CHEMISTRY

PHYSICAL, INORGANIC, AND ORGANIC CHEMISTRY

NITROGEN & OXYGEN FAMILY

Solved Example

1. Give reason, why elemental nitrogen exists as a diatomic molecule, whereas elemental phosphorus is a tetratomic molecule.

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2. Why does nitrogen show catenation properties less than prosphorus.

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3. Write the allotropic forms of oxygen.

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4. Which allotropic form of sulphur is stable at room temperature ?

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5. Out of following forms of sulphur which one is paramagnetic in nature and why ? S_8, S_6 and S_2

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6. Describe the changes which occur on heating sulphur

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

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8. Explain the high reactivity of white phosphorus as compared to red phosphorus.

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9. Why are pentahalides more covalent than trihalides?

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10. Explain why NH_3 is basic while BiH_3 is only feebly basic ?

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11. Write the reaction of thermal decomposition of sodium azide

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12. What happens when: ltbr (a) $NH_4Cl \ \& \ NaNO_3$ is heated strongly (b) $(NH_4)_2CO_3$ is heated. (c) NH_4NO_2 is heated.

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13. $P_4 + NaOHundeset(\text{warm})$ to Products.

Explaine the reducing character of one of the products obtained by taking the example of copper sulphate.

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14. (A) Colourless salt $+NaOH \xrightarrow{\Delta} (B)$ gas + (C) alkaline solution

(C) $+Zn(\text{dust}) \xrightarrow{\text{warm}}$ gas (B) , (A) $\xrightarrow{\Delta} \underbrace{\text{gas} \ \ (D) + \text{liquid}(E)}_{\text{both triatomic}}$

Gas (B) given white fumes with HCl. Identify (A) to (E) and write the chemical reaction involved

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15. Anhydrous $CaCl_2$, P_4O_{10} or concentrated H_2SO_4 can not be used as drying agent for ammonia.Why ?

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16. Why NH_3 gas cannot be dried by passing over P_2O_5, $CaCl_2$ and H_2SO_4 ?

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17. What happens ?

(a)When phosphine is heated at $150^\circ C$.

(b)When phosphine is dissolved in water in presence of light.

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18. Black $(A) + H_2SO_4 \rightarrow (B)\text{gas} + (C)$

$(B) + (CH_3COO)_2Pb \rightarrow (D)$ black ppt.

$(C) + K_3\left[Fe(CN)_6\right] \rightarrow (E)$ blue.

(C) also decolourilses acidified $KMnO_4$.Identify (A) to (E)

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19. NO_2 can not be dried by an alkali, why ?

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20. O_3 is a powerful oxidising agent. Write equation to represent oxidation of

(a)I^- to I_2 in acidic solution,

(b)sulphur to sulphuric acid in the presence of moisture,

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21. Give the important applications of O_3

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22. Ozone layer is being depleted. This is due to :

A. NO emission from supersonic jets

B. chloroflurocarbon used as aerosols

C. both A and B

D. none of the above

Answer:

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25. SO_2 and Cl_2 both are used as bleaching agent. What factors cause bleaching ?

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26.

$$\text{Acid salt(A)} \xrightarrow{\text{heat}} (B) \xrightarrow{HCl} (C)\text{gas} \xrightarrow{Cr_2O_7^{2-}/H^+} (G)\ \text{green}$$

Molar mass 84

$(B) \downarrow BaCl_2$ white ppt (D) solube in HCl $\downarrow Br_2$water White ppt(H)

$(C)\text{gas} \downarrow Ca(OH)_2$ Milkyness appears $\downarrow (G)\text{gas}$ Milkyness disappears (F)

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27. Illustrate, how copper gives different products on reaction with HNO_3.

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28. (i) Sodium salt of an acid (A) is formed on boiling white phosphorus with NaOH solution.

(ii) On passing chlorine through phosphorus kept fused under water, another acid (B) is formed.

(iii) Phosphorus on treatment with concentrated HNO_3 given an acid (C) which is also formed by the action of dilute H_2SO_4 on powdered phosphorite rock.

(iv) (A) on treatment with a solution of $HgCl_2$ first gives a white precipitate of compound (D) and then a grey precipitate of (E). Identify (A) to (E) and write balanced chemical equation for the reactions at steps (i) to (iv)

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29. Why concentrated H_2SO_4 can not be used for drying H_2S?

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30. Can PCl_5 act as oxidising as well as reducing agent ? Justify.

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31. क्या होता है जब PCl_5 को गर्म करते हैं?

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32. Colourless salt (A) decolourise I_2 solution and gives white precipitate (change to black) with $AgNO_3$ solution. (A) also produces pink colour with $FeCl_3$ solution. Identigy (A) and explain reactions.

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33. In the following reaction explain which one is oxidising agent and which one is reducing agent ?

$H_2O_2 + O_3 \rightarrow 2O_2 + H_2O$

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Exercise 1

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

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

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3. Which allotropic form of sulphur is thermodynamically stable at room temperature and pressure ?

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4. The important source of phosphorus is phosphorite rocks which is mainly phosphates. The same chemical compound is also present in bones. What is the formula of the compound(s)

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

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6. Nitrogen shows different oxidation states in the range ___ to ___. It most stable oxidation state is ___

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

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8. Why sulphur in vapour state exhibits paramagnetic behaviour at above $800^\circ C$

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9. Write the following for a white phosphorus molecule

(a) oxidation state of P (b) covalency of P (c) total number of bonds (d) bond order (e) bond angle (f) geometry

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10. Tellurium forms oxides of the formula TeO, TeO_2 and TeO_3. What is the nature of these tellurium oxides ?

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11. Write the structure and oxidation number of sulphur in tetrathionate ion.

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

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13. Write the oxyacids of the following

Oxide	Oxyacids
N_2O_3	
NO_2 / N_2O_4	
N_2O_5	
P_4O_6	
P_4O_{10}	

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

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15. On moving down the group from O to Te acidic strength increases, why ?

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16. What happens when barium azide is heated ?

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17. Which stable elements of 15^{th} and 16^{th} group do not react with water under normal conditions ?

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18. Chemiluminescence is a phenomenon in which on element glows in dark when exposed to moisture. Which element of 15^{th} group shows this phenomenon ?

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19. Among the hydrides of group 16, water shows unsual boiling point. Why ?

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20. Ammonium salts generally resemble those of postassium and rubidium in solubility & sturcture. Give reason

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21. Write balanced equation when NH_3 is dissolves in

(a) water (b) HCl (c) $aq.\ CO_2$

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

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

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24. How is hydrazine prepared ?

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25. 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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26. In the preparation of P_4O_6, a mixture of N_2 and O_2 is used rather than pure O_2, why ?

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27. A compound of 15^{th} group element is used as a fast drying agent in the laboratory. If is

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28. Write the structures of the oxides: N_2O_3, N_2O_5

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29. Why does NO_2 dimerise ?

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30. In the manufacture of sulphuric acid by the contact process, sulphur trioxide is not directly dissolved in water. Why ?

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31. How are SO_2Cl_2. SO_3 and SO_2 obtained from sulphuric acid ?

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32. Sulphur on oxidation with hot sulphuric acid gives :

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

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34. A compound 'X' which is a yellowish white powder is prepared by the reaction of white phosphours with excess of dry Cl_2. Identify 'X'

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35. Which hydride of the oxygen family shows the lowest boiling point ?

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36. What happens when

(A) PCl_5 is heated

(b) PCl_5 is reacted with heavy water

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37. Why does PCl_3 fume in moist air ?

