CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

GROUP 15 ELEMENTS

Problems

1. N_2, CO, CN^- and NO^+ are isoelectronic but the former is chemically inert and later three are very reactive, why?

Watch Video Solution

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

Watch Video Solution

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.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

7. What happens when barium azide is heated ?

Watch Video Solution

8. Phosphorus can expand its valency. Why?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

13. PCI_5 is less stable. Why?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

16. Phosphine is technically used in Holme's signals. Substantiate.

Watch Video Solution

17. In the preparation of P_4O_6, a mixture of N_2 and O_2 is used rather than pure O_2 Why?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

21. HNO_3 is an oxidising agent but H_3PO_4 is not. Explain.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

24. How is tautomerism different from resonance ?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

27. Nitric acid acts as oxidant, while nitrous acid as both oxidant and reductant. Why?

Watch Video Solution

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

Watch Video Solution

29. $Al_2O_3 + N_2 + C \rightarrow X + CO$,

$X + H_2O \rightarrow Y + Z$

'Y' is an amphoteric substance. When aqueous 'Z' is treated with $AICI_3$ solution again 'Y' is formed. What are X, Y and Z?

Watch Video Solution

Exercise 1 1 1

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

4. Mention the oxidation numbers of the elements of nitrogen family in their compounds.Write suitable examples.

Watch Video Solution

5. Discuss the electronic configuration of elements of group 15.

Watch Video Solution

6. Write on the allotropy of group VA elements.

Watch Video Solution

Exercise 1 1 2

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

4. Write the hydrolysis reactions of the halides : NCl_3, PCl_3, PCl_5, P_4O_6 and P_4O_{10}

Watch Video Solution

Exercise 11 3

1. Write on the strcutural aspects of nitrous and nitric acids.

Watch Video Solution

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

Watch Video Solution

3. Comment on the acidic nature of phosphoric acid.

Watch Video Solution

4. Nitrogen behaves different from rest of the elements of the same group. Explain.

Watch Video Solution

Exercise 11 4

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

Watch Video Solution

2. How is ammonia prepared in cyanamide process?

Watch Video Solution

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

Watch Video Solution

4. Nitrous acid acts as oxidant as well as reductant. Give suitable examples.

Watch Video Solution

5. How is nitric acid prepared on a large scale by Birkland and Eyde's process? Write the principle and equations.

Watch Video Solution

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

Watch Video Solution

Exercise 1 2

1. Discuss the structure and bonding in P_4 molecule.

Watch Video Solution

2. What is allotropy ? Give the allotropes of oxygen.

Watch Video Solution

3. Comment on the $M-M$ bond strengths and catenation ability of group 15 elements.

Watch Video Solution

4. Elemental phosphorus is not diatomic like nitrogen. Explain.

Watch Video Solution

5. Write the difference between the properties of white phosphorus and red phosphorus.

Watch Video Solution

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

Watch Video Solution

7. Nitrogen is trivalent, but phosphorus is pentavalent in its compounds. Explain.

Watch Video Solution

8. PH_3 is stable in air, but catches fire when heated at 425K. Why?

Watch Video Solution

9. Discuss the stability of hydrides of group 15 elements.

Watch Video Solution

10. Write the trends in bond length, bond angle, and boiling points of MH_3 type hydrides.

Watch Video Solution

11. Nitrogen forms several oxides. Why?

Watch Video Solution

12. Nitrous oxide supports combustion more vigorously than air. Why?

Watch Video Solution

13. In case of phosphorus trihalides, bond angle increases from PF_3 to PI_2. Why?

Watch Video Solution

14. NH_3 and NF_3 are both pyramidal. What observations are made on the difference in bond angles, bond polarities and dipolemoments?

Watch Video Solution

15. The correct order of bond angles is $NO_2^+ > NO_2 > NO_2^-$. Discuss.

Watch Video Solution

16. Copper metal gives different products on reaction with nitric acid. Illustrate.

Watch Video Solution

17. Discuss the structure and basicity of orthophosphorus acid.

Watch Video Solution

18. Draw the structures of -ous acids of phosphorus and discuss their reduction ability.

Watch Video Solution

Watch Video Solution

19. What hapens when the following are heated?

(a) orthophosphoric acid and (b) sodiumdihydrogen orthophosphate.

Watch Video Solution

20. Nitrogen behaves abnormally from the other elements of the same group. Discuss?

Watch Video Solution

21. Trimethylamine is a stronger base than trisilylamine. Justify.

Watch Video Solution

22. What is the ratio of product gases, nitric oxide and nitrogen dioxide formed when phosphorus is treated to nitric acid?

Watch Video Solution

23. Concentrated nitric acid turns yellow in sunlight. Why?

Watch Video Solution

24. How the products of oxidation of metals with nitric acid depend?

Watch Video Solution

25. How is ammonia prepared from lime and coke?

Watch Video Solution

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

Watch Video Solution

27. Ammonia is used as refrigerant. Why?

Watch Video Solution

28. Though $N - F$ in NF_3 is a polar bond, the experimental bond length is greater than the theoretically predicted value. Explain.

Watch Video Solution

29. A waxy crystalline solid (X) with a garlic odour is obtained by burning white phosphorus in air. X reacts vigorously with hot water forming an acid and gas Y. Y is neutral towards litmus and produces a black residue Z when passed through cupric sulphate, What are Y and Z?

Watch Video Solution

30. Compound 'A' is an unstable pale blue solution of an acidic oxide. 'A' decolourises bromine water as well as acidified permanganate. 'A' oxidises stannous chloride in hydrochloric acid solutions. Predict the acid 'A' and its unhydride.

Watch Video Solution

31. Nitrous acid is considered as a factomaric mixture of two forms. Write its structures.

Watch Video Solution

32.

$NH_3 + O_2 \rightarrow X + H_2O, X + O_2 \rightarrow Y, Y + H_2O \rightarrow Z + X$ and $Z + Zn$

.

What are X and Z in the above sequence of reactions?

Watch Video Solution

33. A colourless inorganic salt (X) decomposes at $300^{\circ} C$ to give products Y and Z, leaving no residue. Z is neutral liquid oxide at room temperature and Y is a colourless diamagnetic neutral oxide. White phosphorus burns in excess Y, produce a strong dehydrating agent and most abundant gas in earths atmosphere. Write all equations related.

Watch Video Solution