is the reduction ability of H_3PO_2 or H_3PO_3 accounted for?

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20. How is tautomerism different from resonance ?



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21. Ammonia cannot be dried over anhydrous calcium chloride. Why?

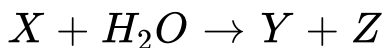
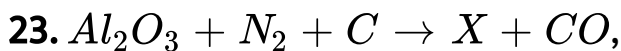


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22. Coal is a potential source for ammonia. Comment.



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'Y' is an amphoteric substance. When aqueous 'Z' is treated with $AlCl_3$ solution again 'Y' is formed. What are X, Y and Z?



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24. What is aqua-regia ? How it works to dissolve noble metals ?



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1. Discuss the general characteristics of nitrogen family and justify their position in the same group.



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SUBJECTIVE EXERCISE - 1(Short answer questions)

1. Discuss on the electronic configuration of elements of group 15.



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2. Mention the occurrence of nitrogen and phosphorus in the earth's crust.

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3. Write the trends in atomic radius, metallic nature and ionisation potential of group VA elements.

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4. Mention the oxidation numbers exhibited by nitrogen. Give an example for each.

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5. Write on the allotropy of group VA elements.



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6. Define catenation. How it vary it nitrogen family.



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SUBJECTIVE EXERCISE - 1(Very short answer questions)

1. Write the names and the atomic number of VA group elements



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2. Give the electronic configurations of phosphorus and Arsenic.



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3. Write the composition of "Phosphate rock".



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4. Write all the oxidation states of nitrogen.



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5. Give any two examples to show the negative oxidation state of nitrogen.



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6. Give reasons for the chemical inactivity of nitrogen at ordinary conditions.



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SUBJECTIVE EXERCISE - 2(Long answer questions)

1. Write about the general characteristics of hydrides of VA group elements.



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2. Discuss the structures of oxides of nitrogen.



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SUBJECTIVE EXERCISE - 2(Short answer questions)

1. Discuss the basic strength and stability of hydrides of group VA.

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2. Write different oxides of nitrogen. Mention the oxidation states of nitrogen in these oxides.

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3. Write the structures of the oxides :
 N_2O_3 , N_2O_5 , P_4O_6 and P_4O_{10} .

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4. Write the hydrolysis reactions of the halides :

NCl_3 , PCl_3 , PCl_5 , P_4O_6 and P_4O_{10}



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SUBJECTIVE EXERCISE - 2(Very short answer questions)

1. What is the stability order of the VA group hydrides ?

Explain the gradation in the reducing property of these hydrides.



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2. Which of the two oxides N_2O_5 and P_2O_5 is a better dehydrating agent. Give an example for the same reaction.



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3. Why is 'NO' paramagnetic in nature ? When does it become diamagnetic ?



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4. How is dinitrogen tetroxide formed ? Give equation.



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5. A colour less oxide of nitrogen in air becomes brown.

Why?



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6. How many oxygens surround a phosphorous is phosphorous pentoxide ?



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7. Write the equation for the hydrolysis of NCI_2 . How does it differ from the hydrolysis of PCI_5 ?





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8. What are the orbitals of P that are involved in the formation of PCl_5 ?



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9. Can NI_5 be prepared by direct union of the elements ? Why ? or Why not?



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10. Which oxides of nitrogen are neutral oxides ?



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SUBJECTIVE EXERCISE - 3(Long answer questions)

1. Write an essay on the structural aspects of phosphorous series of acids.



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SUBJECTIVE EXERCISE - 3(Short answer questions)

1. Write on the structural aspects of $(HPO_3)_3$ and (HPO_3) .



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2. Mention the oxyacids of phosphorus and the oxidation states of phosphorus in them.



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3. Write the different types of salts formed by orthophosphoric acid.



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4. Which of the acids of phosphorous does not show monomeric state but cyclic structure ?



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5. Write the structure of HNO_3 .



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6. How do you prepare hypophosphorous acid in the laboratory?



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SUBJECTIVE EXERCISE - 4 (Long answer questions)

1. Describe the manufacture of NH_3 by Haber's method. Give a labelled diagram.



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2. Discuss the principle of preparing nitric acid in Ostwald's process. Give the necessary equations.



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3. Write the important uses of (a) ammonia and (b) nitric acid.



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SUBJECTIVE EXERCISE - 4 (Short answer questions)

1. Write on the conditions of Haber's ammonia synthesis.



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2. A colourless crystalline chloride, when warmed with solid NaOH, gave ammonia gas. Identify the salt.



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3. Nitric acid can not be concentrated beyond 68 % by direct distillation ? Why?



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4. How is ammonia useful in qualitative analysis ?



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5. Suggest the action of HNO_3 on non-metals.



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6. What is brown ring test ?



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SUBJECTIVE EXERCISE - 4 (Very short answer questions)

1. P_2O_5 is strong dehydrating agent. Why is it not used to dry NH_3 ?



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2. What are the experimental conditions used to manufacture synthetic NH_3 ?

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3. What drying agent is suitable to dry NH_3 ?

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4. How do you convert NH_4NO_3 into NH_3 ? Give equation(s).

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5. How ammonia dissolve a zinc salt ?

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6. Write two examples of metals reacting with nitric acid



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7. Write the composition of aqua-regia.



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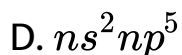
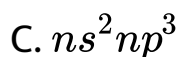
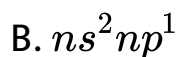
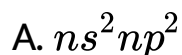
8. Aluminium is passive to concentrated nitric acid.
Why?



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OBJECTIVE EXERCISE - 1 (GENERAL)

1. The valence shell electronic configuration of VA group elements is :

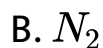


Answer: C



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2. The most abundant element in the earth's atmosphere is



Answer: B



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LIST - 1

A) Phosphorite

B) Indian salt petre

3. C) Fluoroapatite

D) Chile salt petre

LIST - 2

1) KNO_3 2) $Ba(NO_3)_2$ 3) $NaNO_3$ 4) $3Ca_3Ca(PO_4)_2 \cdot CaF_2$ 5) $Ca_3(PO_4)_2$

The correct match is

A.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	2	3	5

B.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
2	4	3	1

C.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
4	3	5	2

D.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
5	1	4	3

Answer: D



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4. The most abundant VA group element in the earth's crust is

- A. Nitrogen
- B. Phosphorous
- C. Arsenic
- D. Bismuth

Answer: B



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5. The following can exist as a diatomic molecule

A. N

B. P

C. As

D. Bi

Answer: A



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6. The following VA group element occurs even in free state

A. Bi

B. As

C. Sb

D. N

Answer: D



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7. The VA group element having more number of allotropes is

A. N

B. P

C. Bi

D. Sb

Answer: B



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8. The following element doesn't have allotropes

A. N

B. P

C. As

D. S

Answer: A



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9. Most reactive allotropic form of Phosphorous is

A. Yellow

B. Red

C. Black

D. Scarlet

Answer: A



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10. In nitrogen molecule, the two atoms of nitrogen are joined by

- A. One sigma bond and one pi bond
- B. Two sigma bonds and one pi bond
- C. One sigma bond and two pi bonds
- D. Three sigma bonds

Answer: C



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11. The chemical inertness of nitrogen is due to

- A. half-filled '2p' orbitals of Nitrogen
- B. high bond dissociation energy
- C. completely filled d-orbitals

D. its gaseous nature

Answer: B



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12. The maximum covalency of nitrogen is

A. 2

B. 3

C. 4

D. 5

Answer: C



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13. The VA group element which exhibits wide range of oxidation states is

A. P

B. As

C. Bi

D. N

Answer: D



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14. The oxidation state of nitrogen in hydrazine is

A. -1

B. -2

C. $+1$

D. $+2$

Answer: B



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15. The stable oxidation state of Bismuth is

A. $+1$

B. + 5

C. - 3

D. + 3

Answer: D



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- 16.
- | Substance | Oxidation state of N |
|---------------|----------------------|
| A) HNO_3 | 1) - 3, + 5 |
| B) NH_4NO_3 | 2) - 1 / 3 |
| C) N_3H | 3) + 5 |
| D) H_3PO_3 | d) + 3 |
| | 5) + 1 / 3 |

The correct match is

A.

A	B	C	D
3	1	2	4

- B.

A	B	C	D
5	2	3	4
- C.

A	B	C	D
1	2	3	4
- D.

A	B	C	D
4	3	2	5

Answer: A



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17. The atomicity of white Phosphorous is 'x' and the $P - \hat{P} - P$ bond angle in the molecule is 'y'. What are 'x' and 'y' ?

A. $x = 4, y = 90^\circ$

B. $x = 4, y = 60^\circ$

C. $x = 3, y = 120^\circ$

D. $x = 2, y = 180^\circ$

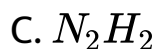
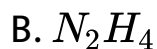
Answer: B



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OBJECTIVE EXERCISE - 1 (HYDRIDES)

1. Acidic hydride of nitrogen is



D. N_3H

Answer: D



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2. In Ostwald's process, nitric oxide is prepared by the oxidation of

A. NH_3

B. N_2

C. Air

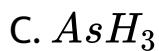
D. Nitrogen oxide

Answer: A



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3. Thermally more stable hydride is

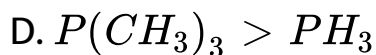
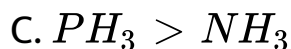
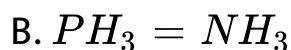
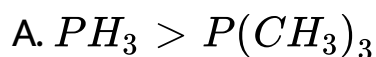


Answer: A



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4. Which one of the following statements is correct with respect to basic character ?

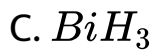


Answer: D



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5. The hydride with more basic nature is

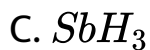


Answer: B



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6. A stronger reducing agent is



D. BiH_3

Answer: D



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7. The shape and bond angle of ammonia are

A. Tetrahedral and $109^\circ 28'$

B. Tetrahedral and $107^\circ 48'$

C. Pyramidal and $107^\circ 18'$

D. Pyramidal and $109^\circ 28'$

Answer: C



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8. More volatile hydride is



Answer: A



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9. VA group hydrides are Lewis bases due to the presence of

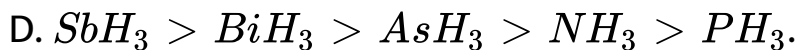
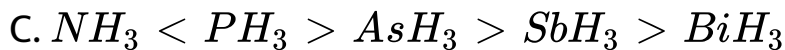
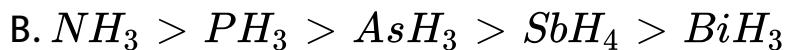
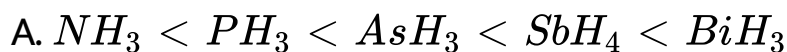
- A. unpaired electrons
- B. high electron affinity values
- C. low electronegativity
- D. lone pair of electrons

Answer: D



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10. The correct order of reducing abilities of VA group hydrides is

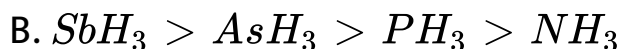
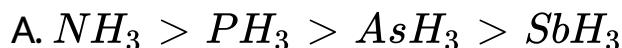


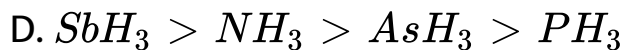
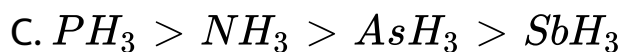
Answer: A



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11. Which is in the decreasing order of boiling points of hydrides?





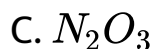
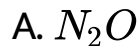
Answer: D



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OBJECTIVE EXERCISE - 1 (OXIDES)

1. Chemical formula of laughing gas is



D. N_2O_5

Answer: A



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2. Ammonium nitrate on heating gives

A. NO

B. N_2

C. N_2O

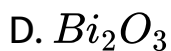
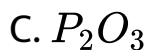
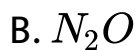
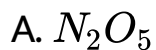
D. N_2O_4

Answer: C



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3. Which of the following exists as dimer

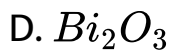
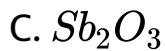
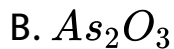
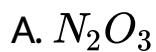


Answer: C



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4. The basic oxide among the following is

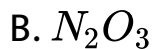
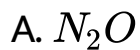


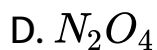
Answer: D



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5. Paramagnetic oxide is



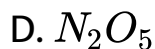
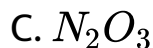


Answer: C



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6. The oxide of nitrogen existing in the solid state at room temperature is



Answer: D



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7. The neutral oxide of nitrogen is

A. NO

B. N_2O

C. NO_2

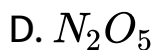
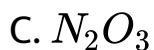
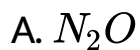
D. Both 1 and 2

Answer: D



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8. The sesquioxide of nitrogen is



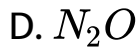
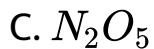
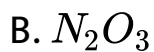
Answer: C



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9. Which is a mixed anhydride?



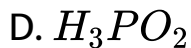
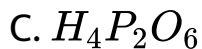
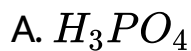


Answer: A



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10. Formula of metaphosphoric acid is



Answer: B



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11. Which one of the following elements does not form the compound M_4O_{10} . (M = element of group VA)?

A. P

B. Sb

C. As

D. Bi

Answer: D



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12. The number of Oxygen atoms present around Nitrogen in N_2O_5 is

A. 2

B. 1

C. 3

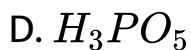
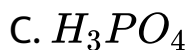
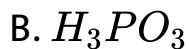
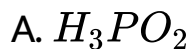
D. 4

Answer: C



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13. P_4O_6 is the anhydride of the following

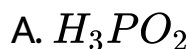


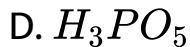
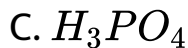
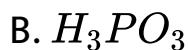
Answer: B



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14. P_4O_{10} is the anhydride of the following





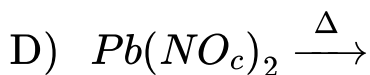
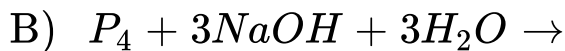
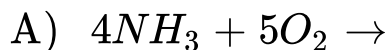
Answer: C



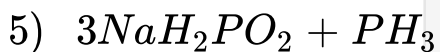
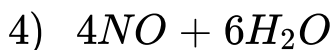
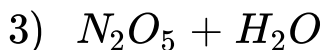
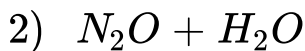
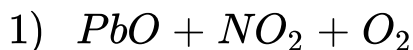
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15.

LIST - 1



LIST - 2



The correct match is

- A.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
4	2	3	1
- B.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	3	2	5
- C.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
4	5	2	1
- D.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
3	4	1	5

Answer: C



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OBJECTIVE EXERCISE - 1 (HALIDES)

1. Which does not form a Pentahalide?

A. P

B. As

C. Sb

D. N

Answer: D



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2. PCl_3 on hydrolysis gives

A. H_3PO_2

B. H_3PO_3

C. HCl

D. Both (2) and (3)

Answer: D



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3. The shape and hybridisation of PCl_3 molecule

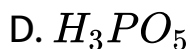
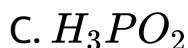
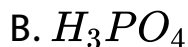
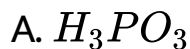
- A. Tetrahedral and sp^3
- B. Pyramidal and sp^3
- C. Angular and sp^3
- D. Planar trigonal and sp^3

Answer: B



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4. PCI_5 on hydrolysis gives

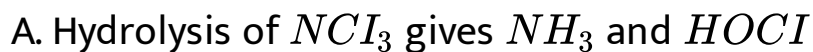


Answer: B



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5. Which of the following is not correct?



B. NH_3 is less stable than PH_3

C. NH_3 is a weak reducing agent compared to PH_3

D. Nitric oxide in solid state exhibits dia magnetic property

Oxyacids

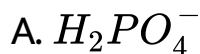
Answer: B



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OBJECTIVE EXERCISE - 1 (OXYACIDS)

1. The existence of following ions have no evidence



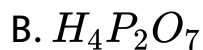
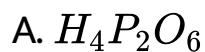


Answer: C



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2. Salt of the following is used as a water softner



Answer: C



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3. Covalency of phosphorus in peroxy phosphoric acid is

A. 6

B. 5

C. 4

D. 3

Answer: B



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4. Basicity of orthophosphoric acid is

A. 2

B. 3

C. 4

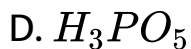
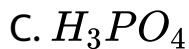
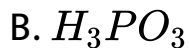
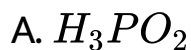
D. 5

Answer: B



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5. A tribasic acid with peroxy bond is



Answer: D



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6. The starting material used for the manufacture of HNO_3 by Ostwald process is



C. Air only

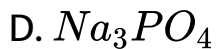
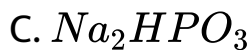
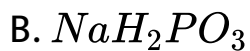
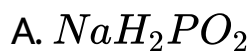
D. Ammonia and nitrogen

Answer: B



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7. Among the following an acidic salt is

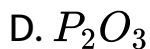
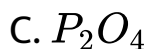
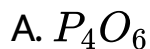


Answer: B



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8. Anhydride of pyrophosphoric acid is

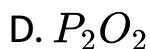
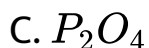
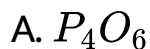


Answer: B



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9. Anhydride of orthophosphoric acid is



Answer: B



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10. Oxidation state of phosphorus is least in



B. Hypophosphorus acid

C. Metaphosphoric acid

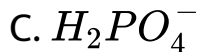
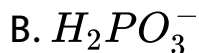
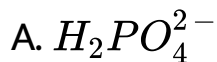
D. Pyrophosphoric acid

Answer: B



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11. The following is a primary phosphate ion



Answer: C



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12. $P - P$ linkage is present in

- A. Pyrophosphoric acid
- B. Hypophosphoric acid
- C. Peroxy phosphoric acid
- D. Metaphosphoric acid

Answer: B



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OBJECTIVE EXERCISE - 1 (AMMONIA)

1. In the preparation of HNO_3 by Ostwald process ammonia is

- A. reduced
- B. oxidised
- C. reduced and oxidised
- D. hydrolysed

Answer: B



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2. NH_4Cl on heating with NaOH liberates

A. $NaCl$

B. NH_3

C. HCl

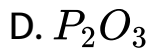
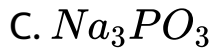
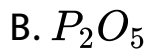
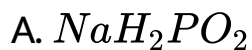
D. $NaOCl$

Answer: B



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3. Aqueous NaOH reacts with white Phosphorous to form Phosphine and



Answer: A



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4. Ammonia gas is dried over

A. Quick lime

B. Conc H_2SO_4

C. P_2O_5

D. CaCl_2

Answer: A



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5. The catalyst used in the manufacture of ammonia by Haber's process is

A. V_2O_5

B. Fe

C. Ni

D. Co

Answer: B



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6. Which of the following compound is not used as fertilizer

A. Ammonium sulphate

B. Urea

C. Calcium super phosphate

D. $Ca_3(PO_4)_2$

Answer: D



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7. Which of the following can serve as a solvent for both ionic and covalent compounds?

A. Liquid ammonia

B. H_2O

C. Benzene

D. CCl_4

Answer: A



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8. Which of the following is used as refrigerant

A. Liquid NH_3

B. C_2H_5Cl

C. CCl_2F_2

D. All

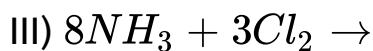
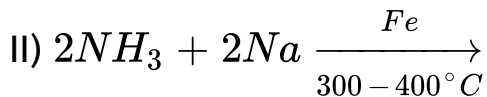
Answer: D



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9. Which of the following reactions yield elementary gases like N_2 , H_2 , O_2 as the byproducts ?

1) $CaO + NH_3 \rightarrow$



A. I and II only

B. II, III and IV only

C. I, II and III only

D. All of these

Answer: D



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OBJECTIVE EXERCISE - 1 (NITRIC ACID)

1. Catalyst in the Ostwald's process is

A. Pt

B. Fe

C. V_2O_5

D. Ni

Answer: A



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2. Moles of oxygen that can oxidise on mole of NH_3 to
 NO

A. 1

B. 1.25

C. 2.5

D. 5

Answer: B



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3. Which of the following is used in pyro-techniques

A. NH_3

B. HNO_3

C. PH_3

D. H_3PO_4

Answer: B



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4. Percentage of nitric acid obtained in Ostwald's process is

A. 61 %

B. 68 %

C. 74 %

D. 82 %

Answer: B



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5. (A) : P_4 is more reactive than N_2 .