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38. Complete and balance the following :

(i)$P_4O_{10} + PCl_5 \rightarrow$ (ii)$NH_3 + NaOCl \rightarrow$

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39. $NAHSO_3 + [X](\text{excess}) + H_2O \rightarrow NaHSO_4 + HI$

$[X] + Na_2S_2O_3 \rightarrow Nal + [Y]$

Identify X and Y ?

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40. Identify the product of the given reaction:

$AgBr + 2Na_2S_2O_3 \rightarrow$ $H_2SO_4(\text{dil}) + Na_2S_2O_3 \rightarrow$ $H_2SO_4(\text{conc.}) +$

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41. A and B are elements with atomic numbers 16 and 17. Write different combinations of binary compounds known from them

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Exercise 1 Part Ii Only One Option Correct Type

1. Which of the following is least reactive?

A. White phosphorous

B. Yellow phosphorus

C. Red phosphorus

D. Black phosphorus

Answer: D

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2. Nitrogen is obtained by the thermal decomposition of :

A. NH_4Cl

B. NH_4NO_3

C. $AgNO_3$

D. NH_4NO_2

Answer: D

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3. In modern proces, white phosphorus is manufactured by :

A. heating a mixture of phosphorite mineral with sand and coke in an electric furnace

B. heating calcium phosphate with lime

C. heating bone ash with coke

D. heating phosphate mineral with sand

Answer: A

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4. The oxidation states of sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$, and $S_2O_6^{2-}$ follow the order

A. $S_2O_6^{2} < CO_4^{2-} < SO_3^{2-}$

B. $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$

C. $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$

D. $S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$

Answer: B

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5. Correct statement about allotropy of sulphur is:

A. Monoclinic sulphur is more stable than Rhombic sulphur at room temperature

B. Both Monoclinic and Rhombic sulphur have same ring structures and crystalline structure

C. Rhombic sulphur exists at room temperature

D. None of these

Answer: C

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6. The nitrogen atom may complete its octet in several ways. Which one is incorrect ?

A. Electron gain to form the nitride Ion, N^{3-} e.g., Li_3N

B. Formation of electron pair bonds e.g. NH_3 or NF_3 Azo compounds $(-N=N-)$

C. Formation of electron - pair bonds with electron gain e.g., Amide ion NH_{2^-} and imide ion NH^{2-}

D. Formation of electron pair bonds with electron gain : NH_{4^+}, $N_2H_5^+$, $(C_2H_5)_4N^+$

Answer: D

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7. $\underset{\text{Ammonium}}{NH_4^+}$, $\underset{\text{Ammonia}}{NH_3}$, $\underset{\text{Amide}}{NH_2^-}$, $\underset{\text{Imide}}{NH^{2-}}$, and $\underset{\text{Nitride}}{N^{3-}}$ are:

A. Isolectronic

B. Isostructural

C. Homologous members

D. Nitrogen has different oxidation state

Answer: A

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8. How many $P = O$ bonds are present in $(HPO_3)_3$?

A. 0

B. 6

C. 3

D. 9

Answer: C

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9. The correct order of sulphur - oxygen bond energy in $S_2O_3^{2-}$, SO_4^{2-}, SO_3 and $S_2O_6^{2-}$ is

A. $S_2O_3^{2-} < SO_4^{2-} < SO_3 < S_2O_6^{2-}$

B. $S_2O_3^{2-} < S_2O_6^{2-} < SO_4^{2-} < SO_3$

C. $S_2O_3^{2-} < SO_4^{2-} < S_2O_6^{2-} < SO_3$

D. $S_2O_6^{2-} < SO_4^{2-} < SO_3 < S_2O_3^{2-}$

Answer: C

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10. Which of the following bonds has the highest energy?

A. Se - Se

B. Te - Te

C. S - S

D. O - O

Answer: C

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11. The wrong statement about N_2O is :

A. It is nitrous oxide

B. It is a neutral oxide

C. It is not a linear molecule

D. It is known as laughing gas

Answer: C

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12. The hydribes of group 15 elements act as :

A. lewis acid

B. lewis base

C. both

D. none

Answer: B

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13. The basic strength of the hydrides of group 15 elements :

A. decreases on moving down the group

B. increases on moving down the group

C. first decrease upto AsH_3 and then increases

D. first increases upto AsH_3 and then decreases

Answer: A

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14. Ammonium salts decompose quite readily on heating :

(i) Ammonium salt of weak oxidizing anion (e.g. Cl^-, CO_3^{2-}, SO_4^{2-}) $\xrightarrow{\text{heat}}$ Gas X

(ii) Ammonium salt of strong oxidizing anion (e.g. NO_2^-, NO_3^-, CiO_4^-, $Cr_2o_7^{2-}$ $\xrightarrow{\text{heat}}$ Gas Y/Z Identify X, Y, Z

A. N_2, NH_3, N_2O

B. NH_3, N_2, N_2O

C. N_2O, NH_3, N_2

D. NO, NH_3, N_2O

Answer: B

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15. Which of the following does not give oxygen on heating?

A. $(NH_4)_2Cr_2O_7$

B. $KClO_3$

C. $Zn(ClO_3)_2$

D. $K_2Cr_2O_7$

Answer: A

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16. Red and white phosphorus will differ but not in:

A. smell

B. solubility in $CHCl_3$

C. exhibiting phosphorescence

D. reaction with concentrated HNO_3

Answer: D

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17. Which of the following is incorrect ?

A. Ammonia is prepared in the laboratory by the action of NaOH on Ammonium salt

B. All the hydrides of 15^{th} group are colourless, highly volatile and poisonous gases

C. Metal phosphides upon hydrolysis given phosphine.

D. Metal phosphides upon hydrolysis give phosphoric acid

Answer: D

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18. $P_4 + NaOH \xrightarrow{\text{warm}}$ Products

Products will be :

A. $H_3PO_4 + PH_3$

B. $PH_3 + NaH_2PO_2$

C. $NaH_2PO_2 + H_3PO_4$

D. H_3PO_4

Answer: B

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19. Hydrolysis of Nitride of s-Block elements (for e.g. Ba_3N_2, Ca_3N_2, Li_3N) will yield

A. $NH_3 +$ Metal hydroxide

B. only NH_3

C. $NH_3 + HNO_3$

D. NH_4OH

Answer: A

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20. The correct order of thermal stability of hydrides of group 15 is

A. $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$

B. $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

C. $PH_3 > NH_3 > AsH_3 > SbH_3 < BiH_3$

D. $AsH_3 < PH_3 > SbH_3 > BiH_3 > NH_3$

Answer: B

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21. One mole of calcium phosphide on reaction with excess of water give:

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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22. H_2S burns in O_2 to form

A. $H_2O + S$

B. $H_2O + SO_2$

C. $H_2O + SO_3$

D. $H_2SO_4 + S$

Answer: B

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23. $PH_3(\text{anhydrous}) + HBr(\text{anhydrous}) \rightarrow X$. Identify X ?