(R) : $P - P$ bonds are relatively weaker than $N \equiv N$

A. Both A & R are true, R is the correct explanation

of A

B. Both A & R are true, R is not correct explanation

of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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6. (A): Nitrogen can form pentahalides

(R): Nitrogen does not possess vacant d-orbitals in the valance shell

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D



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7. (A): H_3PO_3 and H_3PO_4 are tribasic acids

(R) : H_3PO_3 has two replaceable H-atoms and H_3PO_4 has three replaceable H-atoms

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D



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8. (A): NH_3 is a liquid while the other hydrides of V-A

Group elements are gases at room temp.

(R) : NH_3 possess inter molecular hydrogen bonds in liquid state

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D



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9. (A): Thermal stability of VA group hydrides decreases from NH_3 to BiH_3

(R): The dissociation energy of M - H bond! increases down the group regularly

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: C



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10. (A): HNO_3 is a stronger acid than HNO_2 .

(R): There are two nitrogen-oxygen bonds in HNO_3 ,

whereas in HNO_2 there is only one such bond.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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11. (A): NO_3^- and CO_3^{2-} ions are isoelectronic.

(R): Nitrate ion is planar

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B



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12. (A): NO_3^- ion is light bluish in colour.

(R): NO_3^- ion is stabilised by resonance.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: D



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13. (A): PF_5 and IF_5 have similar shapes

(R): PF_5 has two types of $P - F$ bond lengths.

A. Both A & R are true, R is the correct explanation

of A

B. Both A & R are true, R is not correct explanation

of A

C. A is true, R is false

D. A is false, R is true

Answer: D



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14. (A): Nitrous oxide is called laughing gas.

(R): Nitrous oxide is a linear molecule.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B



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15. (A): Nitrogen is unable to show a valency more than three.

(R): Nitrogen does not have vacant d-orbitals in its valence shell.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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16. (A): Central atom usually forms three single and one double bonds in an oxyacid of phosphorus

(R): Phosphorus atom usually undergoes sp^3 hybridisation in its oxyacids

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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17. (A): Phosphorus is more reactive element of Group VA

(R): $N \equiv N$ bond is relatively stronger.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B



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18. (A): Orthophosphoric acid can form two acidic salts and one normal salt

(R): Orthophosphoric acid is a tribasic acid

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: A



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19. (A) : PF_5 , PCl_5 and PBr_3 are known, the pentahalides of nitrogen have not been observed

(R) Phosphorous has lower electronegativity than nitrogen.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: B



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20. (A) : Nitrogen has higher ionization energy than that of oxygen.

(R) : Nitrogen atom has smaller atomic size than that of oxygen.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: C



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OBJECTIVE EXERCISE - 2 (GENERAL)

1. Which of the following elements is most metallic ?

A. P

B. As

C. Sb

D. Bi

Answer: D



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2. The shape and bond angle of white Phosphorous molecules is

- A. Linear and 180°
- B. Trigonal planar and 120°
- C. Tetrahedral and $109^\circ 28^1$
- D. Tetrahedral and 60°

Answer: D



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3. The elements present in Fluorapatite are

- A. Ca, N & O only
- B. Ca & P only
- C. Ca, P, F, O

D. Ca, N, O, F

Answer: C



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4. In the statements regarding P_4 molecule

I) The oxidation state is zero

II) The covalency is 4

III) The $P - \hat{P}$ bond angle 60°

The correct combination is

A. Only III is correct

B. I & III are correct

C. All are correct

D. I and II are correct

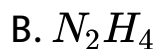
Answer: B



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OBJECTIVE EXERCISE - 2 (HYDRIDES)

1. Most basic among the following



D. P_2H_4

Answer: A



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2. NH_3 has a much higher boiling point than PH_3 because

A. NH_3 has a larger molecular weight

B. NH_3 undergoes umbrella inversion

C. NH_3 forms hydrogen bond

D. NH_3 contains ionic bonds whereas PH_3 contains covalent bonds

Answer: C



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3. The bond energies (in KJ mole^{-1}) of $P - H$, $As - H$ and $N - H$ respectively ?

A. 247, 318 and 389

B. 247, 389 and 318

C. 318, 389 and 247

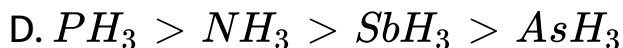
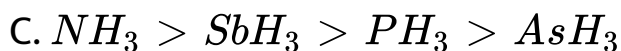
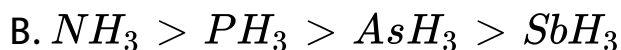
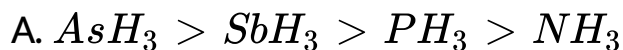
D. 318, 247 and 389

Answer: D



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4. What is the order of basic nature of hydrides of VA group elements?



Answer: C



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5. White phosphorous reacts with caustic soda to give phosphine and sodium hypophosphite. In this reaction phosphorous undergoes

A. Oxidation

B. Reduction

C. Both

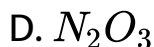
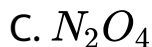
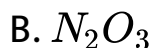
D. None of these

Answer: C



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



Answer: B



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2. Of the following, which has three electron bond in its structure ?

- A. Nitrous oxide
- B. Nitric oxide
- C. Dinitrogen trioxide
- D. Nitrogen pentoxide

Answer: B



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3. The number of oxygen atoms bonded to one phosphorous atom in P_4O_{10} is

- A. 4
- B. 3

C. 6

D. 5

Answer: A



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4. The arrangement of oxygen atoms around each phosphorous in P_4O_{10}

A. Pyramidal

B. Octahedral

C. Tetrahedral

D. Square planar

Answer: C



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5. When NH_4NO_3 is gently heated, an oxide of Nitrogen is formed. What is the oxidation state of Nitrogen in this oxide ?

A. +4

B. +2

C. +3

D. +1

Answer: D



6. The following are some statements about oxides of VA group elements

I) N_2O molecule is linear

II) NO_2 molecule is angular

III) N_2O_5 molecule is angular

The correct combination is

A. All are correct

B. I & III are correct

C. II & III are correct

D. I & II are correct

Answer: D



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OBJECTIVE EXERCISE - 2 (HALIDES)

1. Bismuth forms the only pentahalide with the halogen

A. bromine

B. fluorine

C. Chlorine

D. iodine

Answer: B



LIST - 1

LIST - 2

2. A) NH_3 1) sp^3d , trigonal bipyramidal
B) N_2O_3 2) sp^3 , tetrahedral
C) PCl_5 3) sp , linear
D) NH_4^+ 4) sp^3 , pyramidal
5) anhydride of nitrous acid

The correct match is

A.

A	B	C	D
1	4	3	2

B.

A	B	C	D
1	2	3	4

C.

A	B	C	D
4	5	1	2

D.

A	B	C	D
2	5	3	1

Answer: C



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OBJECTIVE EXERCISE - 2 (OXYACIDS)

1. Nitration mixture is used to generate



Answer: C



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2. Two oxides of Nitrogen, NO and NO_2 , react together at 253K and form a compound of Nitrogen, 'x'. 'x' reacts with water to yield another compound of Nitrogen, 'y'. The shape of the anion of 'y' molecule is

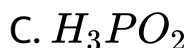
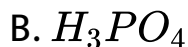
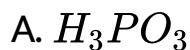
- A. Tetrahedral
- B. Angular
- C. Square planar
- D. Pyramidal

Answer: B



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3. Oxidation state of +1 for phosphorous is found in



Answer: C



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4. The number of hydroxyl groups in pyrophosphoric acid is

A. 3

B. 4

C. 5

D. 7

Answer: B



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5. H_3PO_2 is the formula for one of the phosphorus acids. Its name and basicity are respectively

A. phosphorous acid and two

B. hypophosphorous acid and two

C. hypophosphorous acid and one

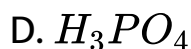
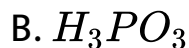
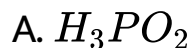
D. hypophosphoric acid and two

Answer: C



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6. The acid that forms primary, secondary and tertiary phosphates is

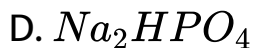
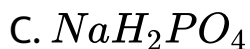
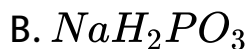


Answer: D



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7. Which of the following is not an acidic salt?



Answer: A



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8. The reducing strength of oxyacid of the Phosphorous depends on

- A. The number of H - atoms directly attached to P
- B. The number of H-atom attached to oxygen atom
- C. The number of O - atoms attached to P-atoms
- D. The number of P-atoms

Answer: A



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9. Regarding H_3PO_5 the wrong statement is

- A. It's basicity is three
- B. Oxidation state P in it is $+5$
- C. It contains $O - O$ linkage
- D. It can form a dimer

Answer: D



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10. The statements regarding oxyacids of phosphorous are

- i) HPO_3 molecule is monobasic acid
- ii) $H_4P_2O_6$ molecule has $P - P$ bond

iii) $H_4P_2O_7$ molecule has $P - O - P$ linkage

The correct combination is

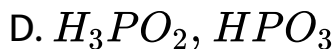
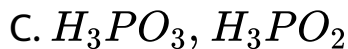
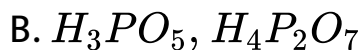
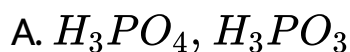
- A. All are correct
- B. Only ii is correct
- C. ii & iii are correct
- D. i & ii are correct

Answer: A



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11. Which pair of oxyacids of phosphorous et contain ' $P - H$ ' bonds?



Answer: C



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OBJECTIVE EXERCISE - 2 (AMMONIA AND NITRIC ACID)

1. In the Haber's process nitrogen chemically combines with

A. Oxygen

B. Iron

C. Ammonia

D. Hydrogen

Answer: D



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2. Conditions for the formation of NH_3 in Haber's process are

A. High temperature, low pressure

B. Optimum temperature, high pressure

C. High temperature, high pressure

D. Optimum temperature, low pressure

Answer: B

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3. Conc. HNO_3 is treated with iron. The metal is passive because

A. It is a transition metal

B. It forms protective oxide film

C. It is reduced

D. It liberates laughing gas

Answer: B



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4.



In this reaction one mole of HNO_3 is reduced by

A. 26 g Zn

B. 64 g Zn

C. 128 g Zn

D. 256 g Zn

Answer: D



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5. $[Ca \odot Ca(NO_3)_2]$ is the chemical composition of the substance, commonly used as

- A. fertiliser
- B. explosive
- C. perfume
- D. medicine

Answer: A



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PRACTICE EXERCISE

1. Which of the following reacts rapidly with oxygen in the air at ordinary temperature?

A. White P

B. Red P

C. N_2

D. N_2O

Answer: A



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2. The p-p bond energy is 'x' KJ/mole. Then the energy needed for the dissociation of 124 g of white phosphorous is

A. x KJ

B. 4x KJ

C. 6x KJ

D. 8x KJ

Answer: C



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3. Nitrogen differs from other elements among the VA group, due to

- A. Small atomic size
- B. High electronegativity
- C. Absence of 'd' orbitals
- D. All of these

Answer: D



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4. The following are some statements about VA group elements

I) All elements exhibits allotropy

II) Boiling points decrease down the group

III) They contain five electrons in their valency shell

The correct combination is

A. All are correct

B. Only III is correct

C. I & II are correct

D. II & III are correct

Answer: B



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5. With reference to protonic acids, which of the following statements is correct?

- A. PH_3 is more basic than NH_3
- B. PH_3 is less basic than NH_3
- C. PH_3 is equally basic as NH_2
- D. PH_3 is amphoteric while NH_3 is basic

Answer: B



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6. The statements regarding N_2 molecule are

- I) The Bond energy is 945.4 KJ/mole

II) It has triple bond

III) It contains 2σ and 1π bond The correct combination is

A. Only II is correct

B. I & II are correct

C. II and I are correct

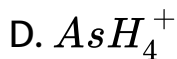
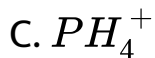
D. All are correct

Answer: B



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7. Which of the following is least stable?



Answer: B



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8. The decreasing values of bond angles from NH_3 to SbH_3 down the group 15 of the periodic table is due to

A. increasing bp-bp repulsion

B. increasing p-orbital character in sp^3

C. decreasing lp-bp repulsion

D. decreasing electronegativity of central atom

Answer: D



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9. One mole of calcium phosphide on reaction with excess of water gives

A. one mole of phosphine

B. two moles of phosphoric acid

C. two moles of phosphine

D. one mole of phosphorus pentoxide

Answer: C



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10. 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 : Ease of replacing H with Cl decreases from NH_3 to BiH_3

IV : Ease of formation of hydrides decreases from NH_3 to BiH_4

The correct statements are:

A. I, II, III, IV

B. I, III and IV

C. I, II and IV

D. I and IV

Answer: A

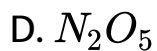
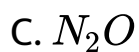


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11. Which of the following oxides of nitrogen is a brown coloured gas?

A. NO_2

B. NO



Answer: A



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12. The number of oxygen atoms around Phosphorous in the dimer of P_2O_5

A. 2

B. 3

C. 4

D. 6

Answer: C



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13. The number of bridge oxygen atoms present in both P_4O_6 and P_4O_{10} are respectively

A. 4,6

B. 4,4

C. 6,4

D. 6,6

Answer: D



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14. The number of $P - O$ bonds and lone pair of electrons present in P_4O_6 molecule.

A. 12,16

B. 12,12

C. 8,8

D. 12,4

Answer: A



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LIST - 1 LIST - 2

15. A) NO 1) Colourless and paramagnetic
B) NO_2 2) Greenish yellow gas
C) N_2O_3 3) Reddish brown and paramagnetic
D) N_2O_5 4) Anhydride of Nitric acid
 5) Anhydride of Nitrous acid

The correct match is

A. $\begin{matrix} A & B & C & D \\ 2 & 4 & 5 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 1 & 3 & 5 & 4 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 2 & 1 & 5 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 1 & 4 & 4 & 3 \end{matrix}$

Answer: B



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16. PCl_5 exists but NCI_5 does not. This is because of

- A. High electronegativity of nitrogen
- B. High ionisation energy of nitrogen
- C. Smaller atomic size of nitrogen
- D. Absence of d-orbitals in the valence shell of nitrogen

Answer: D



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17. The aqueous solution of NCl_3 can be used as

A. Chlorinating agent

B. Bleaching agent

C. Reducing agent

D. Explosive

Answer: B



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18. Which of the following element of Group VA is more metallic

A. Bi

B. As

C. Sb

D. P

Answer: A



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19. The element of Group VA that exhibits maximum number of oxidation states in its compounds

A. phosphorus

B. arsenic

C. bismuth

D. nitrogen

Answer: D



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20. When orthophosphoric acid is strongly heated the product formed is

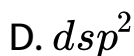
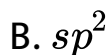
- A. Phosphine, PH_3
- B. Phosphorus trioxide, P_2O_3
- C. Phosphorous acid, H_3PO_3
- D. Metaphosphoric acid, HPO_3

Answer: D



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21. In the oxyacids of phosphorous the hybridisation of phosphorous is

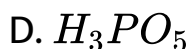
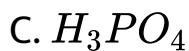
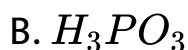
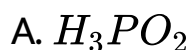


Answer: A



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22. The oxyacid of phosphorous which has more non-ionisable hydrogens

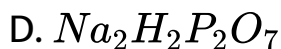
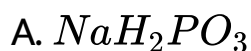


Answer: A



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23. Which of the following is a neutral salt ?



Answer: C



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24. In H_3PO_3 molecule

A. P-atom is surrounded by three $-\text{OH}$ groups

B. P-atom is tetrahedrally surrounded by two $-\text{OH}$ groups, one oxygen atom and one hydrogen

atom

C. P-atom is surrounded by four $-OH$ groups

D. P-atom is surrounded by two $-H$ atoms

Answer: B



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25. The following are some statements about oxyacids of VA group elements

i) The salt of nitric acid contains NO_3^- ion

ii) The salt of phosphoric acid contains PO_4^{3-} ion

iii) Salts of meta phosphoric acid contains HPO_3^{2-} ion

The correct combination is

A. All are correct

B. i, iii are correct

C. ii, iii are correct

D. i, ii are correct

Answer: D



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26. Calcium cyanamide on treatment with steam under pressure gives ammonia and

A. Calcium carbonate

B. Calcium hydroxide

C. Calcium oxide

D. Calcium bicarbonate

Answer: A



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Oxy acid	Basicity
----------	----------

A) H_3PO_2	1) Tribasic
--------------	-------------

27. B) H_3PO_3 2) Mono basic

C) H_3PO_4	3) Tetrabasic
--------------	---------------

D) $H_4P_2O_6$	4) Dibasic
----------------	------------

The correct match is

A.

A	B	C	D
3	2	1	4

B.

A	B	C	D
2	4	1	3

C.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
2	1	3	4

D.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	2	3	4

Answer: B



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28. A and B are two gases. 'A' is identified with a glass rod dipped in NH_3 , and the gas 'B' is identified with a glass rod dipped in HCl . 'A' and 'B' are respectively

A. HCl , NO_2

B. HCl , NH_3

C. NH_3 , HCl

D. NH_3 , SO_2

Answer: B



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29. 98 % pure nitric acid is obtained by

- A. dilution of commercial acid
- B. distillation of commercial acid
- C. distillation in the pressure of con H_2SO_4
- D. freezing the commercial acid

Answer: C



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30. Aquaregia is a mixture of

A. Conc. HNO_3 + Conc. H_2SO_4 in 1:1 ratio

B. Conc. HNO_3 + Conc. H_2SO_4 in 1:3 ratio

C. Conc. HNO_3 + Conc. HCl in 1:3 ratio

D. Conc. HNO_3 + Conc. HCl in 1:1 ratio

Answer: C



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31. The volume percentage of N_2 in air is 78. The Weight percentage of the same

A. 75

B. 78

C. 80

D. 85

Answer: A



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32. When N_2 is obtained from NH_3 using oxide of copper, the change in the oxidation state of metal is

A. $+2$ to 0

B. $+2$ to $+1$

C. $+1$ to $+2$

D. 0 to $+2$

Answer: A



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33. A mixture of potassium nitrite and ammonium chloride on heating liberates the gas

A. O_2

B. N_2O

C. NH_3

D. N_2

Answer: D



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34. Which statement is not correct for nitrogen?

A. It has a small size

B. It does not readily react with O_2

C. It is a typical non-metal

D. d-orbitals are available for bonding

Answer: D



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35. If the nitrogen atoms are in a cyclic arrangement in hydrazoic acid, the oxidation states of N are

A. $+3, +3, +3$

B. $0, 0, -1$

C. $0, 0, -1/3$

D. $-1/3, -1/3, 0$

Answer: B



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36. The allotrope of phosphorous obtained by heating white phosphorous to 473 K is

A. α — balck

B. β — black

C. red

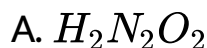
D. scarlet

Answer: B



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37. Which of the following can act as both oxidant and reductant

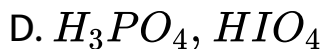
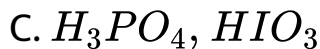
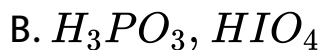


Answer: B



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38. Concentrated nitric acid oxidises phosphorous and iodine, respectively to



Answer: C



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39. In solid state PCl_5 , exists as ionic solid i.e., $[X]^+$, $[Y]^-$ shapes of X^+ and Y^- are respectively

A. Tetrahedral, Pyramidal

B. Tetrahedral, Octahedral

C. Octahedral, Linear

D. Octahedral, Trigonal bipyramidal

Answer: B



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40. In P_4O_6 the number number of oxygen atoms bonded to each P atom is

A. 1.5

B. 2

C. 3

D. 4

Answer: C



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41. P_4O_{10} on reacting with water does not form

A. Tetra metaphosphoric acid

B. Phosphorous acid

C. Orthophosphoric acid

D. Pyrophosphoric acid

Answer: C



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42. The number of $P - O$ bonds and lone pair of electrons present in P_4O_6 molecule.

A. 12, 16

B. 12, 12

C. 8, 8

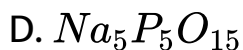
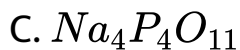
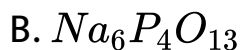
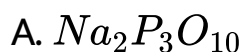
D. 12, 4

Answer: A



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43. Which is cyclic phosphate ?



Answer: C



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44. Dinitrogen tetraoxide (N_2O_4) is a mixed anhydride because it

A. is a mixture of N_2O_3 and N_2O_5

B. Decomposes into two oxides of nitrogen

C. Reacts with water to form nitric acid

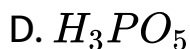
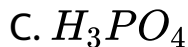
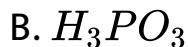
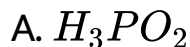
D. Reacts with water to form two oxy acids

Answer: D



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45. The oxyacid of phosphorous which has more non-ionisable hydrogens



Answer: D



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46. PCl_5 exists but NCI_5 does not. This is because of

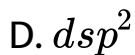
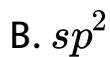
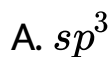
- A. High electronegativity of nitrogen
- B. High ionisation energy of nitrogen
- C. Smaller atomic size of nitrogen
- D. Absence of d-orbitals in the valence shell of nitrogen

Answer: D



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47. In the oxyacids of phosphorous the hybridisation of phosphorous is

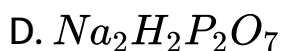
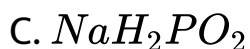
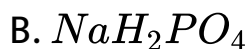
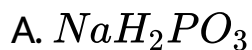


Answer: A



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48. Which of the following is a neutral salt ?



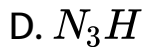
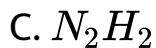
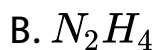
Answer: C



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49. An acidic hydride of nitrogen is





Answer: D



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50. The volume percentage of N_2 in air is 78. The Weight percentage of the same

A. 75

B. 78

C. 80

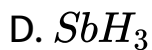
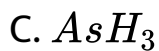
D. 85

Answer: A



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51. The largest bond angle is in



Answer: B





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Problem

1. Nitrogen is chemically inert. Why?



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2. The tendency to exhibit -3 oxidation state by a group VA element decreases down. Why?



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3. Write the following for a white phosphorus molecule:
(a) oxidation state of P, (b) valency of P, (c) total number of bonds and (d) bond order.



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4. White phosphorus is very reactive, but not the red one. Why?



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5. Nitrogen forms a simple diatomic molecule but other elements of same group do not form. Explain.



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6. Maximum covalency of nitrogen is four. Explain.



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7. What happens when barium azide is heated ?



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8. Phosphorus can expand its valency. Why?



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9. Both PH_3 and NH_3 are Lewis bases, but basic strength of PH_3 is less than that of NH_3 . Explain.



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10. What is the covalence of nitrogen in N_2O_5 ?



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11. Both NO and NO_2 have odd number of electrons. NO is colourless, but NO_2 is coloured. Why?



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12. The magnetic properties of NO_2 and N_2O_4 are different. Why?



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13. PCl_5 is less stable. Why?



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14. PCl_3 is covalent. It fumes in moisture and its aqueous solution is electrical conductor. Why?



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15. What happens when phosphine is absorbed in mercuric chloride solution ?



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16. Pentahalides of phosphorus are known, but not pentahydride. Why?



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17. Mention to which oxyacids N_2O , N_2O_4 and N_2O_5 are anhydrides?



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18. What is the basicity of orthophosphoric acid ? Write the types of salts formed by it.

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19. Based on the structures how is the reduction ability of H_3PO_2 or H_3PO_3 accounted for?

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20. How is tautomerism different from resonance ?

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21. Ammonia cannot be dried over anhydrous calcium chloride. Why?



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22. Coal is a potential source for ammonia. Comment.



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23. 3-Hydroxy butanal is formed when (X) reacts with (Y) in dilute (Z) solution. What are (X), (Y) and (Z)?



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24. What is aqua-regia ? How it works to dissolve noble metals ?



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SUBJECTIVE EXERCISE - 1 (Long answer questions)

1. Discuss the general characteristics of nitrogen family and justify their position in the same group.



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SUBJECTIVE EXERCISE - 1 (Short answer questions)

1. Discuss on the electronic configuration of elements of group 15.



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2. Mention the occurrence of nitrogen and phosphorus in the earth's crust.



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3. Write the trends in atomic radius, metallic nature and ionisation potential of group VA elements.



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4. Mention the oxidation numbers exhibited by nitrogen. Give an example for each.



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5. Write on the allotropy of group VA elements.



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6. Define catenation. How it vary it nitrogen family.



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SUBJECTIVE EXERCISE - 1 (Very short answer questions)

1. Write the names and the atomic number of VA group elements



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2. Give the electronic configurations of phosphorus and Arsenic.



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3. Write the composition of "Phosphate rock".



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4. Write all the oxidation states of nitrogen.



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5. Give any two examples to show the negative oxidation state of nitrogen.



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6. Give reasons for the chemical inactivity of nitrogen at ordinary conditions.



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SUBJECTIVE EXERCISE - 2 (Long answer questions)

1. Write about the general characteristics of hydrides of VA group elements.



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2. Discuss the structures of oxides of nitrogen.



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SUBJECTIVE EXERCISE - 2 (Short answer questions)

1. Discuss the basic strength and stability of hydrides of group VA.

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2. Write different oxides of nitrogen. Mention the oxidation states of nitrogen in these oxides.

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3. Write the structures of the oxides :
 N_2O_3 , N_2O_5 , P_4O_6 and P_4O_{10} .

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4. Write the hydrolysis reactions of the halides :

NCl_3 , PCl_3 , PCl_5 , P_4O_6 and P_4O_{10}



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SUBJECTIVE EXERCISE - 2 (Very short answer questions)

1. What is the stability order of the VA group hydrides ?

Explain the gradation in the reducing property of these hydrides.



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2. Which of the two oxides N_2O_5 and P_2O_5 is a better dehydrating agent. Give an example for the same reaction.



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3. Why is 'NO' paramagnetic in nature ? When does it become diamagnetic ?



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4. How is dinitrogen tetroxide formed ? Give equation.



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5. A colour less oxide of nitrogen in air becomes brown.
Why?

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6. How many oxygens surround a phosphorous is
phosphorous pentoxide ?

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7. Write the equation for the hydrolysis of NCI_2 . How
does it differ from the hydrolysis of PCI_5 ?

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8. What are the orbitals of P that are involved in the formation of PCl_5 ?



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9. Can NCI_5 be prepared by direct union of the elements ? Why ? or Why not?



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10. Which oxides of nitrogen are neutral oxides ?



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SUBJECTIVE EXERCISE - 3 (Long answer questions)

1. Write an essay on the structural aspects of phosphorous series of acids.



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SUBJECTIVE EXERCISE - 3 (Short answer questions)

1. Write on the structural aspects of $(HPO_3)_3$ and (HPO_3) .



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2. Mention the oxyacids of phosphorus and the oxidation states of phosphorus in them.

 [Watch Video Solution](#)

3. Write the different types of salts formed by orthophosphoric acid.

 [Watch Video Solution](#)

4. Which of the acids of phosphorous does not show monomeric state but cyclic structure ?

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SUBJECTIVE EXERCISE - 3 (Very short answer questions)

1. Write the structure of HNO_3 .



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2. How do you prepare hypophosphorous acid in the laboratory?



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SUBJECTIVE EXERCISE - 4 (Long answer questions)

1. Describe the manufacture of NH_3 by Haber's method. Give a labelled diagram.



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2. Discuss the principle of preparing nitric acid in Ostwald's process. Give the necessary equations.



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3. Write the important uses of (a) ammonia and (b) nitric acid.



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SUBJECTIVE EXERCISE - 4 (Short answer questions)

1. Write on the conditions of Haber's ammonia synthesis.



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2. A colourless crystalline chloride, when warmed with solid NaOH, gave ammonia gas. Identify the salt.



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3. Nitric acid can not be concentrated beyond 68 % by direct distillation ? Why?



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4. How is ammonia useful in qualitative analysis ?



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5. Suggest the action of HNO_3 on non-metals.



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6. What is brown ring test ?



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SUBJECTIVE EXERCISE - 4 (Very short answer questions)

1. Write the structures of the following

(a) N_2O and (b) NO_2



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2. P_2O_5 is strong dehydrating agent. Why is it not used to dry NH_3 ?



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3. What are the experimental conditions used to manufacture synthetic NH_3 ?



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4. What drying agent is suitable to dry NH_3 ?



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5. How do you convert NH_4NO_3 into NH_3 ? Give equation(s).



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6. How ammonia dissolve a zinc salt ?



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7. Describe the structures of tri and penta chlorides of phosphorus.



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8. Write two examples of metals reacting with nitric acid



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9. Write the composition of aqua-regia.



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10. Aluminium is passive to concentrated nitric acid.

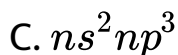
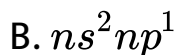
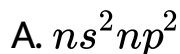
Why?

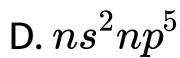


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Objective Exercise - 1

1. The valence shell electronic configuration of VA group elements is :



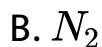


Answer: 3



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2. The most abundant element in the earth's atmosphere is



Answer: 2



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LIST - 1

A) Phosphorite

B) Indian salt petre

C) Fluorapatite

D) Chile salt petre

LIST - 2

1) KNO_3

2) $\text{Ba}(\text{NO}_3)_2$

3) NaNO_3

4) $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaF}_2$

5) $\text{Ca}_3(\text{PO}_4)_2$

3.

The correct match is

A.

A	B	C	D
1	2	3	5

B.

A	B	C	D
2	4	3	1

C.

A	B	C	D
4	3	5	2

D.

A	B	C	D
5	1	4	3

Answer: 4



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4. The most abundant VA group element in the earth's crust is

A. Nitrogen

B. Phosphorous

C. Arsenic

D. Bismuth

Answer: 2



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5. The following can exist as a diatomic molecule

A. Sb

B. P

C. As

D. Bi

Answer: 1



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6. The following VA group element occurs even in free state

A. Bi

B. As

C. Sb

D. N

Answer: 4



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7. The VA group element having more number of allotropes is

A. N

B. P

C. Bi

D. Sb

Answer: 2



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8. The following element doesn't have allotropes

A. N

B. P

C. As

D. Bi

Answer: 4



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9. Most reactive allotropic form of Phosphorous is

A. Yellow

B. Red

C. Black

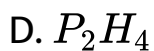
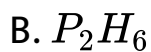
D. Scarlet

Answer: 1



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10. Chemical formula of phosphonium ion



Answer: 3

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11. In nitrogen molecule, the two atoms of nitrogen are joined by

- A. One sigma bond and one pi bond
- B. Two sigma bonds and one pi bond
- C. One sigma bond and two pi bonds
- D. Three sigma bonds

Answer: 3



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12. The chemical inertness of nitrogen is due to

- A. half-filled '2p' orbitals of Nitrogen
- B. high bond dissociation energy
- C. completely filled d-orbitals
- D. its gaseous nature

Answer: 2



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13. The maximum covalency of nitrogen is

- A. 2
- B. 3
- C. 4

D. 5

Answer: 3



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14. The VA group element which exhibits wide range of oxidation states is

A. P

B. As

C. Bi

D. N

Answer: 4



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15. The oxidation state of nitrogen in hydrazine is

A. -1

B. -2

C. $+1$

D. $+2$

Answer: 4



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16. The wrong statement in the following is

A. Pure N_2 is prepared by thermal decomposition of barium azide

B. N_2 exists in two stable isotopic forms N^{14} and N^{15}

C. Liquid dinitrogen has boiling point $77.2^{\circ}C$

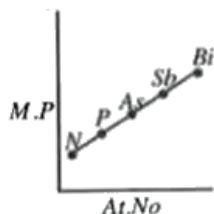
D. Liquid dinitrogen is used in Cryosurgery

Answer: 3

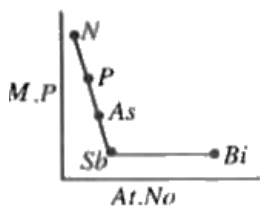


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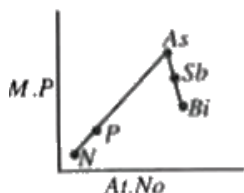
17. Which of the following graph represents melting points of the group - 15 elements is



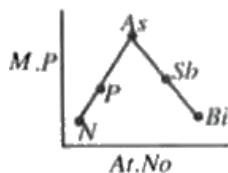
A.



B.



C.



D.

Answer: 3



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18. Which of the following is a wrong statement ?

- A. Catenation ability is maximum for phosphorus among VA elements
- B. White phosphorus is most reactive due to bond angle strain
- C. The chemical inertness of nitrogen is due to bond dissociation energy

D. The VA elements having more number of allotropes is P

Answer: All are correct



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19. The stable oxidation state of Bismuth is

A. + 1

B. + 5

C. - 3

D. + 3

Answer: 4



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Substance

Oxidation state of N

A) HNO_3

1) $-3, +5$

B) NH_4NO_3

2) $-1/3$

C) N_3H

3) $+5$

D) H_3PO_3

4) $+3$

5) $+1/3$

20.

The correct match is

A.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
3	1	2	4

B.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
5	2	3	4

C.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	2	3	4

D.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
4	3	2	5

Answer: 1



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21. The atomicity of white Phosphorous is 'x' and the $P - \hat{P} - P$ bond angle in the molecule is 'y'. What are 'x' and 'y' ?

A. $x = 4, y = 90^\circ$

B. $x = 4, y = 60^\circ$

C. $x = 3, y = 120^\circ$

D. $x = 2, y = 180^\circ$

Answer: 2



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22. Which of the following elements is most metallic?

A. P

B. As

C. Sb

D. Bi

Answer: 4



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23. Very pure N_2 can be obtained by

A. Thermal decomposition of ammonium dichromate

B. Treating aqueous solution of NH_4Cl and $NaNO_2$

C. Liquifaction and fractional distillation of liquid air

D. Thermal decomposition of sodium azide

Answer: 4



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24. Thermally more stable hydride is

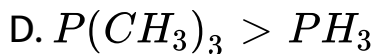
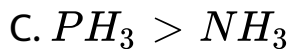
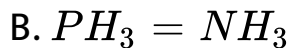
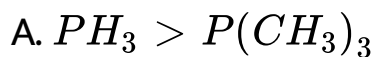


Answer: 1



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25. Which one of the following statements is correct with respect to basic character?



Answer: 4



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26. The hydride with more basic nature is



D. AsH_3

Answer: 2



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27. A stronger reducing agent is

A. NH_3

B. PH_3

C. SbH_3

D. BiH_3

Answer: 4





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28. The shape and bond angle of ammonia are

A. Tetrahedral and $109^{\circ}28'$

B. Tetrahedral and $107^{\circ}48'$

C. Pyramidal and $107^{\circ}18'$

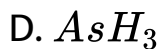
D. Pyramidal and $109^{\circ}28'$

Answer: 3



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29. More volatile hydride is



Answer: 1



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30. VA group hydrides are Lewis bases due to the presence of

A. unpaired electrons

B. high electron affinity values

C. low electronegativity

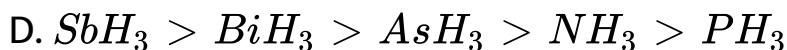
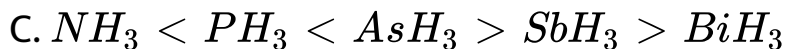
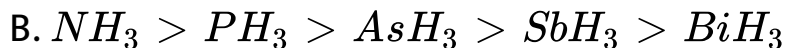
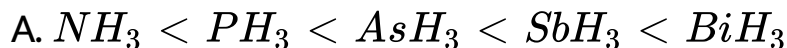
D. lone pair of electrons

Answer: 4



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31. The correct order of reducing abilities of VA group hydrides is

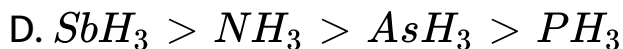
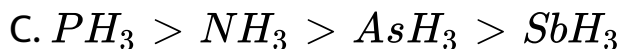
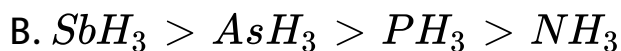
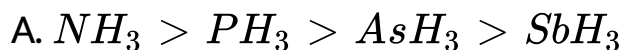


Answer: 1



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32. Which is in the decreasing order of boiling points of hydrides?

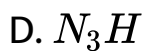
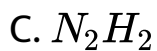
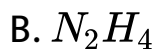


Answer: 4



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33. Acidic hydride of nitrogen is



Answer: 4



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34. In Ostwald's process, nitric oxide is prepared by the oxidation of

A. NH_3

B. N_2

C. Air

D. Nitrous oxide

Answer: 1



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

A. NO

B. N_2O_3

C. N_2O_4

D. N_2O_5

Answer: 2



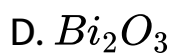
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36. Which of the following exists as dimer

A. N_2O_5

B. N_2O

C. P_2O_3

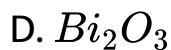
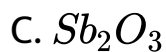
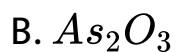
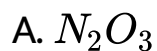


Answer: 3



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37. The basic oxide among the following is

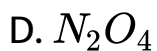
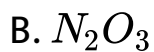
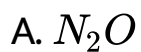


Answer: 4



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38. Paramagnetic oxide is



Answer: 3



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39. The oxide of nitrogen existing in the solid state at room temperature is

A. NO

B. NO_2

C. N_2O_3

D. N_2O_5

Answer: 4



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40. The neutral oxide of nitrogen is

A. NO

B. N_2O

C. NO_2

D. Both 1 and 2

Answer: 4



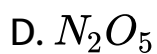
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41. The sesquioxide of nitrogen is

A. N_2O

B. NO

C. N_2O_3

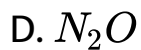
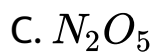
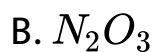


Answer: 3



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42. Which is a mixed anhydride?

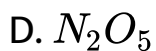
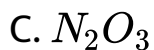
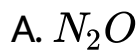


Answer: 1



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43. Chemical formula of laughing gas is



Answer: 1



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44. Ammonium nitrate on heating gives

A. NO

B. N_2

C. N_2O

D. N_2O_4

Answer: 3

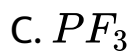


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45. Trihalide which does not undergo hydrolysis easily is

A. NCl_3

B. PCl_3

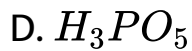
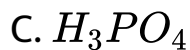
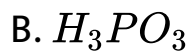
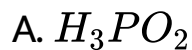


Answer: 3



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46. P_4O_6 is the anhydride of the following

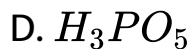
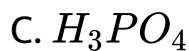
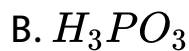
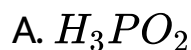


Answer: 2



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47. P_4O_{10} is the anhydride of the following



Answer: 3



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LIST - 1

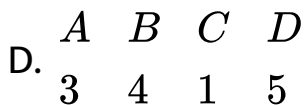
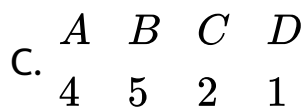
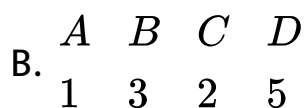
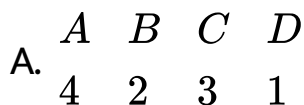


LIST - 2



48.

The correct match is



Answer: 3



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49. Two oxides of nitrogen, NO and NO_2 react together at 253 K and form a compound of nitrogen, X. X reacts with water to yield another compound of nitrogen Y. the shape of the anion of Y molecule is

- A. Tetrahedral
- B. Angular
- C. Square planar
- D. Pyramidal

Answer: 2



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50. Gases liberated when Cu and Zn react with dil. HNO_3 separately

A. NO , NO_2

B. N_2O , NO_2

C. NO , N_2O

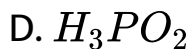
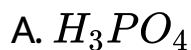
D. NO_2 , N_2O

Answer: 3



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51. Meta phosphoric acid is chemically



Answer: 2



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52. Which one of the following elements does not form the compound M_4O_{10} . (M = element of group VA)?

A. P

B. Sb

C. As

D. Bi

Answer: 4



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53. The number of Oxygen atoms present around Nitrogen in N_2O_5 is

A. 2

B. 1

C. 3

D. 4

Answer: 3



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54. Which does not form a Pentahalide?