A. H_3BrO_3

B. PH_4Br

C. Br_2

D. P_4

Answer: B

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24. Calcium phosphide reacts with water or dil. HCl and give a compound 'X', which fails to react with HCl but produces dense white fumes with $HI(g)$ due to formation of 'Y'. Compound X and Y respectively

A. $X = PH_3$ and $Y = PH_4I$

B. $X = NaH_2PO_2$ and $Y = H_3PO_2$

C. $X = PH_{4^+}$ and $Y = PH_4I$

D. $X = PH_3$ and $Y = H_3PO_2$

Answer: A

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25. $N_2 \xrightarrow[\text{Haber's Process}]{H_2} X \xrightarrow[\text{Oslwald's Process}]{O_2} Y \xrightarrow{O_2 + H_2O} Z$ Identify X, Y, Z

A. NH_3, NO_2, HNO_3

B. NH_3, NO, HNO_3

C. NO_2, NH_3, HNO_2

D. NH_3, NO, HNO_2

Answer: B

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26. Sulphur trioxide can be obtained by which of the following reactions :

A. $S + H_2SO_4 \xrightarrow{\Delta}$

B. $H_2SO_4 + PCl_5 \xrightarrow{\Delta}$

C. $CaSO_4 + C \xrightarrow{\Delta}$

D. $Fe_2(SO_4)_3 \xrightarrow{\Delta}$

Answer: D

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27. NO_2 can be prepared by heating :

A. NH_4NO_3

B. $NaNO_3$

C. $Pb(NO_3)_2$

D. KNO_3

Answer: C

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28. $HNO_3 + P_4O_{10} \rightarrow HPO_3 + X$

in the above reaction the product X is :

A. NO_2

B. N_2O_3

C. N_2O_4

D. N_2O_5

Answer: D

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29. Which of the following oxides of Nitrogen is Neutral

A. N_2O_5

B. N_2O_3

C. N_2O_4

D. N_2O

Answer: D

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30. Which of the following oxides is amphoteric in nature ?

A. N_2O_3

B. P_4O_6

C. Sb_4O_5

D. Bi_2O_3

Answer: C

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31. Following are neutral oxides except :

A. NO

B. N_2O

C. CO

D. NO_2

Answer: D

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32. Aqueous solution of SO_2 is a

A. weak acid

B. reducing agent

C. bleaching agent

D. All of these

Answer: D

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33. Which of the following oxides is the most acidic?

A. N_2O_5

B. P_2O_5

C. As_2O_5

D. Ab_2O_5

Answer: A

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34. The correct order of decreasing acidic strength of oxyacids of group 15 elements is

A. $HNO_3 > H_3SbO_4 > H_3AsO_4 > H_3PO_4$

B. $H_3PO_4 > H_3AsO_4 > H_3SbO_4 > HNO_3$

C. $HNO_3 > H_3PO_4 > H_3AsO_4 > H_3SbO_4$

D. $HNO_3 > H_3AsO_4 > H_3PO_4 > H_3SbO_4$

Answer: C

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35. Industrial preparation of nitric acid by Ostwald's process involves.

A. oxidation of NH_3

B. Reduction of NH_3

C. Hydrogenation of NH_3

D. Hydrolysis of NH_3

Answer: A

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36. Which of the following is the most powerful oxidising agent:

A. H_2SO_4

B. HPO_3

C. H_3BO_3

D. H_3PO_4

Answer: A

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37. When P_4O_{10} is dissolved in water, the acid formed finally is :

A. H_3PO_2

B. H_3PO_4

C. H_3PO_3

D. $H_4P_2O_7$

Answer: B

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38. Which of the following reactions depict the oxidising behaviour of H_2SO_4?

A. $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

B. $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

C. $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

D. $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

Answer: D

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39. The order of stability of halides of sulphur with different halogens is

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

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

C. $Br^{-1} > Cl^- > I^- > F^-$

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

Answer: B

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40. Ammonia reacts with excess of chlorine to form

A. N_2 and NH_4Cl

B. NCl_3 and HCl

C. NH_4Cl and NCl_3

D. N_2 and HCl

Answer: B

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41. A yellow coloured crystalline substance gave a colourless gas X on reaction with fluorine, which is thermally stable and has octahedral geometry. X can be

A. SF_4

B. SF_5

C. SF_2

D. S_2F_6

Answer: B

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42. PCl_3 reacts with water to form :

A. PH_3

B. H_3PO_3 and HCl

C. $POCl_3$

D. H_3PO_4

Answer: B

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43. The final product obtained on hydrolysis of PCl_5 is

A. H_3PO_4

B. H_3PO_3

C. $POCl_3$

D. PH_3

Answer: A

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44. Which of the following phosphorus halide is the best reducing agent?

A. PCl_3

B. PF_3

C. PBr_3

D. PI_3

Answer: D

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45. When sulphur is boiled with Na_2SO_3 solution, the compound formed is

A. sodium sulphide

B. sodium sulphate

C. sodium persulphate

D. sodium thiosulphate

Answer: D

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46. $Na_2S_2O_3$ is prepared by :

A. reacting $H_2S_2O_3$ with NaOH

B. reacting Na_2SO_4 with S in alkaline medium

C. heating NaOH and S

D. reducing Na_2SO_4 with S in acidic medium

Answer: C

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47. The product of the chemical reaction between $Na_2S_2O_3$, Cl_2 and H_2O are

A. $HCl + Na_2S$

B. $HCl + NaHSO_4$

C. $HCl + Na_2SO_3$

D. $NaHClO_3 + H_2O$

Answer: B

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48. The term 'thio' is used in the names of all of the following compounds except :

A. $Na_2S_2O_3$

B. H_2SO_5

C. $NaSCN$

D. Na_2SO_3

Answer: D

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49. Which of the following gives H_2O_2 on hydrolysis ?

A. $H_2S_2O_3$

B. H_2SO_5

C. $H_2S_2O_7$

D. $H_2S_4O_6$

Answer: B

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50. Which of the following is not formed in the below reaction

$O_3 + Kl + D_2O \rightarrow$

A. KOH

B. O_2

C. I_2

D. KOD

Answer: A

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Exercise 1 Part Iii Match The Column

1. Match the reaction listed in coloumn -I with characteristic (s)/type of reactions listed in coloumn II

	Column–I		Column–II
(A)	$PCl_5 \xrightarrow[Air]{Moist}$	(p)	Hydrolysis
(B)	$P_4 + NaOH\ (conc.) + H_2O \xrightarrow{Warm}$	(q)	At least one of the products has tetrahedral hybridisation
(C)	$H_3PO_3 \xrightarrow{200°C}$	(r)	Disproportionation
(D)	$P_4O_6 + H_2O \xrightarrow{200°C}$	(s)	At least one of the products has $p\pi-d\pi$ bonding.

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2. Match the oxy-acids of phosphorus listed in column-I with type of bond (s) listed in column -II

	Column-I (Oxy acids of phosphoros)		Column-II (Characteristic bonds
(A)	$H_4P_2O_7$	(p)	P—P bond (s)
(B)	$H_4P_2O_5$	(q)	P—O—P bond (s)
(C)	$H_3P_3O_9$	(r)	P—H bond (s)
(D)	$(HPO_3)_n$ (cyclic)	(s)	Three or four P—OH bonds

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Exercise 2 Part I

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

A. Availability of vacant d-orbital 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 in solid while N in gaseous state at room temperature

Answer: A

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Exercise 2

1. The $P-P-P$ bond angle in white phosphorus is close to :

A. 120°

B. $109^\circ 28'$

C. 90°

D. 60°

Answer: D

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2. Red phosphorus may be prepared from white phosphorus by :

A. adding red colour to white phosphorus

B. heating white phosphorus to red heat

C. heating white phosphorus in inert atmosphere to $250^\circ C$ or at low temperature in the presence of sun light.

D. heating white phosphorus at high pressure and 473 k temperature

Answer: C

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3. As Rhombic sulphur is heated in a test tube :

	Process	Temperature
(a)	Viscosity increases	T_1
(b)	Visconsity decrease	T_2
(c)	Paramagnetic molecules	T_3
(d)	Breakage of S_8rings (Diradical formation in molten phase)	T_4

Correct order of temperature is

A. $T_1 < T_3 < T_4 < T_2$

B. $T_2 < T_4 < T_3 < T_1$

C. $T_4 < T_1 < T_2 < T_3$

D. $T_3 < T_4 < T_1 < T_2$

Answer: C

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4. Dinitrogen gas is evolved when sodium nitrite is heated below $500^{\circ} C$

A. alone

B. with ammonium chloride

C. with HCl

D. with potassium nitrate

Answer: B

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5. Which statement is not correct for nitrogen?