A. P

B. As

C. Sb

D. N

Answer: 4



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55. In case of nitrogen, NCl_3 is possible but not NCl_5 while in case phosphorous, PCl_3 as well as PCl_5 are possible. It is due to

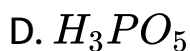
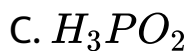
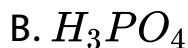
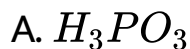
- A. Availability of vacant d orbitals in P but not in N
- B. Lower electronegativity of P than N
- C. Lower tendency of H-bond formation in P than N
- D. Occurrence of P is solid while N in gaseous state at room temperature

Answer: 1



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56. PCI_5 on hydrolysis gives



Answer: 2



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57. Bismuth forms the only pentahalide with the halogen

A. Bromine

B. Fluorine

C. Chlorine

D. Iodine

Answer: 2



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58. PCl_3 on hydrolysis gives

A. H_3PO_2

B. H_3PO_3

C. HCl

D. Both (2) and (3)

Answer: 4



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59. The ease of hydrolysis of trichlorides of group - 15 elements decrease in the order



Answer: 1



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60. The equatin and axial P-Cl bond length (in pm) respectively in PCl_5 are

A. 202, 240

B. 240, 202

C. 200, 400

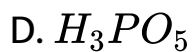
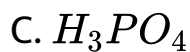
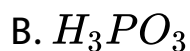
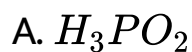
D. 200, 410

Answer: 2



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61. A tribasic acid with peroxy bond is



Answer: 4



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62. The starting material used for the manufacture of HNO_3 by Ostwald process is

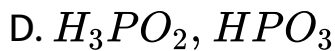
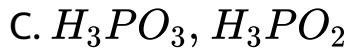
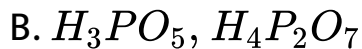
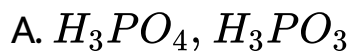
- A. Ammonia and N_2O
- B. Ammonia and air
- C. Air only
- D. Ammonia and nitrogen

Answer: 2



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63. Which pair of oxyacids of phosphorus contains 'P-H' bonds ?

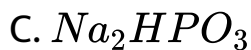
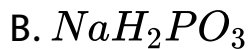


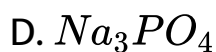
Answer: 3



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64. Which of the following is an acidic salt ?



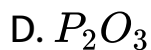
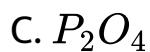
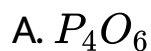


Answer: 2



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65. Anhydride of pyrophosphoric acid is



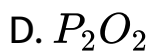
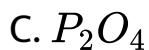
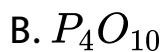
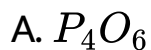
Answer: 2





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66. Anhydride of orthophosphoric acid is



Answer: 2



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67. Oxidation state of phosphorus is least in

A. Hypophosphoric acid

B. Hypophosphorus acid

C. Metaphosphoric acid

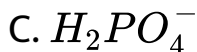
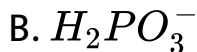
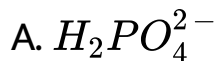
D. Pyrophosphoric acid

Answer: 2



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68. The following is a primary phosphate ion





Answer: 3



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69. P-P linkage is present in

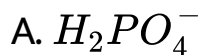
- A. Pyrophosphoric acid
- B. Hypophosphoric acid
- C. Peroxy phosphoric acid
- D. Metaphosphoric acid

Answer: 2



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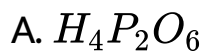
70. The existence of following ions have no evidence



Answer: 3

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71. Salt of the following is used as a water softner



Answer: 3



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72. Covalency of phosphorus has a maximum value

A. 6

B. 5

C. 4

D. 3

Answer: 2



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73. Basicity of orthophosphoric acid is

A. 2

B. 3

C. 4

D. 5

Answer: 2





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74. The intermediate product formed when NH_3 is prepared from urea is

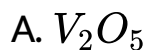
- A. Ammonium bicarbonate
- B. Ammonium carbonate
- C. Ammonium nitrate
- D. Ammonium nitrite

Answer: 2



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75. The catalyst used in the manufacture of ammonia by Haber's process is



Answer: 2



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76. Which of the following compound is not used as fertilizer

A. Ammonium sulphate

B. Urea

C. Ammonium phosphate

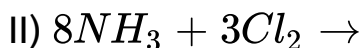
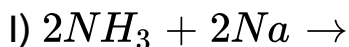
D. Calcium phosphate

Answer: 4



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77. Which of the following reactions yield elementary gases like N_2 , H_2 , O_2 as the byproducts?



- A. I and II only
- B. II and III only
- C. I and III only
- D. All of these

Answer: 4



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78. In the Haber's process nitrogen chemically combines with

- A. Oxygen
- B. Iron

C. Ammonia

D. Hydrogen

Answer: 4



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79. In the preparation of HNO_3 by Ostwald process ammonia is

A. reduced

B. oxidised

C. reduced and oxidised

D. hydrolysed

Answer: 2



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80. NH_4Cl on heating with NaOH liberates

A. NaCl

B. NH_3

C. HCl

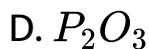
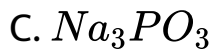
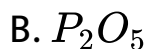
D. NaOCl

Answer: 2



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81. Aqueous NaOH reacts with white Phosphorous to form Phosphine and



Answer: 1



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82. Ammonia gas is dried over

A. Quick lime

B. Conc H_2SO_4

C. P_2O_5

D. HCl

Answer: 1



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83. Which of the following is used as refrigerant

A. Liquid NH_3

B. C_2H_5Cl

C. CCl_2F_2

D. All

Answer: 4



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84. The catalyst used in Haber's process is

A. Fe

B. Al_2O_3

C. $CaCl_2$

D. NH_3

Answer: 1



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85. A metal nitride on hydrolysis with steam gives



Answer: 2



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86. Catalyst in the Ostwald's process is

A. Pt

B. Fe

C. V_2O_5

D. Ni

Answer: 1



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87. Moles of oxygen that can oxidise one mole of NH_3 to NO

A. 1

B. 1.25

C. 2.5

D. 5

Answer: 2



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88. Which of the following is used in pyro-techniques

A. NH_3

B. HNO_3

C. PH_3

D. H_3PO_4

Answer: 2



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89. Percentage of nitric acid obtained in Ostwald's process is

A. 51 %

B. 68 %

C. 74 %

D. 82 %

Answer: 2



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List – I

A) Aquaregia

B) Diazotisation
mixture

C) Nitration mixture

D) Aquafortis

List – II

1) $\text{NaNO}_2 + \text{HCl}$

2) Conc. $\text{HNO}_3 +$
conc. H_2SO_4

3) HNO_2

4) Conc. $\text{HNO}_3 +$
conc. HCl (1 : 3)

5) HNO_3

90.

The correct match is

A. A-5, B-1, C-2, D-3

B. A-4, B-1, C-2, D-5

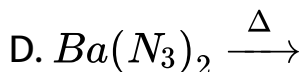
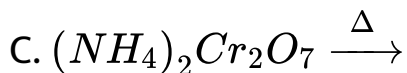
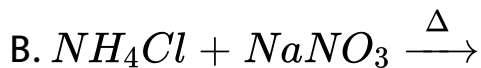
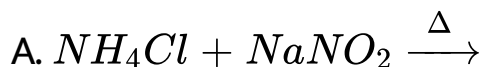
C. A-4, B-1, C-5, D-2

D. A-5, B-3, C-2, D-1

Answer: 2

Objective Exercise - 2

1. In which of the following reaction N_2 is not obtained?



Answer: 2

2. The shape and bond angle of white Phosphorous molecules is

- A. Linear and 180°
- B. Trigonal planar and 120°
- C. Tetrahedral and $109^{\circ}28'$
- D. Tetrahedral and 60°

Answer: 4



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3. In the statements regarding P_4 molecule

I) The oxidation state is zero

II) The covalency is 4

III) The $P - \hat{P}$ bond angle 60°

The correct combination is

A. Only III is correct

B. I & III are correct

C. All are correct

D. I and II are correct

Answer: 2



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4. The elements present in Fluorapatite are

A. Ca, N & O only

B. Ca & P only

C. Ca, P, F, O

D. Ca, N, O, F

Answer: 3



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5. Mole fraction of nitrogen in air is

A. 0.14

B. 0.28

C. 0.5

D. 0.78

Answer: 4



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6. Bond energy of N-N is $x \text{ kJ mol}^{-1}$. Then bond energy of $N \equiv N$ is

A. $x \text{ kJmol}^{-1}$

B. $< 3x \text{ kJmol}^{-1}$

C. $3x \text{ kJmol}^{-1}$

D. $> 3x \text{ kJmol}^{-1}$

Answer: 2



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7. White phosphorus molecule (P_4) doesn't have

- A. Six P-P single bonds
- B. Four P-P single bonds only
- C. Four lone pairs of electrons.
- D. PPP angle of 60°

Answer: 2



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8. The following statements are about VA group elements:

i) As and Sb are semimetals

ii) Only Bi is a metal

iii) N_2 is nonmetal but P_4 is metal

The correct combination is

A. all are correct

B. only i is correct

C. i and ii are correct

D. i & iii are correct

Answer: 3



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9. One mole of magnesium nitride on reaction with an excess of water gives

- A. One mole of ammonia
- B. One mole of nitric acid
- C. Two moles of ammonia
- D. Two moles of nitric acid

Answer: 3



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10. The three important oxidation states of phosphorous are

A. -3 , $+3$ and $+5$

B. -3 , $+3$ and -5

C. -3 , $+4$ and -4

D. -3 , $+3$ and $+4$

Answer: 1



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11. Among the 15^{th} group elements, as we move from nitrogen to bismuth, the pentavalency becomes less

pronounced and trivalency becomes more pronounced due to

- A. Non metallic character
- B. Inert pair effect
- C. High electronegativity
- D. Large ionization energy

Answer: 2



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12. $Al_2O_3 + C + N_2 \xrightarrow{\Delta} X + Y$. If X is a solid and Y is a gas, the correct statement is

- A. Both X and Y are combustible
- B. X and hydrolysis gives ammonia
- C. Y on reduction gives metal
- D. Both X and Y are acidic

Answer: 2



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13. Li and Mg both combine with N_2 at high temp. This suggest that the two metals have

- A. Horizontal relationship
- B. Vertical relationship

C. Diagonal relationship

D. No relationship

Answer: 3



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14. Freezing of food articles can be done using

A. Solid N_2 at 77K

B. Liquid N_2 at 77K

C. Liquid N_2 at 298K

D. Gaseous N_2 at 298K

Answer: 2



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15. The correct arrangement of following acids of phosphorus in the increasing order of oxidation state of phosphorous is

A. Hypophosphoric acid $<$ orthophosphorous acid
 $<$ pyrophosphoric acid

B. Hypophosphorous acid $<$ pyrophosphoric acid
 $<$ orthophosphorous acid

C. Pyrophosphoric acid < hypophosphorous acid

< orthophosphorous acid

D. Pyrophosphoric acid < orthophosphorous acid

< hypophosphorous acid

Answer: 1



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16. Nitrogen has unique ability to form $P\pi - P\pi$ multiple bonds with itself and with other elements due to

A. Small size and low electronegativity

B. Large size and high electronegativity

C. Large size and low electronegativity

D. Small size and high electronegativity

Answer: 2



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17. Most basic among the following

A. NH_3

B. N_2H_4

C. PH_3

D. P_2H_4

Answer: 1



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18. NH_3 has a much higher boiling point than PH_3 because

- A. NH_3 has a larger molecular weight
- B. NH_3 undergoes umbrella inversion
- C. NH_3 forms hydrogen bond
- D. NH_3 contains ionic bonds whereas PH_3 contains covalent bonds

Answer: 3



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19. The bond energies (in KJ mole^{-1}) of $P - H$, $As - H$ and $N - H$ respectively ?

A. 247, 318 and 389

B. 247, 389 and 318

C. 318, 389 and 247

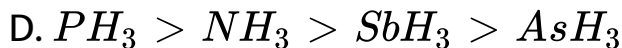
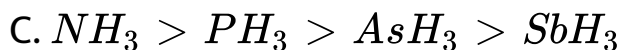
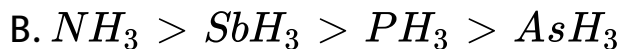
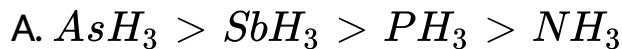
D. 318, 247 and 389

Answer: 4



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20. What is the order of basic nature of hydrides of VA group elements?



Answer: 3



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21. White phosphorous reacts with caustic soda to give phosphine and sodium hypophosphite. In this reaction

phosphorous undergoes

- A. Oxidation
- B. Reduction
- C. Both
- D. None of these

Answer: 3



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22. Among the following statement which one is true ?

- A. NH_3 is less soluble than PH_3 in water

B. NH_3 is stronger base and stronger reducing agent than PH_3

C. NH_3 has higher boiling point than PH_3 and has lower melting point than PH_3

D. PH_3 is stronger reducing agent than NH_3 and it has lower critical temperature than NH_3

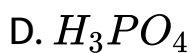
Answer: 4



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23. $NaHSO_4$ is reacted with $NaCl$ at $823K$. The liberated gas is reacted with Ca_3P_2 to form

CaCl_2 and X . Which one of the following is X ?



Answer: 1



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24. The chemical used in Holme's signals are



B. Magnesium nitride and calcium phosphide

C. Calcium carbide and calcium phosphide

D. Calcium chloride and calcium carbonate

Answer: 3



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25. The following are some statements about oxides of
VA group elements

I) N_2O molecule is linear

II) NO_2 molecule is angular

III) N_2O_5 molecule is angular

The correct combination is

- A. All are correct
- B. I & III are correct
- C. II & III are correct
- D. I & II are correct

Answer: 4



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26. When NH_4NO_3 is gently heated, an oxide of Nitrogen is formed. What is the oxidation state of Nitrogen in this oxide ?

- A. +4

B. + 2

C. + 3

D. + 1

Answer: 4



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27. 'X' is a neutral oxide. On exposure to air 'X' is converted to 'Y', which is an acidic oxide. Then 'X' and 'Y' are

A. N_2O , NO

B. NO , NO_2

C. NO_2 , NO

D. NO_2 , N_2O_4

Answer: 2



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28. Of the following, which has three electron bond in its structure ?

A. Nitrous oxide

B. Nitric oxide

C. Dinitrogen trioxide

D. Nitrogen pentoxide

Answer: 2



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29. The number of oxygen atoms bonded to one phosphorous atom in P_4O_{10} is

A. 4

B. 3

C. 6

D. 5

Answer: 1



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LIST - 1

A) N_2O

B) HNO_2

C) NO_3^-

D) HNO_4

LIST - 2

1) sp^2 and planar triangle

2) Nitrite and nitro form

3) sp^3 and tetrahedron

4) Laughing gas

5) Peroxy bond

30.

A.

A	B	C	D
1	2	3	4

B.

A	B	C	D
3	2	4	1

C.

A	B	C	D
2	5	3	4

D.

A	B	C	D
4	2	1	5

Answer: 4



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31. The arrangement of oxygen atoms around each phosphorous in P_4O_{10}

- A. Pyramidal
- B. Octahedral
- C. Tetrahedral
- D. Square planar

Answer: 2



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32. Nitrogen dioxide

- A. dissolves in water forming nitric acid
- B. does not dissolve in water
- C. dissolves in water to form nitrous acid and gives off oxygen
- D. dissolves in water to form a mixture of nitrous and nitric acids

Answer: 4



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33. Which oxide does not act as a reducing agent ?

A. NO

B. NO_2

C. N_2O

D. N_2O_5

Answer: 4



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34. A wrong statement related to the oxides of nitrogen.

A. Oxides of nitrogen are generally stable

B. Nitrogen sesquioxide is regarded as a 1 : 1

mixture of nitrogendioxide and nitric oxide

C. Nitrous oxide as well as nitric oxides are examples of neutral oxides

D. $2NO_2 \rightleftharpoons N_2O_4$. Both oxides represented here are diamagnetic

Answer: 4



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35. Atomicity of dimeric phosphorous pentoxide is 'x' and the number of shared electron pairs is 'y'. Then

a) $y - x = 6$ b) $2x = y + 8$

c) $10x - 7y = 0$

- A. Only 'a' is correct
- B. Only 'b' is correct
- C. Only 'c' is correct
- D. All the above are correct

Answer: 4



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36. Amongst the trihalides of nitrogen which one has the highest dipole moment?



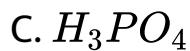


Answer: 2



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37. Aqueous solution of PCl_3 conducts electricity due to the presence of



Answer: 2



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38. The statement that is NOT correct is

- A. In solid state PCl_5 exists as $[PCl_4]^+ [PCl_6]^-$
- B. Phosphorous acid on heating disproportionates to give metaphosphoric acid and phosphine
- C. Hypophosphorous acid reduces silver nitrate to silver
- D. Pure phosphine is non-inflammable.

Answer: 2



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39. In solid state PCl_5 , exists as ionic solid i.e.,

$[X]^+$, $[Y]^-$ shapes of X^+ and Y^- are respectively

A. X-octahedral, Y-trigonal bipyramidal

B. X-tetrahedral, Y-plane trigonal

C. X-square planar, Y-octahedral

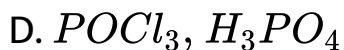
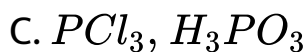
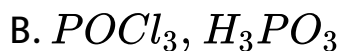
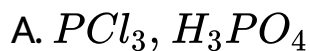
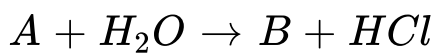
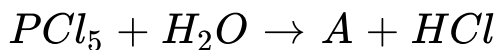
D. X-tetrahedral, Y-octahedral

Answer: 4



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40. Identify A and B in the following chemical reactions.



Answer: 4



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41. $PCl_5 + Cl^- \rightarrow PCl_6^-$. The wrong statement regarding the above equation is

- A. Hybridisation of P changes from sp^3d to sp^3d^2
- B. Oxidation number of P changes from +5 to +6
- C. Covalency P changes from 5 to 6
- D. Here PCl_5 is a Lewis acid

Answer: 2



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LIST - 1

LIST - 2

A) NH_3 1) sp^3d , trigonal bipyramidal

B) N_2O_3 2) sp^3 , tetrahedral

C) PCl_5 3) sp , linear

D) NH_4^+ 4) sp^3 , pyramidal

5) anhydride of nitrous acid

42.

The correct match is

A.

A	B	C	D
1	4	3	2

B.

A	B	C	D
1	2	3	4

C.

A	B	C	D
4	5	1	2

D.

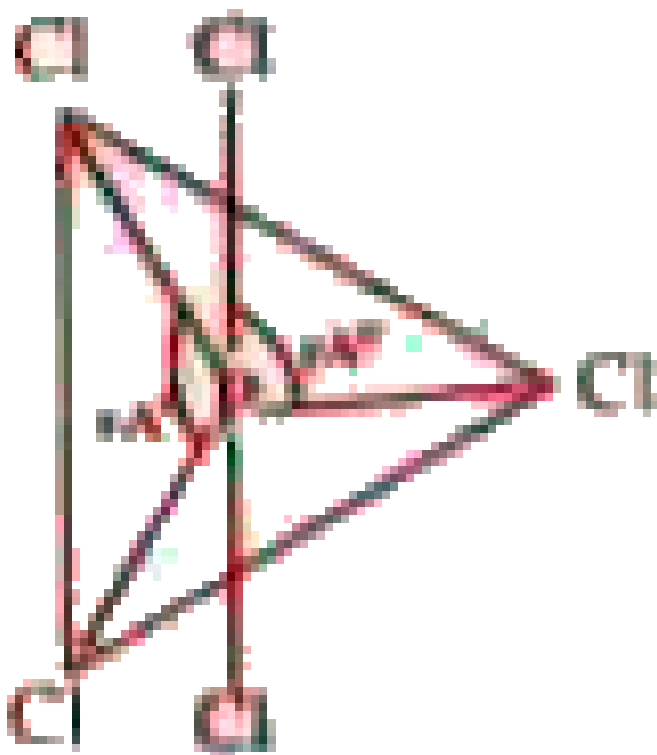
A	B	C	D
2	5	3	1

Answer: 3



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43. The relation between x and y



A. $x > y$

B. $x < y$

C. $x = y$

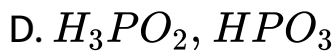
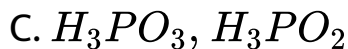
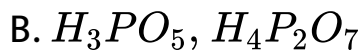
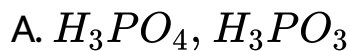
D. $y = 2x$

Answer: 1



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44. Which pair of oxyacids of phosphorus contains 'P-H' bonds ?



Answer: 3



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45. Which of the following does not contain P-O-P bond

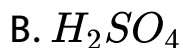
- A. Isohypophosphoric acid
- B. Diphosphorous acid
- C. Diphosphoric acid
- D. Hypophosphoric acid

Answer: 4



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46. Which of the following acids possess oxidising, reducing and complex forming properties?



Answer: 4



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47. The number of P-P bonds in cyclotrimeta phosphoric acid is

A. 3

B. 9

C. 6

D. zero

Answer: 4



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48. Two oxides of Nitrogen, NO and NO, react together at 253K and form a compound of Nitrogen, 'x'. 'x' reacts with water to yield another compound of Nitrogen, 'y'. The shape of the anion of 'y' molecule is

A. Tetrahedral

B. Angular

C. Square planar

D. Pyramidal

Answer: 2



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49. Oxidation state of +1 for phosphorous is found in

A. H_3PO_3

B. H_3PO_4

C. H_3PO_2

D. $H_4P_2O_7$

Answer: 3



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50. The number of hydroxyl groups in pyrophosphoric acid is

A. 3

B. 4

C. 5

D. 7

Answer: 2



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51. H_3PO_2 is the formula for one of the phosphorus acids. Its name and basicity are respectively

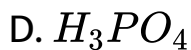
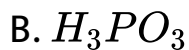
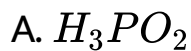
- A. phosphorous acid and two
- B. hypophosphorous acid and two
- C. hypophosphorous acid and one
- D. hypophosphoric acid and two

Answer: 3



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52. The acid that forms primary, secondary and tertiary phosphates is

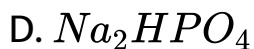
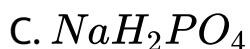
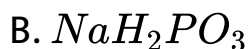


Answer: 4



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53. Which of the following is not an acidic salt?



Answer: 1



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54. The reducing strength of oxyacid of the Phosphorous depends on

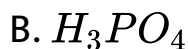
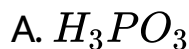
- A. The number of H-atoms directly attached to P
- B. The number of H-atom attached to oxygen atom
- C. The number of O- atoms attached to P-atoms
- D. The number of P-atoms

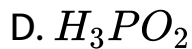
Answer: 1



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55. Which of the following on heating undergoes disproportionation





Answer: 1



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56. Nitration mixture is used to generate



Answer: 3



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57. The statements regarding oxyacids of phosphorous are

- i) HPO_3 molecule is monobasic acid
- ii) $H_4P_2O_6$ molecule has $P - P$ bond
- iii) $H_4P_2O_7$ molecule has $P - O - P$ linkage

The correct combination is

- A. all are correct
- B. only ii is correct
- C. ii & iii are correct

D. i & ii are correct

Answer: 1



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58. Calgon is

- A. Sodium hexa meta phosphate
- B. Aluminium hexa meta phosphate
- C. Potassium hexa meta phosphate
- D. Magnesium exa meta phosphate

Answer: 1



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59. Regarding H_3PO_5 the wrong statement is

- A. It's basicity is three
- B. Oxidation state P in it +5
- C. It contains O - O linkage
- D. It can form a dimer

Answer: 4



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60. Match the following

List-I

Oxoacids of
phosphorus

A) Metal phosphoric

B) Pyro phosphorous

C) Hypo phosphoric

D) Hypo phosphorous

List-II.

Oxidation state of
phosphorus

i) + 4

ii) + 1

iii) + 2

iv) + 3

v) + 5

A. $\begin{matrix} A & B & C & D \\ v & iv & ii & i \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ v & iv & i & ii \end{matrix}$

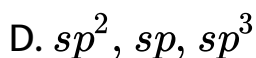
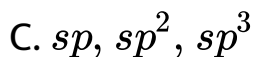
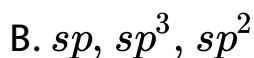
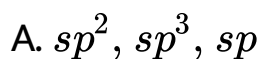
C. $\begin{matrix} A & B & C & D \\ iii & iv & ii & i \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ iv & iii & i & ii \end{matrix}$

Answer: 2

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61. The hybridisation of N in O_2^+ , NO_3^- and NH_4^+ respectively is



Answer: 4

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62.



.

In this reaction one mole of HNO_3 is reduced by

A. 32g Zn

B. 64g Zn

C. 128g Zn

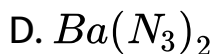
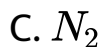
D. 26g Zn

Answer: 4



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63. Chemical used as oxidiser in rocket fuels and in the picking of steel is



Answer: 2



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64. One gram atom of zinc can reduce

A. 1 mol conc. HNO_3

B. 2 mol conc. HNO_3

C. 3 mol conc. HNO_3

D. 4 mol conc. HNO_3

Answer: 2



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65. The oxide involved in the formation of brown ring for testing nitrate ion

A. N_2O

B. NO

C. NO_2

D. N_2O_3

Answer: 2



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66. N_2O is obtained by the reaction of

A. Cu with dil HNO_3

B. Cu with conc. HNO_3

C. Zn with dil HNO_3

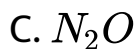
D. Zn with conc. HNO_3

Answer: 3



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67. A gas which is used as anaesthetic in dental surgery is



Answer: 3



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68. Serpeck process may be used to prepare

- A. cyanide
- B. isocyanide
- C. ammonia
- D. nitric acid

Answer: 3



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69. The cyanide ion, CN^- and N_2 are isoelectronic. But in contrast to CN^- , N_2 is chemically inert because of
- A. low bond energy
 - B. absence of bond polarity
 - C. unsymmetrical electron distribution
 - D. presence of more number of electrons in bonding orbitals.

Answer: 2



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70. Conditions for the formation of NH_3 in Haber's process are

- A. High temperature, low pressure
- B. Optimum temperature, high pressure
- C. High temperature, high pressure
- D. Optimum temperature, low pressure

Answer: 2



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71. Conc. HNO_3 is treated with iron. The metal is passive because

- A. it is a transition metal
- B. it forms protective oxide film
- C. it is reduced
- D. it liberates laughing gas

Answer: 2



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72. Which one has the highest percentage of nitrogen?

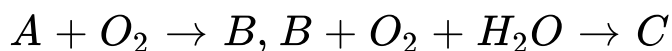
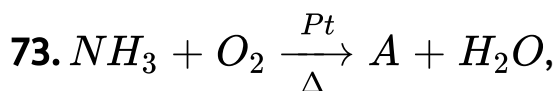
- A. Urea
- B. CAN
- C. Ammonium nitrate

D. Calcium nitrate

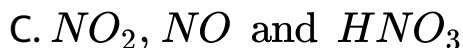
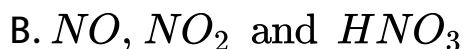
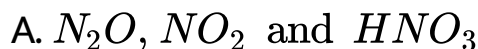
Answer: 1



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Substances A, B and C of the above sequence of reactions are



D. N_2O , NO and HNO_3

Answer: 2



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74. Which one of the following is used to remove moisture from ammonia?

A. Anhydrous $CaCl_2$

B. CaO

C. P_4O_{10}

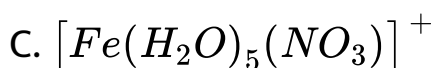
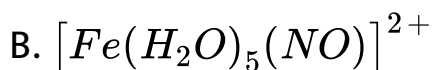
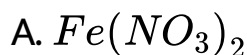
D. Conc. H_2SO_4

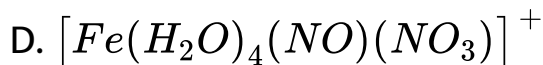
Answer: 2



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75. When dilute ferrous (Fe^{2+}) salt solution is added to an aqueous solution containing nitrate (NO_3^-) ion followed by the addition of conc. H_2SO_4 forms a brown colored ring. What is the chemical composition of the complex that is responsible for this brown colored ring.





Answer: 2



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Objective Exercise - 3 (PREVIOUS NEET/AIPMT QUESTIONS)

1. The electronegativity difference between N and F is greater than that between N and H yet the dipole moment of NH_3 (1.5 D) is larger than that of NF_3 (0.2D)

This is because

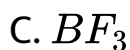
- A. In NH_3 the atomic dipole and bond dipole are in the opposite directions whereas in NF_3 these are in the same direction
- B. In NH_3 as well as in NF_3 the atomic dipole and bond dipole are in the same direction
- C. In NH_3 the atomic dipole and bond dipole are in the same direction whereas in NF_3 these are in opposite directions
- D. In NH_3 as well as in NF_3 the atomic dipole and bond dipole are in opposite directions

Answer: 3



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2. In which of the following molecules are all the bonds are not equal?



Answer: 2



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3. How many bridging oxygen atoms are present in P_4O_{10} ?

A. 6

B. 4

C. 2

D. 5

Answer: 1



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4. Oxidation state of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$ are respectively

A. +3, +5, +4

B. +5, +3, +4

C. +5, +4, +3

D. +3, +4, +5

Answer: 4



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5. Which of the following statements is not valid for oxoacids of phosphorus?

A. Orthophosphoric acid is used in the manufacture of triple superphosphate.

B. Hypophosphorous acid is a diprotic acid

C. All oxoacids contain tetrahedral four coordinated phosphorus

D. All oxoacids contains atleast one $\text{P} = \text{O}$ unit and one $\text{P} - \text{OH}$ group

Answer: 2



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6. Strong reducing behaviour of H_3PO_2 is due to

A. high electron gain enthalpy of phosphorus

B. high oxidation state of phosphorus

C. presence of two - OH groups and one P-H bond

D. presence of one - OH group and two P-H bonds

Answer: 4



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7. The product obtained as a result of a reaction of nitrogen with CaC_2 is

A. $CaCN_3$

B. Ca_2CN

C. $CaCN_2$

D. $CaCN$

Answer: 3



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

A. Phosphinic acid is a monoprotic acid while

Posphonic acid is a diprotic acid.

B. Phosphinic acid is a diprotic acid while Posphonic

acid is a monoprotic acid.

C. Both are diprotic acids

D. Both are triprotic acids

Answer: 1



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Objective Exercise - 4 (Assertion (A) & Reason (R) Type Questions)

1. (A) : P_4 is more reactive than N_2 .

(R) : $P - P$ bonds are relatively weaker than $N \equiv N$

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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2. (A) N_2O is called laughing gas

(R) N_2O causes hysterical laugh.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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3. (A): Nitrogen can form pentahalides

(R): Nitrogen does not possess vacant d-orbitals in the valance shell

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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4. (A) H_3PO_3 is dibasic acid and H_3PO_4 is tribasic

(R) H_3PO_3 has two replaceable H - atoms and H_3PO_4

has three replaceable H - atoms

A. Both (A) and (R) are true and (R) is the correct
explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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5. (A) White phosphorous is more reactive than Red P

(R) White phosphorous possesses high bond angle strain of 60°

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



Watch Video Solution

6. (A) The heat of formation of NH_3 is -46.1 KJ/mole
- (R) NH_3 possess intermolecular hydrogen bonds in

liquid state

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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7. (A): Thermal stability of VA group hydrides decreases from NH_3 to BiH_3

(R): The dissociation energy of M - H bond! increases down the group regularly

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 3



8. (A) White precipitate of silver chloride gets dissolved in NH_4OH solution.

(R) NH_3 reacts with $AgCl$ to form a soluble complex with formula $[Ag(NH_3)_2]Cl$.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



Watch Video Solution

9. (A) Anhydrous nitric acid can be obtained by distillation of conc. HNO_3 with P_4O_{10} .

(R) HNO_3 is a strong acid.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



Watch Video Solution

10. (A): HNO_3 is a stronger acid than HNO_2 .

(R): There are two nitrogen-oxygen bonds in HNO_3 , whereas in HNO_2 there is only one such bond.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



Watch Video Solution

11. (A): NO_3^- and CO_3^{2-} ions are isoelectronic.

(R): Nitrate ion is planar

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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12. (A) In brown ring test Fe^{+2} ion reduce nitrates to nitric oxide

(R) NO_3^- is stabilized by resonance

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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13. (A) In PF_5 , 'P' has two types of P - F bond lengths
(R) In PF_5 , 'P' undergoes sp^3d hybridisation with trigonal bipyramidal structure and possess unequal bond angles and bond lengths

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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14. (A): Nitrous oxide is called laughing gas.

(R): Nitrous oxide is a linear molecule.

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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15. (A): Nitrogen is unable to show a valency more than three.

(R): Nitrogen does not have vacant d-orbitals in its valence shell.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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16. (A): Central atom usually forms three single and one double bonds in an oxyacid of phosphorus

(R): Phosphorus atom usually undergoes sp^3 hybridisation in its oxyacids

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1





17. (A): Phosphorus is more reactive element of Group VA

(R): $N \equiv N$ bond is relatively stronger.

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



Watch Video Solution

18. (A): Orthophosphoric acid can form two acidic salts and one normal salt

(R): Orthophosphoric acid is a tribasic acid

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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19. (A) : PF_5 , PCl_5 and PBr_3 are known, the pentahalides of nitrogen have not been observed

(R) Phosphorous has lower electronegativity than nitrogen.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



Watch Video Solution

20. (A) : Nitrogen has higher ionization energy than that of oxygen.

(R) : Nitrogen atom has smaller atomic size than that of oxygen.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 3



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21. (A) Dinitrogen is chemically inert

(R) Nitrogen has stable half filled p-subshell

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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22. (A) In PCl_5 axial $P - Cl$ bonds are weaker than equatorial P-Cl bonds.

(R) In PCl_5 axial P-Cl bonds experience greater repulsion from equatorial P-Cl bonds than the repulsion among equatorial P-Cl bonds.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



Watch Video Solution

23. (A) Nitrogen can not form more than three bonds
(R) Nitrogen has three valence electrons.

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 4



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24. (A) PH_3 has the lowest boiling point among the VA group hydrides

(R) PH_3 explodes in presence of oxidising agent like HNO_3

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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25. (A) PCl_3 is non-polar, but PCl_5 is polar

(R) PCl_3 has unsymmetrical structure, but PCl_5 is symmetrical

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 4



Watch Video Solution

26. (A) Ammonia is least volatile among MH_3 type hydrides of group VA elements.

(R) Molecules of ammonia are held together by strong electrostatic forces

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 4



Watch Video Solution

27. (A) Among oxyacids of phosphorus, hypophosphorous acid is the best reductant

(R) More the number of P-H bonds in the oxyacid, more is the reduction ability

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



Watch Video Solution

28. (A) Ammonia can be dried over conc. H_2SO_4

(R) Conc. H_2SO_4 has more affinity to water than to ammonia

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 4



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29. (A) H_3PO_3 is tribasic acid

(R) Three H atoms are directly attached to P atom in a H_3PO_3 molecule.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 4



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30. (A) PF_3 behaves as a Lewis acid

(R) PF_3 has a pyramidal shape

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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31. (A) Liquid ammonia is used for refrigeration

(R) The moisture in ammonia is removed by using CaO

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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32. (A) : NO_3^- is planar whereas NH_3 has pyramidal shape (R) : In NO_3^- sp^2 hybridisation whereas in NH_3 , sp^3 hybridisation takes place with a lone pair

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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33. (A) : Nitrogen is a non metal where as Bismuth is a typical metal

(R) Oxides of Nitrogen are acidic where as Bi_2O_3 is a basic oxide

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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34. (A) Atmosphere contains 78% by volume of nitrogen
(R) Oxygen is the most abundant element in the earth

crust

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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35. (A) Electronegativity of nitrogen is less than that of oxygen

(R) Nitrogen has stable P^3 configuration where as oxygen doesnot have such a configuration

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2





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36. (A) Electronegativity of Sb and Bi are the same

(R) Ionisation enthalpy of Bi is greater than that of Sb

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 3



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37. (A) Among 15th group elements nitrogen has the least B.P where as Bi has the high B.P than N.

(R) Nitrogen is a non metal where as Bi is a metal

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



38. (A) From Nitrogen to phosphorus increase in atomic radii is more when compared to increase in size from P to As

(R) Nitrogen is a gas at room temperature where as P_4 is a solid at room temperature

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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39. (A) N_3H exist but not P_3H

(R) Nitrogen can form effective (P-d) π bonds where as phosphorus cannot form such bonds

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 3



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40. (A): Nitrogen is unable to show a valency more than three.

(R): Nitrogen does not have vacant d-orbitals in its valence shell.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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41. (A) HNO_2 disproportionate to give HNO_3 and NO
(R) In basic media HNO_2 is less stable

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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42. (A) NH_3 is a better reducing agent than PH_3

(R) NH_3 is weaker lewis base when compared to PH_3

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)

- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 4



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43. (A) Nitrogen is a gas, where as phosphorus is a solid
(R) Nitrogen can form (P-P) π bonds in effective manner when compared to phosphorus

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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44. (A) In NH_3 the bond angle is very close to tetrahedral angle

(R) In NH_3 nitrogen atom is SP^3 hybridized

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 1



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45. (A) Boiling point of NH_3 is less than that of SbH_3
(R) In NH_3 hydrogen bonding is observed.

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: 2



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46. (A) N_2O_5 is more acidic than N_2O_4

(R) N_2O_4 is a mixed anhydride where as N_2O_5 is not

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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47. (A) P_4O_{10} is more acidic than N_2O_5

(R) P_4O_{10} is soluble in water where as N_2O_5 is not

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 4



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48. (A) As_2O_3 is less acidic when compared to As_4O_{10}

(R) Arsenic is a metalloid.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 2



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49. (A) PCl_5 is more covalent than PCl_3

(R) Polarising power of P^{5+} is greater than that of P^{3+}

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 1



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50. (A) Among trihalides of nitrogen NF_3 is most stable
(R) NF_3 is a ionic compound.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: 3



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51. (A) NCl_3 is known, but not NCl_5

(R) Nitrogen can not expand its valency beyond four.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

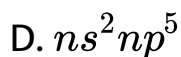
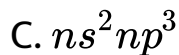
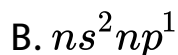
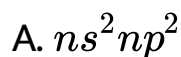
Answer: 1



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LEVEL - I (EXERCISE)

1. The valence shell electronic configuration of VA group elements is :

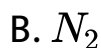


Answer: C



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2. The most abundant element in the earth's atmosphere is



Answer: B



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3. The most abundant VA group element in the earth's crust is

A. Nitrogen

B. Phosphorous

C. Arsenic

D. Bismuth

Answer: B



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LIST - 1

A) Phosphorite

B) Indian salt petre

4. C) Fluoroapatite

D) Chile salt petre

LIST - 2

1) KNO_3

2) $Ba(NO_3)_2$

3) $NaNO_3$

4) $3Ca_3Ca(PO_4)_2 \cdot CaF_2$

5) $Ca_3(PO_4)_2$

The correct match is

- A.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	2	3	5
- B.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
2	4	3	1
- C.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
4	3	5	2
- D.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
5	1	4	3

Answer: D



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5. The following can exist as a diatomic molecule

A. N

B. P

C. As

D. Bi

Answer: A



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6. The following VA group element occurs even in free state

A. Bi

B. As

C. Sb

D. N

Answer: D



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7. The VA group element having more number of allotropes is

A. N

B. P

C. Bi

D. Sb

Answer: B



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8. Most reactive allotropic form of Phosphorous is

A. Yellow

B. Red

C. Black

D. Scarlet

Answer: A



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9. (A) : P_4 is more reactive than N_2 .