A. It is obtained by heating $(NH_4)_2Cr_2O_7$

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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6. Nitrolim is obtained by passing nitrogen over:

A. heated mixture of Al_2O_3 and carbon

B. oleum

C. calcium carbide

D. heated calcium carbide

Answer: D

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7. Which of the following have $\Delta H_f^\circ < 0$

A. Ozone

B. O(g)

C. P(red)

D. S_8 (monoclinic)

Answer: C

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8. CS_2 can separate a mixture of

A. P_4 and S_8 (rhombic)

B. P_4 and S_8 (monoclinic)

C. S_8 (rhombic) and S_8 (monoclinic)

D. S_8 (rhombic) and S (plastic)

Answer: D

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9. Which of the following reaction liberate oxygen ?

A. $O_3 + KI + H_2O \rightarrow$

B. $H_2O_2 + Cl_2 \rightarrow$

C. $KO_2(s) + CO_2(g) \rightarrow$

D. All of the above

Answer: D

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10. The gases respectively absorbed by alkaline pyrogallon and oil of cinnamon is.

A. O_2, O_3

B. SO_2, O_2

C. O_3, CH_4

D. N_2O, O_3

Answer: A

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11. Alkaline KI is oxidised by ozone to :

A. potassium iodate

B. potassium periodate

C. both (A) and (B)

D. None of these

Answer: C

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12. NH_3 can't be obtained by :

A. heating of NH_4NO_3 or NH_4NO_2

B. heating of NH_4Cl or $(NH_4)_2CO_3$

C. heating of NH_4NO_3 with $NaOH$

D. reaction of AlN or Mg_3N_2 or $CaCN_2$ with H_2O

Answer: A

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13. When H_2S is passed through nitric acid and acidified $KMnO_4$ solution the product formed is

A. H_2SO_4

B. colloidal sulphur

C. SO_2

D. plastic sulphur

Answer:

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14. Ammonia reacts with red -hot cupric oxide to produce

A. Cu_2O, N_2, H_2

B. Cu, H_2O, N_2

C. $Cu(OH)_2$, N_2

D. $\left[Cu(NH_3)_4\right](OH)_2$

Answer: B

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15. Phosphine is not obtained by the reaction

A. White P is heated with NaOH

B. Red P is heated with NaOH

C. Ca_3P_2 reacts with water

D. Phosphorus trioxide is boiled with water under pressure

Answer: B

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16. When ammonia is oxidsed by oxygen in the presence of platinum at $800^\circ C$, the gas obtained is :

A. N_2O

B. NO

C. NO_2

D. N_2O_5

Answer: B

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17. Substances burn more readily in N_2O than in air because N_2O:

A. is reactive at high temperature

B. dissociates to give more nitrogen than in air

C. the activation energy is increased on increasing temperature

D. dissociates more readily than O_2

Answer: D

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18. Which of the following is a mixed acid anhydride ?

A. NO

B. NO_2

C. N_2O_5

D. N_2O

Answer: B

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19. When an article is bleached by SO_2 it loses its colour. The colour can be restored by :

A. exposure to air

B. heating

C. dilution

D. none of these

Answer: A

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20. The true statement for the acids of phosphorus. H_3PO_2, H_3PO_3 and H_3PO_4 is:

A. H_3PO_3 on heating does not disproportionate

B. all of them are reducing in nature

C. all of them are tribasic acids

D. H_3PO_2 is obtained by alkaline hydrolysis of P_4 (white)

Answer: D

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21. Which of the following does not have S-S linkage but have O-O linkage ?

A. $S_2O_8^{2-}$

B. $S_2O_6^{2-}$

C. $S_2O_5^{2-}$

D. $S_2O_3^{2-}$

Answer: A

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22. The true statement for the acids of phosphorus H_3PO_2, H_3PO_3 and H_3PO_4 is

A. the order of their reducing strength is $H_3PO_2 > H_3PO_3 > H_3PO_4$

B. the hybridisation of phosphorus is sp^2 in all these

C. The acidic strength order is $H_3PO_2 > H_3PO_3 > H_3PO_4$

D. All of these

Answer: A

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23. Hydrolysis of one mole of peroxodisulphuric acid produces

A. two moles of sulphuric acid

B. two moles of peroxymonosulphuric acid

C. one mole of sulphuric acid and one mole of peroxy monosulphuric acid

D. one mole of sulphuric acid, one mole of hydrogen peroxide

Answer: C

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24. The reaction of SO_2 with PCl_5 yield two oxohalides A and B. 'A' can also be prepared industrially by reaction of SO_3 and SCl_2. Which of the following about A and B is incorrect ?

A. The structure of B is tetrahedral

B. The structure of A is trigonal pyramidal

C. A reacts vigorously with water and is particularly useful for drying or dehydrating readily hydrolysable inorganic halides

D. A and B contain their respective central atoms in their highest oxidation states

Answer: D

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25. Which of the following cannot dissociated as $PX_5 \Leftrightarrow PX_3 + X_2$

A. PF_5

B. PCl_5

C. PBr_5

D. PI_5

Answer: A

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26. The aqeous solution of hydrogen peroxide:

A. converts blue litmus pink

B. converts blue litumus white

C. converts red litumus blue

D. None of these

Answer: B

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27. Consider the following compounds :

(i) sulpher dioxide

(ii) hydrogen peroxide

(iii) ozone

Among these compounds, those which can act as bleaching agents would include :

A. 1 and 3

B. 2 and 3

C. 1 and 2

D. 1, 2 and 3

Answer: D

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28. Bleaching of a fabric cloth is done using A and excess of chlorine is removed using B.A and B are :

A. $CaOCl_2, Na_2SO_3$

B. $Na_2S_2O_3, CaOCl_2$

C. $CaCl_2, Na_2S_2O_3$

D. $CaOCl_2, Na_2S_2O_3$

Answer: D

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29. Aqueous hypo solution on reaction with aqueous $AgNO_3$ gives :

A. yellow precipitate changing to black

B. white precipitate changing to black

C. orange precipitate to blue

D. no precipitate

Answer: B

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Exercise 2 Part Ii Single And Double Value Integer Type

1. What is the sum of highest and lowest oxidation states for oxygen family

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2. How many of the following is correct order of sphecified property

(a)	$N > P > As > Sb > Bi$	(First ionisation enthalpy)
(b)	$N > P > As > Sb$	(Electronegativity)
(c)	$N-N < P-P < As-As$	(Single bond length)
(d)	$As^{3+} > Sb^{3+} > Bi^{3+}$	(Stability of +3 oxidation state)
(e)	White > Red > Black	(Reactivity of allotropes of phosphorus)
(f)	$H_3PO_2 < H_3PO_3 < H_3PO_4$	(Proticity of acids)
(g)	$H_3PO_2 < H_3PO_3 < H_3PO_4$	(Reducing power of acids)

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3. How many of the following properties increase down the group for nitrogen family

(a) Atomic size (b) Acidic character of oxides (c) Boiling point of hydrides

(d) Reducing power of hydrides (e) Extent of $p\pi - p\pi$ overlap (f) Metallic character

(g) Basic character of hydrides

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4. Given below are some properties. How many of these can hold good for phosphorous

(a) Metal (b) Non- metal (c) Metalloid (d) Exhibits allotropy

(e) Catenation property (f) Solid (g) Good conductor of electricity

(h) Least dense among nitrogen family elements

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5. Below reaction sequence illustrates the various stages of reduction of nitric acid where a, b, c,d are the number of electrons involved in the reduction of 1 mole N-atoms