(R) : $P - P$ bonds are relatively weaker than $N \equiv N$

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

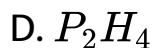
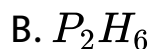
D. (A) is false but (R) is true

Answer: A



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10. Diphosphine is



Answer: D



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11. The chemical inertness of nitrogen is due to

A. half - filled '2p' orbitals of Nitrogen

B. high bond dissociation energy

C. completely filled d - orbitals

D. its gaseous nature

Answer: B



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12. The maximum covalency of nitrogen is

A. 2

B. 3

C. 4

D. 5

Answer: C



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13. The VA group element which exhibits wide range of oxidation states is

A. P

B. As

C. Bi

D. N

Answer: D



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14. The oxidation state of nitrogen in hydrazine is

A. -1

B. -2

C. $+1$

D. $+2$

Answer: B



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15. The stable oxidation state of Bismuth is

A. + 1

B. + 5

C. - 3

D. + 3

Answer: D



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Substance	Oxidation state of N
A) HNO_3	1) - 3, + 5
B) NH_4NO_3	2) - 1 / 3
16. C) N_3H	3) + 5
D) H_3PO_3	d) + 3
	5) + 1 / 3

The correct match is

- A.

A	B	C	D
3	1	2	4
- B.

A	B	C	D
5	2	3	4
- C.

A	B	C	D
1	2	3	4
- D.

A	B	C	D
4	3	2	5

Answer: A



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17. The atomicity of white Phosphorous is 'x' and the $P - \hat{P} - P$ bond angle in the molecule is 'y'. What are 'x' and 'y' ?

A. $x = 4, y = 90^\circ$

B. $x = 4, y = 60^\circ$

C. $x = 4, y = 120^\circ$

D. $x = 4, y = 180^\circ$

Answer: B



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18. Which of the following reacts rapidly with oxygen in the air at ordinary temperature?

A. White P

B. Red P

C. N_2

D. N_2O

Answer: A



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19. The shape and bond angle of white Phosphorous molecules is

- A. Linear and 180°
- B. Trigonal planar and 120°
- C. Tetrahedral and $109^\circ 28^1$
- D. Tetrahedral and 60°

Answer: D



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20. The p-p bond energy is 'x' KJ/mole. Then the energy needed for the dissociation of 124 g of white phosphorous is

A. x KJ

B. 4x KJ

C. 6x KJ

D. 8x KJ

Answer: C



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21. Nitrogen differs from other elements among the VA group, due to

- A. Small atomic size
- B. High electronegativity
- C. Absence of 'd' orbitals
- D. All of these

Answer: D



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22. (A) White phosphorous is more reactive than Red P
(R) White phosphorous possesses high bond angle strain of 60°

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Answer: A



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23. In the statements regarding P_4 molecule

I) The oxidation state is zero

II) The covalency is 4

III) The $P - \hat{P}$ bond angle 60°

The correct combination is

A. Only III is correct

B. I & III are correct

C. All are correct

D. I and II are correct

Answer: B



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24. The statements regarding N₂ molecule are

I) The Bond energy is 945.4 KJ/mole

II) It has triple bond

III) It contains 2 σ and 1 π bond The correct combination is

A. Only II is correct

B. I & II are correct

C. II and III are correct

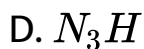
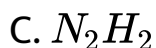
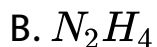
D. All are correct

Answer: B



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25. Acidic hydride of nitrogen is



Answer: D



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26. In Ostwald's process, nitric oxide is prepared by the oxidation of

A. NH_3

B. N_2

C. Air

D. Nitrous oxide

Answer: A



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27. Thermally more stable hydride is

A. NH_3

B. PH_3

C. AsH_3

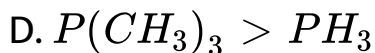
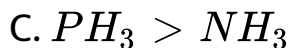
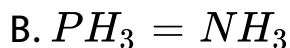
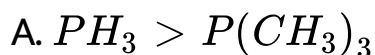


Answer: A



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28. Which one of the following statements is correct with respect to basic character ?

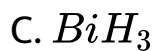


Answer: D



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29. The hydride with more basic nature is

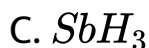


Answer: B



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30. A stronger reducing agent is



Answer: D



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31. The shape and bond angle of ammonia are



B. Tetrahedral and $107^{\circ} 48^1$

C. Pyramidal and $107^{\circ} 18^1$

D. Pyramidal and $109^{\circ} 28^1$

Answer: C



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32. More volatile hydride is

A. PH_3

B. NH_3

C. BiH_3

D. AsH_3

Answer: A



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33. VA group hydrides are Lewis bases due to the presence of

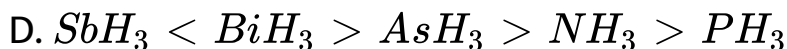
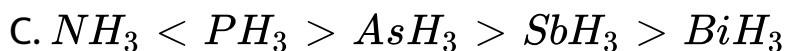
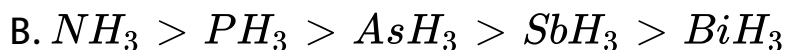
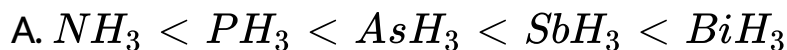
- A. unpaired electrons
- B. high electron affinity values
- C. low electronegativity
- D. lone pair of electrons

Answer: D



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34. The correct order of reducing abilities of VA group hydrides is

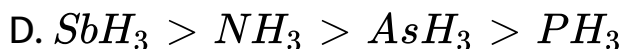
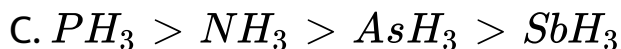
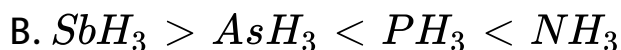
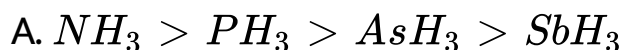


Answer: A



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35. Which is in the decreasing order of boiling points of hydrides?

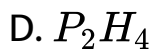
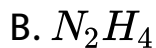


Answer: D



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36. Most basic among the following



Answer: A



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37. NH_3 has a much higher boiling point than PH_3 because



C. NH_3 form hydrogen bond

D. NH_3 contains ionic bonds whereas PH_3 contains covalent bonds

Answer: C



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38. With reference to protonic acids, which of the following statements is correct?

A. PH_3 is more basic than NH_3

B. PH_3 is less basic than NH_3

C. PH_3 is equally as NH_3

D. PH_3 is amphoteric while NH_3 is basic

Answer: B



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39. The bond energies (in KJ mole^{-1}) of $P - H$, $As - H$ and $N - H$ respectively ?

A. 247, 318 and 389

B. 247, 389 and 318

C. 318 , 389 and 247

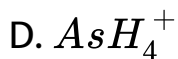
D. 318 , 247 and 389

Answer: D



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40. Which of the following is least stable?



Answer: B



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41. The decreasing values of bond angles from NH_3 to SbH_3 down the group 15 of the periodic table is due to

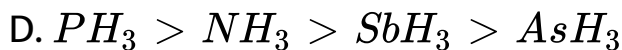
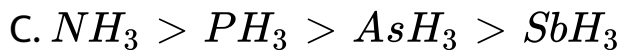
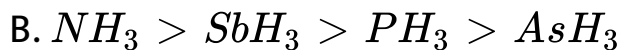
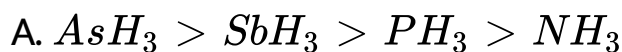
- A. increasing bp - bp repulsion
- B. increasing p - orbital character in sp^3
- C. decreasing lp - bp repulsion
- D. decreasing electronegativity of central atom

Answer: D



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42. What is the order of basic nature of hydrides of VA group elements ?



Answer: C



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43. (A) : NH_3 is a liquid while the other hydrides of V-A

Group elements are gases at room temperature

(R) : NH_3 possess inter molecular hydrogen bonds in liquid state

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Answer: D



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44. (A) : Thermal stability of VA group hydrides decreases from NH_3 to BiH_3

(R) : The bond dissociation energy of M - H bond increases down the group regularly

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C



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45. 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 : Ease of replacing H with Cl decreases from NH_3 to BiH_3

IV : Ease of formation of hydrides decreases from NH_3 to BiH_4

The correct statements are:

A. I , II , III, IV

B. I , III and IV

C. I, II and IV

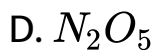
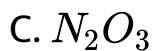
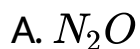
D. I and IV

Answer: A



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46. Chemical formula of laughing gas is



Answer: A





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47. Ammonium nitrate on heating gives

A. NO

B. N_2

C. N_2O

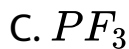
D. N_2O_4

Answer: C



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48. Trihalide which does not undergo hydrolysis easily is

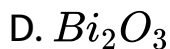
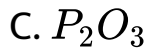
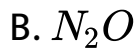
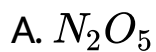


Answer: C



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49. Which of the following exists as dimer

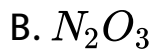
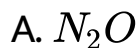


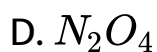
Answer: C



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50. Paramagnetic oxide is



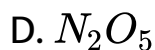
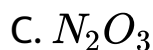


Answer: C



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51. The oxide of nitrogen existing in the solid state at room temperature is



Answer: D



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52. The neutral oxide of nitrogen is

A. NO

B. N_2O

C. NO_2

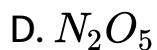
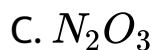
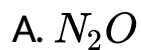
D. Both 1 and 2

Answer: D



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53. The sesquioxide of nitrogen is



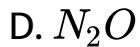
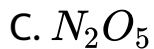
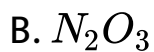
Answer: C



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54. Which is a mixed anhydride?



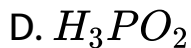
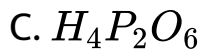
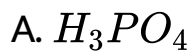


Answer: A



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55. Glacial phosphoric acid is



Answer: B



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56. Which one of the following elements does not form the compound M_4O_{10} . (M = element of group VA)?

A. P

B. Sb

C. As

D. Bi

Answer: D



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57. The number of Oxygen atoms present around Nitrogen in N_2O_5 is

A. 2

B. 1

C. 3

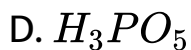
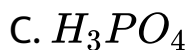
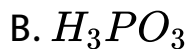
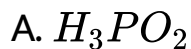
D. 4

Answer: C



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58. P_4O_6 is the anhydride of the following

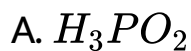


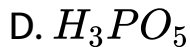
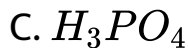
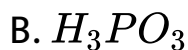
Answer: B



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59. P_4O_{10} is the anhydride of the following



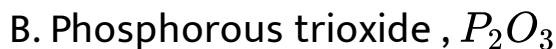


Answer: C



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60. When orthophosphoric acid is strongly heated the product formed is



D. Metaphosphoric acid , HPO_3

Answer: D



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61. The number of hydroxyl groups in pyrophosphoric acid is

A. 3

B. 4

C. 5

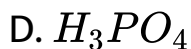
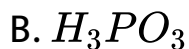
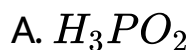
D. 7

Answer: B



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62. The acid that forms primary, secondary and tertiary phosphates is

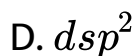
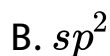
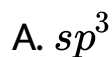


Answer: D



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63. In the oxyacids of phosphorous the hybridisation of phosphorous is

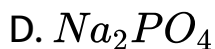
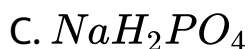
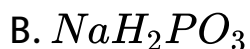


Answer: A



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64. Which of the following is not an acidic salt?



Answer: A



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65. Regarding H_3PO_5 the wrong statement is

A. It's basicity is three

B. Oxidation state P in it is + 5

C. It contains O - O linkage

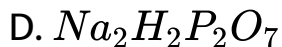
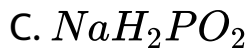
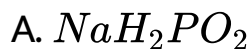
D. It can form a dimer

Answer: D



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66. Which of the following is an acidic salt?



Answer: C



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67. In H_3PO_3 molecule

- A. P - atom is surrounded by three - OH groups
- B. P - atom is tetrahedrally surrounded by two - OH groups , one oxygen atom and one hydrogen atom
- C. P - atom is surrounded by four - OH groups
- D. P - atoms is surrounded by two - H atoms

Answer: B



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68. The reducing strength of oxyacid of the Phosphorous depends on

- A. The number of - atoms directly attached to P
- B. The number of H - atom attached to oxygen atom
- C. The number of O - atoms attached to P - atoms
- D. The number of P - atoms

Answer: A



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69. The following are some statements about HNO_2

i) It undissociated forms are tautomers

ii) It's undissociated forms are resonance structures

iii) Its anhydride in pure state exists as plane blue solid

and that melts to deep blue liquid

The correct combination is

A. All are correct

B. i,iii are correct

C. ii,iii are correct

D. i,ii are correct

Answer: B



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70. The following are some statements about oxyacids of VA group elements

i) The salt of nitric acid contains NO_3^- ion

ii) The salt of phosphoric acid contains PO_4^{3-} ion

iii) Salts of meta phosphoric acid contains HPO_3^{2-} ion

The correct combination is

A. All are correct

B. i,iii are correct

C. ii,iii are correct

D. i,ii are correct

Answer: D



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71. The statements regarding oxyacids of phosphorous are

- i) HPO_3 molecule is monobasic acid
- ii) $H_4P_2O_6$ molecule has $P - P$ bond
- iii) $H_4P_2O_7$ molecule has $P - O - P$ linkage

The correct combination is

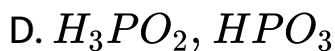
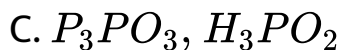
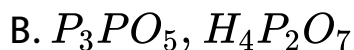
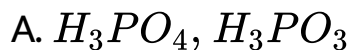
- A. All are correct
- B. Only ii is correct
- C. ii & iii are correct
- D. i & ii are correct

Answer: A



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72. Which pair of oxyacids of phosphorus contains 'P-H' bonds ?



Answer: C



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73. In the preparation of HNO_3 by Ostwald process ammonia is

- A. reduced
- B. oxidised
- C. reduced and oxidised
- D. hydrolysed

Answer: B



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74. NH_4Cl on heating with NaOH liberates

- A. NaCl

B. NH_3

C. HCl

D. NaCl

Answer: B



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75. Aqueous NaOH reacts with white Phosphorous to form Phosphine and

A. NaH_2PO_2

B. P_2O_5

C. Na_3PO_3

D. P_2O_3

Answer: A



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76. Ammonia gas is dried over

A. Quick lime

B. Conc H_2SO_4

C. P_2O_5

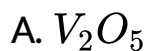
D. $CaCl_2$

Answer: A



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77. The catalyst used in the manufacture of ammonia by Haber's process is



B. Fe

C. Ni

D. Co

Answer: B



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78. The material used for the manufacture of ammonia by cyanamide process is

- A. Coal
- B. Lime
- C. Nitrogen
- D. All

Answer: D



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79. The mixture of Calcium Cyanamide and graphite is called

A. Nitration mixture

B. Soda lime

C. Nitrolim

D. Aquaregia

Answer: C



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80. Which of the following compound is not used as fertilizer

A. Ammonium sulphate

B. Urea

C. Calcium super phosphate

D. $Ca_3(PO_4)_2$

Answer: D



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81. Which of the following can serve as a solvent for both ionic and covalent compounds?

A. Liquid ammonia

B. H_2O

C. Benzene

D. CCl_4

Answer: A



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82. Calcium cyanamide on hydrolysis with steam gives



Answer: B



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83. Which of the following is used as refrigerant

A. Liquid NH_3

B. C_2H_5Cl

C. CCl_2F_2

D. All

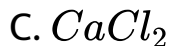
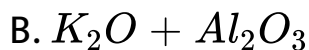
Answer: D



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84. The catalyst used in cyanamide process is

A. Fe

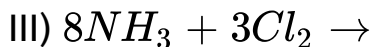
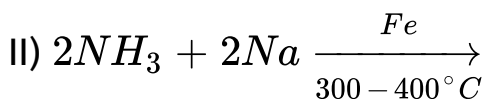
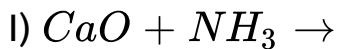


Answer: C



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85. Which of the following reactions yield elementary gases like N_2 , H_2 , O_2 as the byproducts ?



A. I and II only

B. II, III and IV only

C. I, II and III only

D. All of these

Answer: D



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86. Calcium cyanamide on treatment with steam under pressure gives ammonia and

A. Calcium carbonate

B. Calcium hydroxide

C. Calcium oxide

D. Calcium bicarbonate

Answer: A



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87. Conditions for the formation of NH_3 in Haber's process are

A. High temperature , low pressure

B. Optimum temperature , high pressure

C. High temperature , high pressure

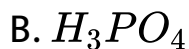
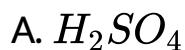
D. Optimum temperature , low pressure

Answer: B



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88. Calcium super phosphate is prepared from phosphate using the acid



Answer: A



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89. Superphosphate of lime is an example of
phosphate

A. 1°

B. 2°

C. 3°

D. 4°

Answer: A



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90. Among of the following the most soluble in water is

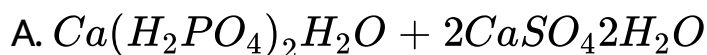
- A. superphosphate
- B. triple phosphate
- C. calciumphosphate
- D. calcium sulphate

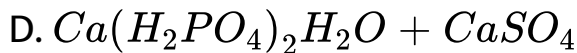
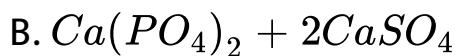
Answer: B



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91. Which of the following is calcium super phosphate ?





Answer: A



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92. To avoid the water product CaSO_4 superphosphate is changed into

A. Monophosphate

B. Diphosphate

C. Triple phosphate

D. Tetra phosphate

Answer: C



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93. Which of the following is not correct?

A. Ammonia is used refrigerant

B. A mixture of $Ca(CN)_2$ and C is known as nitrolim

C. A mixture of $Ca(H_2PO_4)_2$ and $CaSO_4 \cdot 2H_2O$

known as superphosphate of lime

D. Hydrolysis of NCl_3 gives NH_3 and $HOCl$

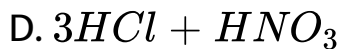
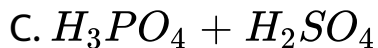
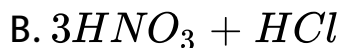
Answer: B



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LEVEL - I (LECTURE SHEET) (EXERCISE - I) (Single & One or More than One Correct Answers)

1. Aquaregia is a mixture of



Answer: D



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2. Which of the following is true for allotropes of phosphorous?

A. Yellow phsphorus is soluble in CS_2 while red phosphorus is not

B. P - P - P bond angle is 60° in red phohorus

C. On heating in air, white phosphorus change to red

D. white phosphorus will slowly change to red phosphorus at ordinary temperatures.

Answer: A::D



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3. The VA group elements are present in the Earth's crust as

A. Nitrates

B. Phophates

C. Carbonates

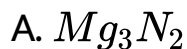
D. Sulphates

Answer: A::B



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4. Which of the following give ammonia with water



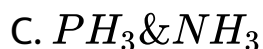
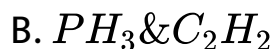
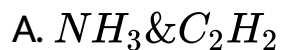
D. all

Answer: D



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5. Substance used in Home's signal is :



D. all

Answer: B



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6. PH_3 can be obtained by :

A. heating hypophosphorus acid

B. heating orthophosphorus acid

C. reacting white phosphorus with hot conc. NaOH

D. all

Answer: C



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7. The correct order of reducing power of MH_3 is

A. $NH_3 < PH_3 < SbH_3 < BiH_3$

B. $PH_3 < AsH_3 < BiH_3 < SbH_3$

C. $BiH_3 < SbH_3 < PH_3 < NH_3$

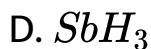
D. $PH_3 < AsH_3 < SbH_3 < BiH_3$

Answer: A::D



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8. Which of the following do not have any tendency to act as ligands during complex formation ?

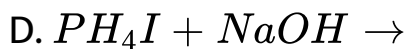
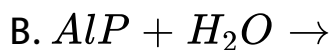


Answer: A::C::D



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9. Which of the following reactions can evolve PH_3



Answer: A::B::D



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10. Extra pure N_2 can be obtained by heating :

A. NH_3 with CuO

B. NH_4NO_3

C. $(NH_4)_2Cr_2O_7$

D. $Ba(N_3)_2$

Answer: D



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11. Liquid Ammonia is similar to H_2O as a solvent .

Ammonia can form the following ions in liquid state by ionisation

A. NH_4^+



D. all

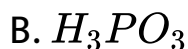
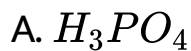
Answer: A::B

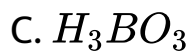


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LEVEL - I (LECTURE SHEET) (EXERCISE - II)

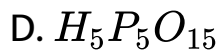
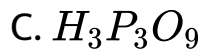
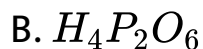
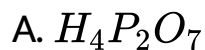
1. The acid which forms two series of salts is :





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2. Which one of the following is a cyclic oxoacid ?



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3. The number of $P \rightarrow O$ or $P = O$ and $P - O - H$ bonds in H_3PO_4 are :

A. 3,1

B. 2,2

C. 1,2

D. 1,3



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1. Terrorists often use ammonium nitrate fertilizer as an ingredient in car bombs . When ammonium nitrate explodes, it decomposes to gaseous nitrogen , oxygen and water vapour. The force of the explosion results from the sudden production of a huge volume of hot gas. It has been claimed that NH_4NO_3 fertilizer $(NH_4)_2HPO_4$ Analysis of such a desensitized sample of NH_4NO_3 showed the mass % nitrogen to be 33.81%

An explosive mixture called Amatol contains :

A. 80% NH_4NO_3 + 20 % TNT

B. 50% NH_4NO_3 + 50 % TNB

C. NH_4NO_3 + Al

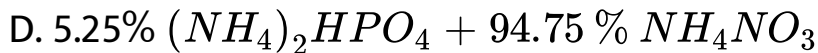
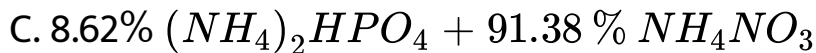
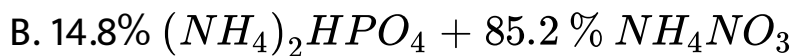
D. C + NH_4NO_3



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2. Terrorists often use ammonium nitrate fertilizer as an ingredient in car bombs . When ammonium nitrate explodes, it decomposes to gaseous nitrogen , oxygen and water vapour. The force of the explosion results from the sudden production of a huge volume of hot gas. It has been claimed that NH_4NO_3 fertilizer $(NH_4)_2HPO_4$ Analysis of such a disensitized sample of NH_4NO_3 showed the mass % nitrogen to be 33.81% NH_4NO_3 on explosion gives



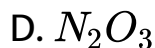


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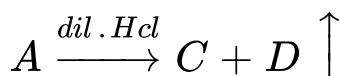
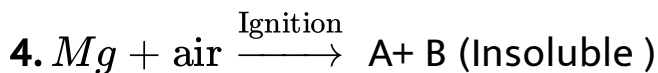
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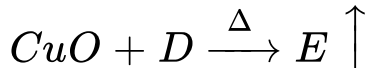
of NH_4NO_3 showed the mass % nitrogen to be 33.81%

NH_4NO_3 on explosion gives



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Which can Increase the solubility of AgCl in water ?

A. B

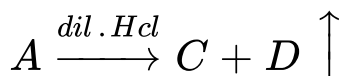
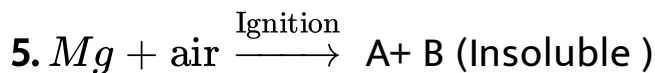
B. D

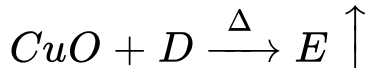
C. E

D. C

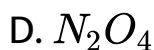
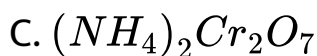


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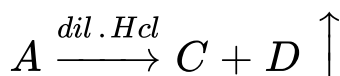
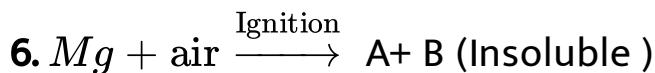


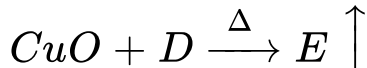


'E' can be prepared by heating



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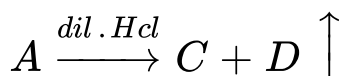
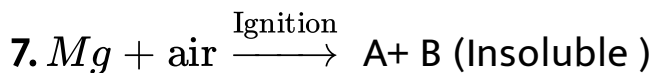


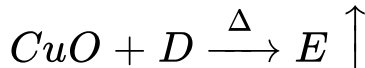
Correct statment about 'D' is

- A. It is a Lewis acid
- B. It can act as a strong ligand
- C. It is a good oxidant
- D. It is neutral to Litmus



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Correct statment about 'E'

A. It is an acidic gas

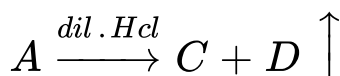
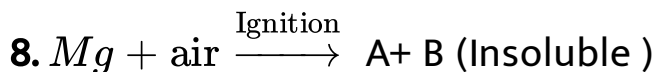
B. It I a basic gas

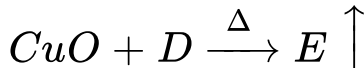
C. It can be prepared by heating NH_4NO_2

D. It can be obtained by heating NH_4Cl with NaOH

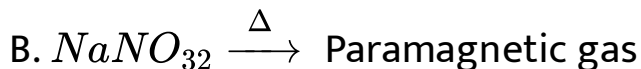
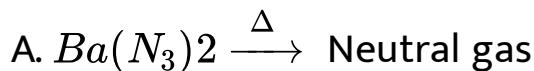


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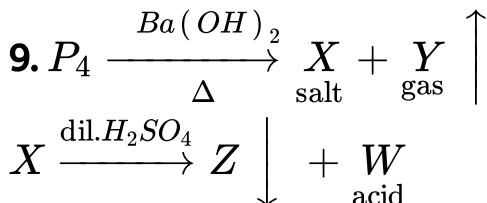




What is not correct ?



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Which statement is correct ?

A. The anion of salt 'X' cannot have a Lewis base

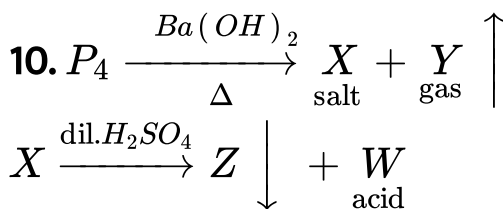
B. Gas 'Y' is a better than NH_3

C. W' is tribasic acid

D. oxidation state of 'P' in 'X' is + 3



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Which is correct in view of 'W' ?

A. It's shape is planar

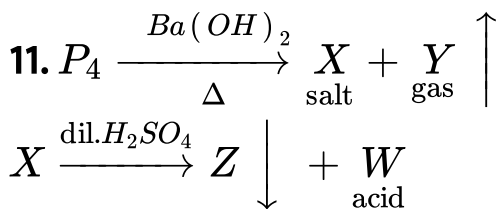
B. It is a dibasic acid

C. It can be a reducing agent

D. It has three 'P - OH' linkages



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Which is incorrect about Y?

A. It usually ignites due to presence of P_2H_4

B. It is less soluble than NH_3 in water

C. It has $107^{\circ}28^1$ bond angles

D. It can be obtained by hydrolysis of Ca_3P_2



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LEVEL - I (LECTURE SHEET) (EXERCISE - III)

1. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN - I COLUMN - II

A) NO_2^+ p) 180°

B) NO_2 r) 132°

C) NO_2^- r) 120°

D) NO_3^- s) 115°



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2. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN - I

(Mixtures)

A) N_2 and CO

B) N_2 and O_2

C) N_2 and NH_3

D) PH_3 and NH_3

COLUMN - II

(Solution used for separation)

p) Water

p) H_2SO_4

r) Ammonical $CuCl$

s) Pyrogallol



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3. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes

given below the lists :

COLUMN-I

(Metal with HNO_3)

- A) Mg +very dil. HNO_3
- B) Zn + dil. HNO_3
- C) Sn + dil. HNO_3
- D) Pb + dil. HNO_3

COLUMN-II

(Main product)

- p) NO
- q) H_2
- r) N_2O
- s) NH_4NO_3



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4. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

- A) HOCl
- B) HNO_3
- C) H_3PO_4
- D) HClO_4

COLUMN-II

(anhydride)

- p) N_2O_5
- q) Cl_2O_7
- r) Cl_2O
- s) P_4O_{10}



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5. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

- A) Hypo phosphorous acid
- B) Orthophosphoric acid
- C) Orthophosphorous acid
- D) Pyrophosphoric acid

COLUMN-II

- p) Only one hydrogen is ionizable in water
- q) Two hydrogen are ionizable in water
- r) Three hydrogens are ionizable in water
- s) Four hydrogens are ionizable in water



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6. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes

given below the lists :

COLUMN-I

- A) CO_2
- B) SO_2
- C) NO_2
- D) N_2O

COLUMN-II

- p) Acidic oxide
- q) Colourless
- r) Paramagnetic
- s) Coloured



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7. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

- A) $4\text{NH}_3 + 5\text{O}_2 \rightarrow$
- B) $\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} \rightarrow$
- C) $\text{NH}_4\text{NO}_3 \rightarrow$
- D) $\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta}$

COLUMN-II

- p) $\text{PbO} + \text{NO}_2 + \text{H}_2\text{O}$
- q) $\text{N}_2\text{O} + \text{H}_2\text{O}$
- r) $3\text{NaH}_2\text{PO}_2 + \text{PH}_3$
- s) $4\text{NO} + 6\text{H}_2\text{O}$



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8. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

- A) NH_3
- B) N_2O_3
- C) PCl_5
- D) NH_4^+

COLUMN-II

- p) sp^3d , trigonal bipyramidal
- q) sp^3 , tetrahedral
- r) anhydride of nitrous acid
- s) sp^3 , pyramidal



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9. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

- A) $\text{NCl}_3 + \text{H}_2\text{O} \rightarrow$
- B) $\text{PCl}_3 + \text{H}_2\text{O} \rightarrow$
- C) $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow$
- D) $\text{PF}_3 + \text{H}_2\text{O} \rightarrow$

COLUMN-II

- p) HOCl
- q) H_3PO_4
- r) H_3PO_3
- s) No Hydrolysis



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10. Match COLUMN-I (Species) with COLUMN-II (O-N-O angle) and select the correct answer using the codes given below the lists :

COLUMN-I

(Oxy acid)

- A) H_3PO_2
- B) H_3PO_3
- C) H_3PO_4
- D) $\text{H}_4\text{P}_2\text{O}_6$

COLUMN-II

(Basicity)

- p) Tribasic
- q) Mono basic
- r) Tetrabasic
- s) Dibasic



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LEVEL - I (LECTURE SHEET) (EXERCISE - IV) (Integer answer type Questions)

1. The brown ring complex is formulated as $[Fe(H_2O)_5NO^+]SO_4$. The Oxidation state of Fe is X. What is the value of X?



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2. How many number of bond pairs are present in NO_3^- ?



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3. The element which forms oxides, with all oxidation states from +1 to +5 belongs to which group in the

periodic table ?



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4. The number of $p\pi - d\pi$ bonds in H_3PO_4

What is the value of X ?



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5. The volume of 0.1 M NaOH solution required to neutralise the solution produced by dissolving 1.1 g of P_4O_6 in water is $Y \times 100$. What is the value of Y ?



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6. How many number of P - O - P bonds in P_4O_{10} ?



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7. The catenation power of a 'N' in its compound where 'N' shows fractional oxidation state is 'X' .



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8. In triple phosphate the available P_2O_5 when compared to normal super phosphate is increased by how many times ?



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9. HPO_3 has the ability to form metaphosphates, which can be polymerised. Calogon is a salt of HPO_3 . How many times is it polymerised?



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10. The number of peroxy bonds in H_3PO_5 is 'X'. What is the value of 'X'?



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EXERCISE

1. White phosphorous (P_4) has :

- A. Six P - P single bond
- B. Four P - P single bond
- C. Four lone pairs of electrons
- D. PPP angle of 60°

Answer: A::C::D



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2. Cane sugar reacts with conc. HNO_3 to give :

- A. NO_2 and H_2O

B. Oxalic acid

C. CO_2 and H_2O

D. H_2CO_3

Answer: A::B



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3. $(NH_4)_2Cr_2O_7$ on heating gives:

A. Cr_2O_3

B. N_2

C. H_2CrO_4

D. NH_3

Answer: A::B



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4. Nitrogen is comparatively inactive because :

- A. Of its stable electronic configuration
- B. The bond dissociation energy of the nitrogen molecule is high
- C. Its molecular size is small
- D. Its electronegativity is fairly high

Answer: B::C



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EXERCISE (Linked Comprehension type questions)

1. In order to maintain soil fertility , it is necessary to add containing nitrogen , phosphorous and potassium in the form of manures. Manures are two type they are a) Natural and b) Artificial ,

Artificial manures are chemical compounds obtained by artificial mean containing N,P or K. These chemical compounds are generally called fertilizers. The chemical substance which are added to the soil as to make up the deficiency of essential elements are called fertilizers.

Every chemical compounds of N,P , & K can be used as

fertilizer and it must have characteristic properties.

Fertilizers are classified according to the element (N,P or K) which they are supplied to the soil.

complete manure is that which supplies

A. S,K and N

B. S and N

C. N,K and P

D. S,N and P

Answer: C



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2. In order to maintain soil fertility , it is necessary to add containing nitrogen , phosphorous and potassium in the form of manures. Manures are two type they are a) Natural and b) Artificial ,

Artificial manures are chemical compounds obtained by artificial mean containing N,P or K. These chemical compounds are generally called fertilizers. The chemical substance which are added to the soil as to make up the deficiency of essential elements are called fertilizers.

Every chemical compounds of N,P , & K can be used as fertilizer and it must have characteristic properties. Fertilizers are classified according to the element (N,P

or K) which they are supplied to the soil.

Super phosphate of lime is obtained by treating

- A. Calcium phosphate with HCl
- B. Calcium phosphide with HCl
- C. Calcium phosphate with H_2SO_4
- D. Calcium phosphate with NaOH

Answer: C



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3. In order to maintain soil fertility , it is necessary to add containing nitrogen , phosphorous and potassium

in the form of manures. Manures are two type they are
a) Natural and b) Artificial ,

Artificial manures are chemical compounds obtained by artificial mean containing N,P or K. These chemical compounds are generally called fertilizers. The chemical substance which are added to the soil as to make up the deficiency of essential elements are called fertilizers.

Every chemical compounds of N,P , & K can be used as fertilizer and it must have chracteristic properties.

Fertilizers are classified according to the element (N,P or K) which they are supplied to the soild.

A compound of N,H,C and 'O' which is used as a fertilizer

A. CAN

B. urea

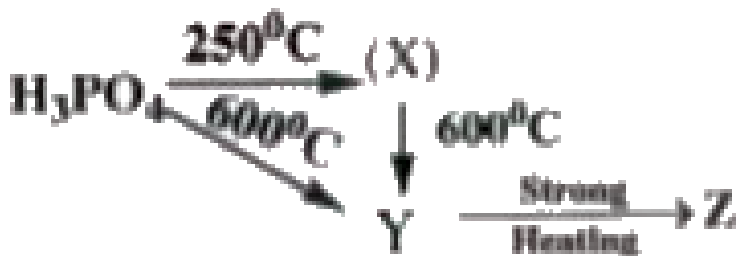
C. NPK

D. Thomas slag

Answer: B

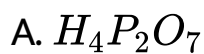


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4.

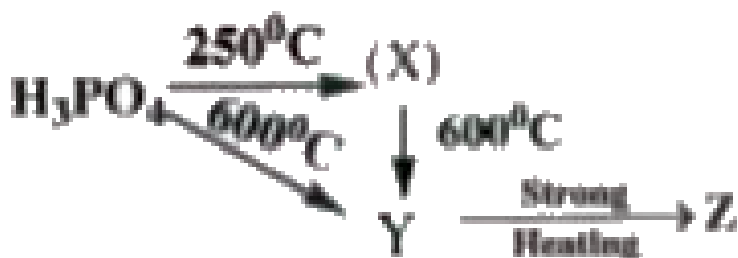
What is X.



D. None

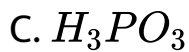
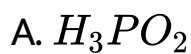
Answer: A

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5.

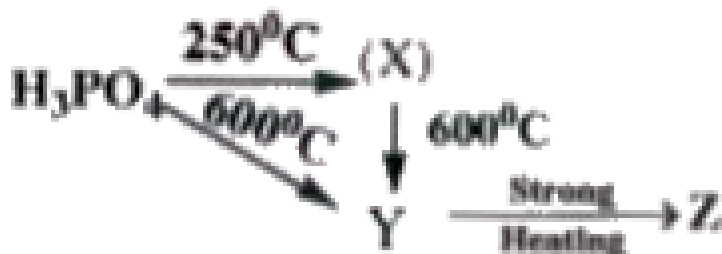
What is X.



D. None

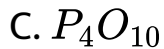
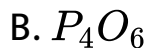
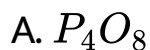
Answer: B

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6.

Z is



D. None

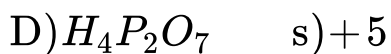
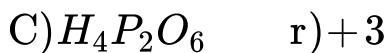
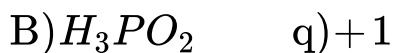
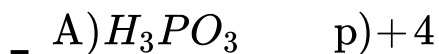
Answer: C



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COLUMN - I COLUMN - II

(oxo - acid) (ox.state of P)



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COLUMN - I
(Super script
indicates O.S)

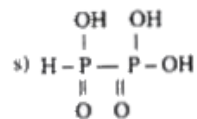
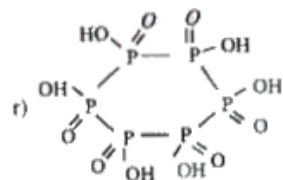
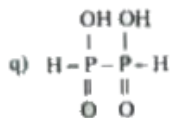
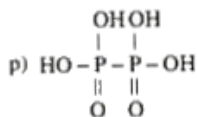
A) P^2-P^2 acid

B) $(P^3)_6$ ring acid

C) P^2-P^4 acid

D) P^4-P^4 acid

COLUMN - II



8.



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EXERCISE (Integer answer type Questions)

1. When ammonia is heated with cupric oxide. How many electrons will each ammonia molecule lose.



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2. The sum of formal change of oxygen in PO_4^{3-} which is attached to P' atom through double bond ___



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3. In trimetaphosphate ion, the ratio of no. of oxygen atoms and P-O-P bond is/are ___



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4. The atomicity of yellow phosphorous is ____



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5. The ratio of number of single and double P—Q bonds in P_4O_{10} is/are ____



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6. Graham's salt is one of the salt of Phosphorous acid having formula $(NaPO_3)_n$ What is the value of n.



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PRACTICE SHEET - 3 (Single or more than one option questions)

1. Very pure nitrogen can be obtained by the thermal decomposition of

A. Barium azide

B. Sodium azide

C. Either a or b

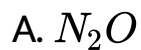
D. None

Answer: C



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2. Following are neutral oxides except

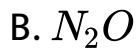


Answer: C



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3. Fe^{+3} oxidises NH_2 to

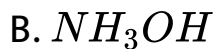
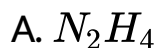


Answer: B



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4. All of the following are bases except



D. N_3H

Answer: D



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5. Fe^{+2} reduces NH_2OH to

A. NH_3

B. N_3H

C. $N_2 - (4)$

D. N_2

Answer: A



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6. N_2O is formed when

A. Moist Fe reacts with NO

B. Sn^{2+} reacts with conc. HNO_3 in presece of HCl

C. Cold dil HNO_3 reacts with Zn

D. All the above

Answer: D



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7. Select incorrect statments about N_2O_4

A. It self ionises as NO^+ , NO_3^-

B. Substance containing NO^+ is said to be acid and
that containing NO_3^- is said to be base

C. It is para magnetic

D. It is dimer of NO_2

Answer: C



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8. NaOCl reacts with NH_3 to produce.....

A. NH_2OH

B. $NH_2 \cdot NH_2$

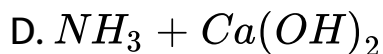
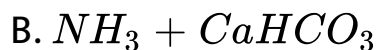
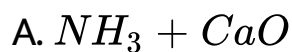


Answer: B



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9. Calcium cyanamide on treatment with steam produces

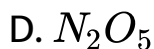
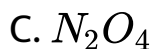
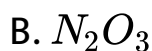
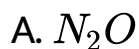


Answer: C



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10. Which blue liquid is obtained on reacting equi molar amounts of two gases at $-30^{\circ}C$?