$HNO_3 \underset{ao}{\longrightarrow} NO_2 \underset{bo}{\longrightarrow} NO \underset{co}{\longrightarrow} N_2O \underset{do}{\longrightarrow} NH_3F \in dthevalueof$(2a + b + 3c -d)`

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6. A yellow coloured crystalline substance gave a colourless gas X on reaction with fluorine, which is thermally stable and has octahedral geometry. X can be

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7. Sulphur can form dihalide, tetrahalide and hexahalide with fluorine. One mole of each of these three compounds is mixed with water. The total number of moles of product molecules obtained is ____. If no reaction occurs, count zero

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8. Number of halides undergoing complete reaction in presence of water under normal conditions is :

(i) BF_3 (ii) BCl_3 (iii) NCl_3 (iv) $AlCl_3$ (v) CCl_4 (vi) PCl_3 (vii) $AsCl_3$

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9. In how many of the following reactions N_2 gas may be released

$(a) NH_4NO_2 \xrightarrow{\Delta}$ $(b) (NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$ $(c) NH_2CONH$

$(d) NH_2CONH_2 + NaOBr \rightarrow$ $(e) NH_3 + Cl_2(LR) \rightarrow$ $(f) NH_3 + Br_2$

$(g) NH_3 + NaOCl \rightarrow$ $(h) NH_3 + CaOCl_2 \rightarrow$ $(i) Ba(N_3)_2 \xrightarrow{\Delta}$

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10. (i) NH_3 (ii) N_2H_4 (iii) HN_3 (iv) PH_3 (v) H_2S (vi) AsH_3

(vii) SbH_3 (viii) H_2Se (ix) H_2Te

Number of molecules in which lone pair of electrons on the central atom is present in pure s-orbital

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11. $NH_3 + NaOCl \xrightarrow{\text{golatin or } EDTA^+}$ products

The number of moles of $N-H$ bonds present in one mole of the strongest nucleophile present in the product is:

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12. Number of acidic oxides among the following is:

(a) N_2O (b) NO (c) N_2O_3 (d) N_2O_4 (e) N_2O_5 (f) P_4O_6

(g) P_4O_{10} (h) SO_3 (i) B_2O_3 (j) CO

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13. Number of gaseous oxides among the following at room temperature is:

(a) N_2O (b) NO (c) N_2O_3 (d) NO_2 (e) N_2O_5 (f) P_4O_6

(g) P_4O_{10} (h) SO_2 (i) SO_3

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14. The number of O atoms having sp^2 hybridisation in P_4O_{10} molecule is:

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15.

$N_2O_4, (HPO_2)_2, H_2CO_3, SO_2, SO_3, P_4O_{10}H_2SO_4, N_2O_3, HNO_3, H_3PO_3$

.

(a) Among the above compounds, compounds having at least one $p\pi - p\pi$ bond are x.

(b) Among the above compounds, compounds having at least one $d\pi - p\pi$ bond are y.

Given the answer as $x + y$

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16. Number of acids having central atom in $+3$ oxidation state among the following is

(a) HNO_2 (b) HNO_3 (c) H_3PO_2 (d) H_3PO_3 (e) H_3PO_4 (f) $H_4P_2O_5$

(g) $H_4P_2O_7$ (h) H_2SO_3 (i) $H_2S_2O_7$ (j) $H_2S_2O_8$ (k) H_2SO_4

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17. Cold conc. HNO_3 will completely dissolve:

(i) Pb (ii) Pb_3O_4 (iii) Fe (iv) Sn (v) Mg (vi) MgO (vii) Hg (viii) Au (ix) Ag (x) Pt

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18. Cold dil. H_2SO_4 will completely dissolve :

(i) Pb (ii) Fe_3O_4 (iii) Fe (iv) Cu (v) Mg (vi) MgO

(vii) $CoCO_3$ (viii) $CuCO_2$ (ix) $SrCO_3$

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19. How many are redox reaction-

(i) $K_4\left[Fe(CN)_6\right] + \text{conc.}H_2SO_4 \xrightarrow{\Delta}$ (ii) $\text{conc.}H_2SO_4 + KCl \rightarrow$

(iii) $\text{conc.}H_2SO_4 + KBr \rightarrow$ (iv) $\text{conc.}H_2SO_4 + NH_3 \rightarrow$

(v) $\text{conc.}H_2SO_4 + KNO_3 \rightarrow$ (vi) $\text{conc.}H_2SO_4 + PCl_5 \rightarrow$

(vii) $\text{conc.}H_2SO_4 + COCl_2 \rightarrow$ $(viii)$ $\text{conc.}H_2SO_4 + Zn \rightarrow$

(ix) $\text{conc.}H_2SO_4 + Cu \rightarrow$

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20. $xP_4 + ySO_2Cl_2 \rightarrow$

then y/x ?

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21. Complete hydrolysis product of 1 mole each of following will need how many total number of moles of NaOH for complete neutralisation?

$SOCl_2$, SO_2Cl_2, PCl_3, PCl_5, NCl_3

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22. Aqueous solution of how many of the following species turn blue limtus red ?

(i) SF_4 (ii) PCl_3 (iii) H_2O (iv) NO_2Cl (v) SF_6 (vi) SeF_6

(vii) $AsCl_3$ (viii) $POCl_3$ (ix) SO_2 (x) SO_2Cl_2 (xi) $SOCl_2$ (xii) $COCl_2$

(viii) CCl_4

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23. How many of the following compounds are possible products when chlorine is passed through hypo solution

(i) S (ii) HCl (iii) Na_2S (iv) Na_2SO_4 (v) $Na_2S_4O_6$ (vi) $HClO_4$

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24. The difference in the oxidation numbers of two types of sulphul atoms in $Na_2S_4O_6$ is.....

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25. How many compound(s) or iron (s) can be oxidised by H_2O_2 among the following

(i) AsO_3^2 (ii) SO_4^{2-} (iii) $Fe_2(SO_4)_3$ (iv) $NH_2 - NH_2$ (v) H_2S

(vi) PbS (vii) O_3

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26. A gas is pale blue in colour on liquifaction, the colour arises from electronic transitions. This transition is forbidden in gaseous state. The gas does not burn but is a strong supported of combustion. Given the molar mass of this gas.

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Exercise 2 Part Iii One Or More Than One Option Correct Type

1. As, Sb and Bi show little or no tendency to form negative ions of the type M^{3-}. This is because

A. these elements are less electronegative

B. metallic character increases down the group

C. they are unable to hold the added electrons due to inert pair effect

D. they do not posses half filled np subshells

Answer: A::B

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2. The correct statement(s) is/are

A. The PF_4^- ion exists

B. The NF_4^- ion does not exist

C. N can form $p\pi - p\pi$ bonds with itself and with other elements having small size and high E.N.

D. The catenation tendency is weaker in N than P

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

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3. Correct statements about allotropy ?

A. Plastic sulphur exists as zig-zag chains of sulphur

B. Monoclinic sulphur is soluble in water and insoluble in CS_2

C. Milk of sulphur gradually changes to Rhombic sulphur

D. Milk of sulphur is used in medicines

Answer: A::C::D

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4. Which of the following statements is/are correct ?

A. The hydrides of group 15 elements act as oxidising agents

B. The hydrides of group 15 elements act as reducing agents

C. The oxidising power increases in going from NH_3 to BiH_3

D. The reducing power increases in going from NH_3 to BiH_3

Answer: B::D

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5. Ammonium dichromate on heating liberates a gas. The same gas will be obtained by :

A. heating $NaNO_2$ and NH_4Cl

B. treating H_2O_2 and $NaNO_2$

C. passing ammonia gas over red hot CuO

D. treating ammonia with $KMnO_4$ in neutral medium

Answer: A::C

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6. Nitrogen differs from rest of the members on the account of various factors. Which of the following properties can be classified as anomalous properties of nitrogen ?