Answer: B



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11. N_2H_4 and H_2O_2 show similarity in

- A. Hybridisation of central atoms
- B. Oxidising nature
- C. Reducing nature
- D. Molar mass

Answer: B::C::D



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12. N_2H_2 reduces IO_3^- / H^+

A. to I^+

B. with I_2 as an intermediate by violet colour in CCl_4 layer

C. to I^-

D. indicated by blue colour with starch

Answer: A::B::D



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13. Which of the following metals continue to burn in nitrogen gas

A. Li

B. Mg

C. Zn

D. Pb

Answer: A::B



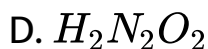
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14. Which of the following acids is/are produced by dissolving NO_2 in water ?

A. HNO_2

B. HNO_4

C. HNO_3



Answer: A::C::D



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15. Which of the following statements (s) is/ are true

.....

A. NO_2 can be prepared by heating $Pb(NO_3)_2$

B. NO_2 is red brown gas

C. NO_2 is paramagnetic

D. NO_2 is a basic gas

Answer: A::B::C



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PRACTICE SHEET - 3 (Linked Comprehension type questions)

1. Which of the following gases gives a brown precipitate with $FeSO_4$ solution

A. N_2

B. NO

C. NO_2

D. N_2O_4

Answer: B

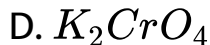
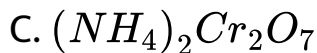


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2. An orange colour solid (A) on heating gives a colourless gas (B) and colourless vapours (C) which on condensation gives a colourless neutral liquid and a green residue (D) which is a metal oxide. Gas - B gives a pungent odoured gas when reacts with hydrogen catalytically. Neutral liquid above formed converts anhydrous copper sulphate to blue

Compound 'A' in the above paragraph is





Answer: C



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3. An orange colour solid (A) on heating gives a colourless gas (B) and colourless vapours (C) which on condensation gives a colourless neutral liquid and a green residue (D) which is a metal oxide. Gas - B gives a pungent odoured gas when reacts with hydrogen catalytically. Neutral liquid above formed converts

anhydrous copper sulphate to blue

Gas 'B' in the above paragraph is

A. H_2

B. O_2

C. N_2

D. Cl_2

Answer: C

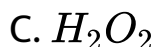


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4. An orange colour solid (A) on heating gives a colourless gas (B) and colourless vapours (C) which on

condensatio gives a colourless neutral liquid and a green residue (D) which is a metal oxide. Gas - B gives a pungent odoured gas when reacts with hydrogen catalytically. Neutral liquid above formed converts anhydrous copper sulphate to blue

Neutral liquid formed in the reaction is



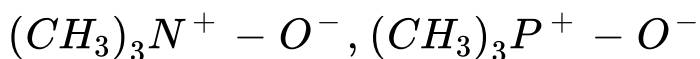
D. None

Answer: B



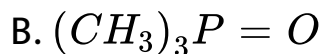
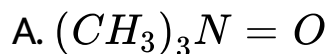
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5. Trimethyl amine oxide and trimethyl phosphine oxide can be represented as



Answer the following questions based on these

Select the correct structure



C. Both a & b

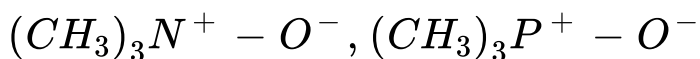
D. None

Answer: B



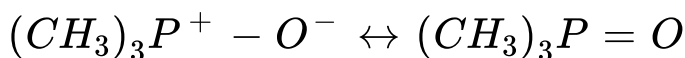
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6. Trimethyl amine oxide and trimethyl phosphine oxide can be represented as



Answer the following questions based on these

Triphenyl Phosphine oxide can be respectively by two canonical forms but trimethyl amine oxide can't be



It is due to

A. Phosphorus accepts charge density from oxygen

and accomodates it in its vacant d - orbitals

B. Nitrogen does not posses d - orbitals and thus

can't form the π - bonded structure

C. Both (a) and (b)

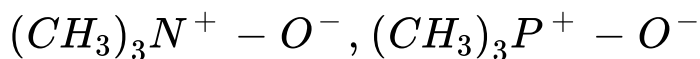
D. None forms canonical forms

Answer: C



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7. Trimethyl amine oxide and trimethyl phosphine oxide can be represented as



Answer the following questions based on these

Trimethyl Phosphine oxide is stable because

A. It has two resonating structures

B. $P = O$ has high dissociation energy

C. Both (a) and (b)

D. None

Answer: C



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PRACTICE SHEET - 3 (Match the following questions)

COLUMN - I (Salt)

P) NH_4Cl

Q) NH_4NO_3

R) $(NH_4)_3PO_4$

S) $(NH_4)_2SO_4$

T) $(NH_4)_2Cr_2O_7$

U) $(NH_4)_2HPO_3$

COLUMN - II (property)

a) Water soluble

b) Canary yellow ppt with ammonium molybdate

c) Brown ppt with Nessler's reagent

d) White ppt with aq. $BaCl_2$

e) Produce N_2O on heating

f) Gives brown ring test

g) Produce nitrogen gas on heating

h) contains acidic hydrogen

1.



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**COLUMN - I
(Oxide)**

P) NO

Q) N_2O

R) N_2O_3

S) N_2O_4

**COLUMN - II
(Character)**

a) Coloured

b) Acidic

c) Neutral

d) Exist below -50°C

e) Ionic solid

f) Colourless

2.



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PRACTICE SHEET - 3 (Integer answer type Questions)

1. NO_3^- is reduced to NH_4^+ What is the change in oxidation number of nitrogen



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2. Total number of bonds in NH_3 is



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3. In the oxidation of N_2H_4 to N_2 equivalent weight of N_2H_4 would be.....



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4. How many of the following are coloured
 N_2O , NO , NO_2 , O_2 , N_2O_3



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5. How many of the following species have reducing properties ?



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6. How many of the following compounds gives nitrogen on heating



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PRACTICE SHEET - 4 (Single or more than one option questions)

1. In P_4 (tetrahedral)

- A. Each P is joined to four P
- B. Each p is jonied to three P
- C. Each P is joined to two P
- D. None

Answer: B



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2. Which forms $p\pi - p\pi$ multiple bonds with itself and with C and O ?

A. P, As

B. N, As

C. N,P

D. N

Answer: D



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3. Glacial phosphoric acid is

A. HPO_3

B. H_3PO_3

C. H_3PO_4

D. $H_4P_2O_7$

Answer: C



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4. The number of P-O-P bonds in cyclic meta phosphoric acid is

A. 0

B. 2

C. 3

D. 4

Answer: C



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5. The solid PCl_5 exists as

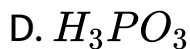
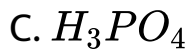


Answer: D



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6. which of the following acid will be formed only when P_2O_3 ?



Answer: D



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7. Red and white Phosphorous will differ but not in

A. smell

B. Solubility in $CHCl_3$

C. Exhibiting phosphorescence

D. Reactions with HNO_3

Answer: D



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8. Compound used in safety matches is

A. P_4S_3

B. P_4

C. P_2O_5

D. PCl_3

Answer: A



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9. In the preparation of red Phosphorous from within Phosphorous

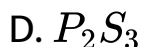
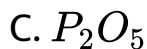
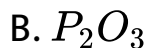
- A. MnO_2 is used as catalyst
- B. White phosphorus is treated in electric furnace
- C. A little iodine is used as catalyst
- D. The gas P_4 is released

Answer: C



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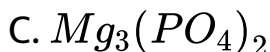
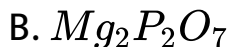
10. Compounds A undergoes hydrolysis to produce a colourless gas with rotten fish smell. The gas gives a vortex ring. The gas is



Answer: A



11. When a mixture of NH_4Cl , NH_4OH and Na_2HPO_4 was added to a solution containing Mg^{+2} a white precipitate (A) was formed. When A was heated strongly, residue B was obtained. A & B are



Answer: A::B



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12. Pyrophosphorus acid $H_2P_2O_5$

- A. Contain P + 5 oxidation state
- B. Is a dibasic acid
- C. Is oxidizing in nature
- D. Contains one P - O - P bond

Answer: B::D



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13. Identify the correct statements (s)

A. Red P_4 is less volatile than white P_4

B. Red P_4 is more volatile than white P_4

C. Reducing properties of hypophosphorous acid is due to O H bonds

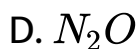
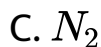
D. Hypophosphoric acid has one P - O - P bond

Answer: A



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14. When PbO_2 reacts with conc. HNO_3 , the gas evolved is

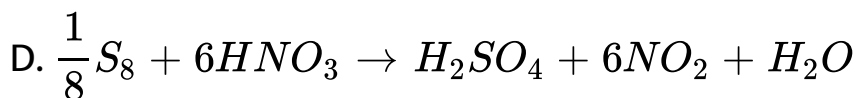
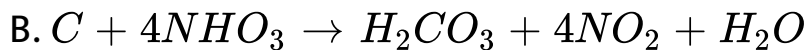
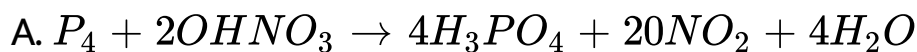


Answer: A::B



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15. Which of the following equations is not correctly written



Answer: B



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16. PH_3 can be obtained by heating

A. White phosphorus with not concentrated alkali

B. Heating phosphinic acid (H_3PO_2)

C. Heating phosphinic acid (H_3PO_3)

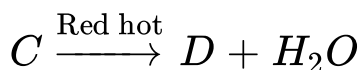
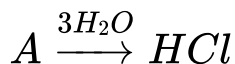
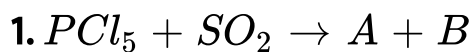
D. Heating phosphinic acid (H_3PO_4)

Answer: A::B::C



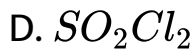
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PRACTICE SHEET - 4 (Linked Comprehension type questions)



Compound 'A' is

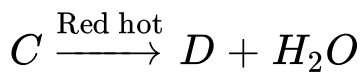
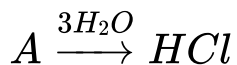
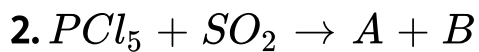




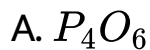
Answer: A

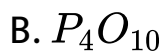


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Compound 'D' is

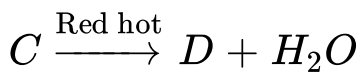
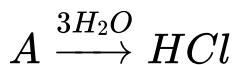
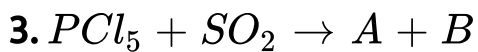




Answer: A

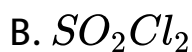


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Compound 'B' is





Answer: A



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4. PCl_5 in solid state exists as PCl_4^+ and PCl_6^- and

also in some solvents it undergoes dissociation as



The geometry and hybridisation of PCl_4^+ is

A. Tetrahedral, sp^3

B. Octahedral , sp^3d^2

C. Linear , sp

D. Angular , sp^2

Answer: A



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5. PCl_5 in solid state exists as PCl_4^+ and PCl_6^- and

also in some solvents it undergoes dissociation as



The geometry and hybridisation of PCl_6^- is

A. Octahedral , sp^3

B. Octahedral , sp^3d^2

C. Trigonal bipyramid sp^3d

D. See - saw , sp^3d

Answer: A



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6. PCl_5 in solid state exists as PCl_4^+ and PCl_6^- and

also in some solvents it undergoes dissociation as



Which statement is wrong ?

A. In PCl_5 all the P - Cl bonds are of same energy

B. PCl_5 has no lone pair of electrons

C. PCl_5 is a white solid which melts at $167^\circ C$

D. PCl_5 gives white fumes with moist air

Answer: A



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PRACTICE SHEET - 4 (Match the following questions)

COLUMN-I

- A) PH_3
- B) HNO_3
- C) H_3PO_3
- D) N_2O_5

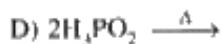
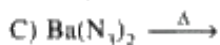
COLUMN-II

- p) Acidic in nature
- q) Oxidising agent
- r) Reducing agent
- s) Basic in nature

1.



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COLUMN-I**COLUMN-II**

2.



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PRACTICE SHEET - 4 (Integer answer type Questions)

1. The number of sp^3 atoms in cyclotrimeta phosphoric acid is



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2. Number of dative bonds (including σ & π) in P_4O_{10} molecule is



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3. The number of oxygen atoms bonded to one phosphorous atom in P_4O_{10} is



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4. The number of bridge hydrogen atoms in diborane is



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5. The total number of lone pairs in PH_3 molecule is



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6. The difference between bond order in N_2 & P_4 is



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PRACTICE SHEET - 5 (Single or more than one option questions)

1. The pair that act as both oxidising and as well as reducing agent is

A. NO , SO_3

B. NO_2 , H_2O_2

C. CO_2 , SO_2

D. N_2O_5 , O_3



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2. The ease of hydrolysis of trichlorides of group - 15 elements decrease in the order

A. $NCl_3 > PCl_3 > AsCl_3 > SbCl_3 > BiCl_3$

B. $PCl_3 > NCl_3 > AsCl_3 > SbCl_3 > BiCl_3$



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3. The bond angle in PH_3 is less than bond angle in PF_3 This is due to

A. Enhanced repulsions due to the presence of double bond in PF_3

B. Increases bond pair - bond pair repulsions due to multiple bond

C. Both (a) and (b)

D. Displacement of electron cloud in P - F bond towards F in PF_3



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4. In N_2O , the N - N distance corresponds to

A. $N = N$

B. $N \equiv N$

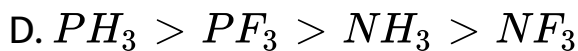
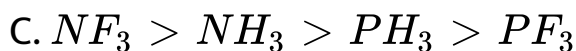
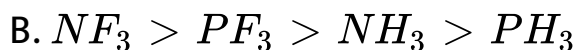
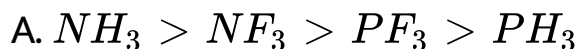
C. $N - N$

D. Intermediate of $N = N$ and $N \equiv N$



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5. Arrange the following in decreasing order of bond angle



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6. The kinetically more stable alltrope of phosphorus is

A. Red phosphorus

B. Black phosphorus

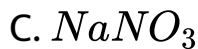
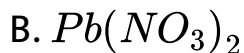
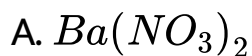
C. Yellow phosphorus

D. White phosphorus



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7. A colourless salt gives a white ppt (soluble in ammonium acetate) and a brown coloured pungent gas on reaction with conc. H_2SO_4 . The salt is



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8. $BiCl_3$ on hydrolysis form a white ppt of

A. Bismuth acid

B. Bismuth oxychloride

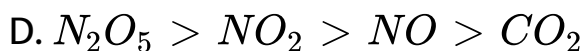
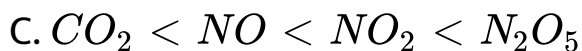
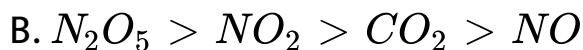
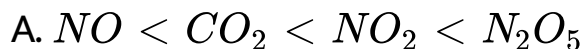
C. Bismuth pentachloride

D. Bismuth hydride



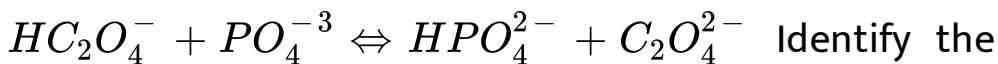
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9. Choose the correct increasing order of acidic strength



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10. Consider the ionic reaction :



Identify the incorrect statement (s)

A. The above equilibrium mixture can act as buffer

(both acids have nearly the same dissociation constant)

B. $HC_2O_4^-$ and $C_2O_4^{2-}$ are conjugate acid - base pairs

C. The P - O bond order in PO_4^{3-} is 1.75

D. The C - O bond order in $C_2O_4^{2-}$ is 1.50



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PRACTICE SHEET - 5 (Single or more than one option questions) s

1. Which of the following statements are correct

- A. If an electron is removed by oxidising NO, the nitrosonium ion NO^+ is formed
- B. In NO^+ , the bond order is 3.0
- C. The N - O bond length contracts from 1.15Å in NO to 1.06Å in NO^+

D. NO is coloured gas the presence of an unpaired electron



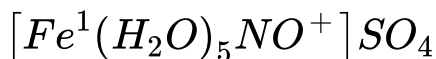
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2. In the dark brown ring test for nitrate ions

A. The colour is due to charge transfer spectra

B. Iron has a formal +2 oxidation state and NO has no charge

C. The complex species can be represented as



D. The dark brown colour is due to NO_2 evolved in the reaction



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3. Select the correct statement(s) about the compound $NO[BF_4]$

A. It has 5σ and 2π bonds

B. Nitrogen - oxygen bond length is higher than in nitric oxide (NO)

C. It is a diamagnetic species

D. B - F bond length in this compound is lower than
in BF_3



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4. Select the correct statement(s)

A. NF_3 is a weaker base than NH_3

B. NO^+ is more stable than O_2^+

C. $AlCl_3$ has a higher melting point than AlF_3

D. $SbCl_3$ is more covalent than $SbCl_5$



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5. Which of the following order (s) is/are correct ?

A. $H_3PO_4 > H_3PO_3 > H_3PO_2$ (reducing character)

B. $N_2O < NO < N_2O_3 < N_2O_5$ (oxidation state on nitrogen)

C. $NH_3 > PH_3 > AsH_3 > SbH_3$ (basicity)

D. $SbH_3 > NH_3 > AsH_3 > PH_3$ (reducing character)



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6. Which of the following metal nitrates give oxides on heating ?

A. Li

B. Mg

C. Na

D. Ca



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7. When white phosphorus was boiled with caustic soda a gas 'A' and the compound 'B' were obtained . When the gas 'A' was passed through $AgNO_3$ solution , a black precipitate 'C' was obtained

The product 'C'

A. $+3, -3$

B. $-3, -3$

C. $-3, +1$

D. $+3, +5$



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8. When white phosphorus was boiled with caustic soda a gas 'A' and the compound 'B' were obtained . When the gas 'A' was passed through $AgNO_3$ solution , a black precipitate 'C' was obtained

The correct statement regarding the reaction between white phosphorus and caustic soda is

- A. The reaction can occur when red phosphorus is used instead of white phosphorus
- B. It is a disproportionation reaction
- C. The reaction can not occur when KOH is used instead of NaOH

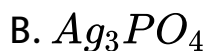
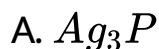
D. The phosphorus get reduced from 0 to -1 in the reaction

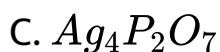


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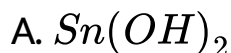
The product 'C'

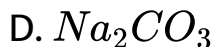
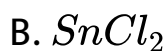




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10. An inorganic compound (A) that is transparent like glass is strong reducing agent. It hydrolyzes in water to give white turbidity (B). Aqueous solution of A gives white ppt (C) with NaOH which is soluble in excess NaOH. (A) reduces I_2 and give chromyl chloride test 'A' will be





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11. An inorganic compound (A) that is transparent like glass is strong reducing agent. It hydrolyzes in water to give white turbidity (B). Aqueous solution of A gives white ppt (C) with NaOH which is soluble in excess NaOH. (A) reduces I_2 and give chromyl chloride test 'A' will be

A. $\text{Sn}(\text{OH})\text{Cl}$, 2

B. SnCl_4 .1

C. Na_2SnO_2 , 2

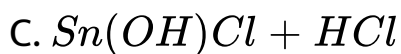
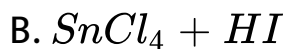
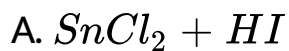
D. SnCl_2 , 2



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12. An inorganic compound (A) that is transparent like glass is strong reducing agent . It hydrolyzes in water to give white turbidity (B). Aqueous solution of A gives white ppt (C) with NaOH which is soluble in excess NaOH. (A) reduces I_2 and give chromyl chloride test

A reduces I_2 and gives chromyl chloride test. What will be the product ?



D. None



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