A. Bond enthalpy of $N \equiv N$ is 941.4 kJ/mol

B. Hydride of nitrogen i.e., amonia has apperciable boiling point as compared to the other members like P, As.

C. NH_3 can form unstable complexes by donating its lone pair

D. Molecular nitrogen comprises 78% by volume of the atmosphere

Answer: A::B

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7. Which of the following elements react with metals to form their binary compounds exhibiting -3 oxidation state ?

A. N

B. P

C. As

D. Bi

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

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8. White Phosphorus may be removed from red Phosphorus by

A. sublimation under reduced pressure

B. dissolving in water

C. dissolving in CS_2

D. heating with an alkali solution

Answer: A::C::D

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9. The compound which on strong heating gives oxygen is :

A. $AgNO_3$

B. BaO_2

C. $Pb(NO_3)_2$

D. $CaCO_3$

Answer: A::B::C

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10. Which of the following is//are true for oxygen.

A. $KMnO_4$(S) on strong heating given oxygen gas

B. Oxygen mixed with helium is used for artificial respiration

C. It has two unpaired electrons in bonding π molecular orbitals

D. Fractional distillation of liquefied air is used as an industrial method for the preparation of oxygen gas

Answer: A::B::D

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11. The correct statements(s) regarding hydrides (H_2E) of group -16 is/are

A. The acidic character increases from H_2O to H_2Te

B. The bond $(H-E)$ dissociation enthalpy decreases down the group

C. The thermal stability of hydrides decreases down the group

D. The reducing character of hydrides increases down the group

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

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12. The correct statements regarding ozone is/are

A. Ozone is thermodynamically less stable with respect to oxygen

B. It acts as powerful oxidising agent

C. It rapidly react with $NO_{(g)}$ and form $NO_{2(g)}$ and $O_{2(g)}$

D. It is toxic substance

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

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13. The incorrect statement(s) regarding oxides of group-16 elements is/are

A. Reducing property of dioxide decreases from SO_2 to TeO_2

B. All these elements from oxides of the EO_2 and EO_4 types

C. Selenium and tellurium do not form SeO_3 and TeO_3

D. SO_2 is an oxidising agent while TeO_2 is a reducing agent

Answer: B::C::D

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14. Which of the following ions dissolve in excess of aq. NH_3

A. Al^{3+}

B. Cu^{2+}

C. Ag^{+}

D. Zn^{2+}

Answer: B::C::D

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15. Which of the following is/are incorrect statements(s) for phosphine ?

A. It is less basic then NH_3

B. It is less poisonous than NH_3

C. The solution of copper sulphate given no precipitate with PH_3

D. Phosphine burns in air forming predominantly H_3PO_4

Answer: B::C::D

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16. Which of the following process(es) can given sulphur ?

A. H_2S gas is passed through nitric acid

B. Cl_2 gas is passed into water saturated with hydrogen sulphide

C. Hydrogen sulphide is passed through sodium bisulphate solution

D. H_2S gas is passed through acidified $KMnO_4$ solution

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

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17. How is H_2S prepared in laboratory ?

A. $FeS + H_2SO_4$

B. $FeSO_4 + H_2SO_4$

C. $FeS + HCl$

D. Elemental $H_2 +$ elemental S_8

Answer: A::C

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18. A gas is obtained on heating ammonium nitrate. Which of the following statements are incorrect about this gas

A. causes laughter

B. brings tears to the eyes

C. is acidic in nature

D. is basic in nature

Answer: B::C::D

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19. Which of the following repressents correct dissociation of nitrate salts on heating

A. $2LiNO_3 \rightarrow Li_2O + 2NO_2 + \frac{1}{2}O_2$

B. $Pb(NO_3)_2 \rightarrow PbO + 2NO_2 + \frac{1}{2}O_2$

C. $NH_4NO_3 \rightarrow N_2O + 2H_2O$

D. $NH_4NO_2 \rightarrow N_2 + 2H_2O$

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

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20. SO_2 can reduce :

A. $HClO_3$ to HCl

B. $Cr_2O_7^{2-}/H^+$ to Cr^{3+}

C. MnO_4^-/H^+ to Mn^{2+}

D. IO_3^- to I_2

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

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21. A white crystaline oxide (A) having garlic smell reacts with cold water to form a compound (B). On heating, (B) gives compound (C) & gas (D). Which of the following are correct statements:

A. Solution of gas (D) does not turn red litmus blue

B. The gas (D) can also be produced by reaction of NaOH with red phosphorus

C. Gas (D) exists in dimeric form

D. Compound (B) can act as a reducing agent but (C) cannot

Answer: A::D

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22. Select the correct statement

A. Ostwald's method of preparation of HNO_3 is based upon catalytic oxidation of NH_3 by atmospheric oxygen

B. HNO_2 can act as both oxidising and reducing agent

C. NO_2 reacts with O_3 to form N_2O_5

D. HNO_3 can be used both as oxidising and reducing agent

Answer: A::B::C

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23. Which of the following statements is (are) correct ?

A. Antimony on reaction with conc. HNO_3 gives antimonic acid

B. Manganese on reaction with cold and dilute HNO_3 gives NO_2 gas

C. HNO_2 disproportionate to given HNO_3 and NO

D. HNO_3 on reaction with P_4O_{10} given N_2O_5

Answer: A::C::D

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24. Concentrated sulphuric acid acts as

A. dehydrating agent

B. sulphonating agent

C. reducing agent

D. oxidising agent

Answer: A::B::D

View Text Solution

25. Which among the following is/are peroxo acid (s) ?

A. $H_2S_2O_3$

B. H_2SO_3

C. $H_2S_2O_7$

D. $H_2S_2O_8$

Answer:

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26. Which of the following are used as chlorinating agents in organic synthesis of compounds ? (Like acid converted to acid chloride)

A. $SOCl_2$

B. SO_2Cl_2

C. PCl_3

D. PCl_5

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

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27. Select the correct statement(s) regarding reaction of SO_2 with PCl_5

A. It is a redox reaction

B. One of the product is sulphuryl choride

C. Both the products on addition of water produce strongely acidic solution

D. both the products have same hybridisation of central atom

Answer: C::D

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28. $(P) \xrightarrow{NaH} (Q) \uparrow \xrightarrow{CuSO_4} (R) \downarrow$ black precipitate, (P) may be

A. SCl_2

B. PCl_3

C. NCl_3

D. HCl

Answer: A::B

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29. What is true for hydrogen peroxide and ozone ?

A. H_2O_2 acts as a stronger reducing agent in alkaline medium than in acidic medium

B. H_2O_2 and O_3 both are oxidising agents as well as bleaching agents

C. H_2O_2 forms a hydrate, $H_2O_2.H_2O$

D. Ozone is used in the manufacture of potassium permangnate from pyrolusite

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

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30. Which of these statement is true for sodium thiosulphate ?

A. it acts as an antichlor

B. it is used as a reducing agent in iodometric titration

C. it reacts with hydrochloric acid to form SO_2 and sulphur

D. it is used in photography as hypo to dissolve excess of AgBr as a soluble complex

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

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31. Which of the following statements are correct for H_2O_2 ?

A. it is neutral towards litmus, but bleaches litmus white

B. It is more acidic than H_2O

C. Density and dielectric constant are higher than dilute solution of H_2O

D. H_2O_2 is produced by auto oxidation of 2-ethyl anthraquinol

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

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32. A solution of ammonia in water contains

A. H^+ (aq.)

B. OH^- (aq.)

C. NH_4^+ (aq.)

D. NH_3 (aq.)

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

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Exercise 2 Part Iv Comprehension

1. Nitrogen forms the largest number of oxides as it is capable of forming stable multiple bonds with oxygen. They range of N_2O (O.S of nitrogen +1) through NO, N_2O_3, NO_2, N_2O_4 "to" N_2O_5 (O.S of nitrogen +5). Following points are improtant regarding the study of oxides of nitrogen.

(a) All oxides of nitrogen expect N_2O_5 are endothermic as a large amount of energy is required to dissociate the stable molecule of oxygen and nitrogen.

(b) The small electronegativity difference between oxygen and nitrogen make N-O bond easily breakle to give oxygen and hence oxides of nitrogen are said to be better oxidising agents.

(c) Expect N_2O_5, all are gases at ordinary temperature. N_2O_3 is stable only at lower temperature (253K).

(d) Expect N_2O and NO which are neutal oxides, all are acidic oxides which dissolve in water forming coresponding oxy acids.

(e) They are also good example for illustrating the concept of resonance.

The gas which is acidic in nature is :

A. NO

B. N_2O

C. NO_2

D. both A and C

Answer: C

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2. Nitrogen forms the largest number of oxides as it is capable of forming stable multiple bonds with oxygen. They range from N_2O (O.S of nitrogen +1) through $NO, N_2O_3, NO_2, N_2O_4,$ to N_2O_5 (O.S of nitrogen +5). Following points are important regarding the study of oxides of nitrogen

(a) All oxides of nitrogen except N_2O_5 are endothermic as a large amount of energy is required to dissociate the stable molecule of oxygen and nitrogen.

(b) The small electronegativity difference between oxygen and nitrogen make $N-O$ bond easily breakble to give oxygen and hence oxides of nitrogen are said to be better oxidising agents.

(c) Except N_2O_5, all are gases at ordinary temperature N_2O_3 is stable only at lower temperature (253 K).

(d) Except N_2O and NO which are neutral oxides, all are acidic oxides which dissolve in water forming corresponding oxy acids.

(e) They are also good example for illustrating the concept of resonance

Which of the following statements is correct for the oxides of nitrogen ?

A. Dinitrogen trioxide dissolves in potassium hydroxide forming potassium nitrate

B. Aqueous solution of nitrogen dioxide behaves both as a reducing agent and as an oxidising agent

C. Nitrous oxide is fairly soluble in cold water and turns blue litmus red

D. Nitrogen dioxide is not acidic oxide

Answer: B

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3. An inorganic iodide (A) on heating gives gases (B) and (C). (B) is neutral towards litmus while (C) is acidic (B) gives back dense white fumes of (A) when cooled with (C). (A) functions as a strong acid in water. (C) is also obtained by action of (D) on water. (D) can be obtained when (B) reacts with I_2 in presence of anhydrous $CaCl_2$. (B) is poisonous, has smell of rotten fish and it is sparingly soluble in water. Now answer the following question

Select the correct statement from the following for the gas (B)

A. It produces dense white fumes with HCl

B. It produces dense violet fumes on combustion

C. It produces dense white fumes with BF_3

D. It can act as oxidising agent

Answer: C

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4. An inorganic iodide (A) on heating gives gases (B) and (C). (B) is neutral towards litmus while (C) is acidic (B) gives back dense white fumes of (A) when cooled with (C). (A) functions as a strong acid in water. (C) is also obtained by action of (D) on water. (D) can be obtained when (B) reacts with I_2 in presence of anhydrous $CaCl_2$. (B) is poisonous, has smell of rotten fish and it is sparingly soluble in water. Now answer the following question

The compound (A)

A. turns moist red litmus blue

B. reacts completely with water

C. is used as a dehydrating agent

D. All of these

Answer: B

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5. An inorganic iodide (A) on heating gives gases (B) and (C). (B) is neutral towards litmus while (C) is acidic (B) gives back dense white fumes of (A) when cooled with (C). (A) functions as a strong acid in water. (C) is also obtained by action of (D) on water. (D) can be obtained when (B) reacts with I_2 in presence of anhydrous $CaCl_2$. (B) is poisonous, has smell of rotten fish and it is sparingly soluble in water. Now answer the following question

What is true compound (D) ?

A. The oxidation number of central atom of (D) is + IV

B. Compound (D) produces a yellow precipitate with silver nitrate solution

C. Compound (D) dissolves in water forming an acid which with sodium hydroxide forms three series of salts

D. Both (B) and (C)

Answer: D

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6. Oxygen differs from the other elements of the group. Compounds of oxygen with metals are more ionic in nature and hydrogen bonding is more important for oxygen compounds. Oxygen is never more than divalent beacasue when it hs formed two covalent bonds, there are no low energy orbitals which can be used for form. further bonds. However, the elements S,Se,Te and Po have empty d- orbitals which may be used for bonding, and they can form four or six bonds by unpairing electrons. The higher oxidation states become less stable on decending the group.

The bond between S and O, or Se and O, are much shorter than might be expected for a single bond owing to $\rho\pi - d\pi$ interaction between the p-orbital of oxygen and d- orbital of S or Se.

Which of the following statemet is incorrect ?

A. Oxo-anions of sulphur have little tendency to polymerise compared with the phosphates and silicates.

B. In pyrosulphurous acid $(H_2S_{2O_5}$, the oxidation states of both the sulphur atoms are not same, they are +V and +III

C. Concentrated HNO_3 oxidises both sulphur and selenium to $H_2SO_4(+VI)$ and $H_2SeO_4(+VI)$ respectively

D. Most metal oxides are ionic and basic in nature while non-metallic oxides are usually covalent and acidic in nature

Answer: C

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The bond between S and O, or Se and O, are much shorter than might be

expected for a single bond owing to $\rho\pi - d\pi$ interaction between the p-orbital of oxygen and d- orbital of S or Se.

Which one of the following orders represents the correct order for the properties indicated against them?

A. $H_2O < H_2S < H_2Se < H_2Te -$ acidic character

B. $H_2O < H_2S < H_2Se < H_2Te$ - thermal stability

C. $H_2S > H_2Se < H_2Te < H_2O -$ reducing character

D. $H_2S < H_2Se < H_2O < H_2Te -$ boiling point

Answer: A

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8. The property of hydrides of p-block elements mostly depends on :

(i) electronegativity differnece between central atom and hydrogen.

(ii) size of central atom

(iii) number of valence electrons in central atom

Some undergo hydrolysis in which central is less electronegative, react

with OH^- to give hydrogen. while acidic property of hydride in a period depends on electronegativity of central atoms. i.e. more electronegative is the atom, more acidic is hydirde. In a group, acidic property is proportional to size of central atom. Some electron deficient hydride behaves as Lewis acid while only one hydride of an element in p-block behaves as Lewis base with central atom's electronegativity is close to hydrogen has no reaction with water.

Which one is the weakest acid among the following ?

A. HF

B. HCl

C. HBr

D. HI

Answer: A

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9. The property of hydrides of p-block elements mostly depends on :

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Which hydride has no reaction with water ?

A. NH_3

B. CH_4

C. BeH_2

D. NaH

Answer: B

Watch Video Solution

10. The property of hydrides of p-block elements mostly depends on :

(i) electronegativity differnece between central atom and hydrogen.

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Which one is strongest base ?

A. OH^-

B. HS^-

C. Hse^-

D. The^-

Answer: A

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11. Observe the three columns in which column-1 represents chemical reactions, column-2 represents nature of substance with colour and physical state while column-3 represents differentiate products.

Column-1		Column-2		Column-3	
(I)	Cu + dil. HNO_3	(i)	Colourless gas, Neutral	(P)	NO
(II)	Cu + conc. HNO_3	(ii)	Blue solid, Acidic	(Q)	NO_2
(III)	Zn + dil. HNO_3	(iii)	Brown gas, Acidic	(R)	N_2O
(IV)	Zn + conc. HNO_3	(iv)	Colourless solid, Acidic	(S)	N_2O_3

Which of the following set of combination is correct ?

A. I, iv, S

B. II, ii, Q

C. II, iii, Q

D. IV, iv, S

Answer: C

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12. Observe the three columns in which column-1 represents chemical reactions, column-2 represents nature of substance with colour and physical state while column-3 represents differentiate products.

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(III)	Zn + dil. HNO_3	(iii)	Brown gas, Acidic	(R)	N_2O
(IV)	Zn + conc. HNO_3	(iv)	Colourless solid, Acidic	(S)	N_2O_3

Which of the following set of combination is incorrect ?

A. (III), (i), (R)

B. (I), (i), (P)

C. (IV), (iii), (Q)

D. (III), (iv), (S)

Answer: D

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13. Observe the three columns in which column-1 represents chemical reactions, column-2 represents nature of substance with colour and physical state while column-3 represents differentiate products.

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(III)	Zn + dil. HNO_3	(iii)	Brown gas, Acidic	(R)	N_2O
(IV)	Zn + conc. HNO_3	(iv)	Colourless solid, Acidic	(S)	N_2O_3

Which of the following set of combination is correct ?

A. `(I), (ii), (P)

B. (IV), (iii), (Q)

C. (IV), (ii), (Q)

D. (I), (iii), (P)

Answer: B

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Exercise 3 Part I Jee Advanced

1. The number of P-O-P bonds in cyclic trimetaphosphoric acid is :

A. zero

B. two

C. three

D. four

Answer: C

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2. The correct order of acidic strength is

A. $Cl_2O_7 > SO_2 > P_4O_{10}$

B. $CO_2 > N_2O_5 > SO_3$

C. $Na_2O > MgO > Al_2O_3$

D. $K_2O > CaO > MgO$

Answer: A

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3. Ammonia can be dried by :

A. conc. H_2SO_4

B. P_4O_{10}

C. CaO

D. anhydrous $CaCl_2$

Answer: C

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4. Give reason, why elemental nitrogen exists as a diatomic molecule, whereas elemental phosphorus is a tetratomic molecule.

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5. Polyphosphates are used as water softening agents because they

A. form soluble complexes with anionic species

B. precipitate anionic species

C. form soluble complexes with cationic species

D. precipitate cationic species

Answer: C

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6. For H_3PO_3 and H_3PO_4 the correct choice is

A. H_3PO_3 is dibasic and reducing

B. H_3PO_3 is dibasic and non-reducing

C. H_3PO_4 is tribasic and reducing

D. H_3PO_3 is tribasic and non-reducing

Answer: A

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7. $(NH_4)_2Cr_2O_7$ on heating gives a gas which is also given by :

A. heating NH_4NO_2

B. heating NH_4NO_3

C. treating Mg_3N_2 with H_2O

D. teating Na (compound) with H_2O_2

Answer: A

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8. A pale bule liquid is obtained by equuimolar mixture of two gases at -$30^\circ C$.

A. N_2O

B. N_2O_3

C. N_2O_4

D. N_2O_5

Answer: B

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9. Thermodynamically most stable allotrope of phosphorus is :

A. Red

B. White

C. Black

D. Yellow

Answer: C

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10. (a) What amount of CaO in grams is required to neutralise 852g of P_4O_{10}.

(b) Write the structure of P_4O_{10}.

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11. There are some deposits of nitrated and phosphates in the earth's crust. Nitrates are more soluble in water. Nitrates are difficult to reduce under laboratory conditions but microbes do it easily. Ammonia forms a large number of complexes with transition metal ions. Hybridisation easily explains the ease of sigma donation capability of NH_3 and PH_3. Phosphine is a flammable gas and is prepared from white phosphorous. Which of the following statement is correct ?

A. phosphates have no biological significance in humans

B. between nitrates and phosphates, phosphates are less a abundant in earth's crust

C. between nitrates and phosphates, nitrates are less abundant in earth's crust

D. oxidation of nitrates is possible in soil

Answer: C

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A. between NH_3 and PH_3, NH_3 is a better electron donor because the lone pair of electrons occupies spherical 's' orbital and is less directional

B. between NH_3 and PH_3, PH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional

C. between NH_3 and PH_3, NH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional

D. between NH_3 and PH_3, PH_3 is a better electron donor because the lone pair of electrons occupies spherical 's' orbital and is less directional

Answer: C

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13. There are some deposits of nitrates and phosphates in the earth's crust. Nitrates are more soluble in water. Nitrates are difficult to reduce under laboratory conditions but microbes do it easily. Ammonia forms a large number of complexes with transition metal ions. Hybridisation easily explains the ease of sigma donation capability of NH_3 and PH_3. Phosphine is a flammable gas and is prepared from white phosphorous. White phosphorous on reaction with $NaOH$ gives PH_3 as one of the products. This is a.

A. dimerization reaction

B. disproportionation reaction

C. condensation reaction

D. precipitation reaction

Answer: B

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

A. Dry O_2

B. A mixture of O_2 and N_2

C. Moist O_2

D. O_2 in the presence of aqueous NaOH

Answer: B

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15. Match each of the reaction given in Column I with the corresponding product(s) given in Column II.

Column I	Column II
A. $Cu+dil.\ HNO_3$	p. NO
B. $Cu+cons.\ HNO_3$	q. NO_2
C. $Zn+dil.HNO_3$	r. N_2O
D. $Zn+cons\ HNO_3$	s. $Cu(NO_3)_2$
	t. $Zn(NO_3)_2$

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

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

A. HNO_3, NO, NH_4Cl, N_2

B. HNO_3, NO, N_2, NH_4Cl

C. HNO_3, NH_4Cl, NO, N_2

D. NO, HNO_3, NH_4Cl, N_2

Answer: B

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

A. NO

B. NO_2

C. N_2O

D. N_2O_4

Answer: B

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20. The pair(s) of reagents that yield paramagnetic species is/are

A. Na and excess of NH_3

B. K and excess of O_2

C. Cu and dilute HNO_3

D. O_2 and 2-ethylanthraquinol

Answer: A::B::C

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21. The product formed in the reaction of $SOCl_2$ (thionyl chloride) with white phosphorous is.

A. PCl_3

B. SO_2Cl_2

C. SCl_2

D. $POCl_3$

Answer: A

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22. The compound (s) which generate (s) N_2 upon thermal decomposation is (are) :

A. NH_4NO_3

B. $(NH_4)_2Cr_2O_7$

C. $Ba(N_3)_2$

D. Mg_3N_2

Answer: B::C

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

A. Bi_2O_5 is more basic than N_2O_5

B. NF_3 is more covalent than BiF_3

C. PH_3 boils at lower temperature than NH_3

D. The $N-N$ single bond is strogner than the $P-P$ single bond

Answer: A::B::C

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24. Amongest H_2O, H_2S, H_2Se and H_2Te the one with highest boiling point is :

A. H_2O because of H-bonding

B. H_2Te because of higher molecular weight

C. H_2S because of H-bonding

D. H_2Se because of lower molecular weight

Answer: A

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25. The number of S-S bonds in sulphur trioxide trimer (S_3O_9) is

A. three

B. two

C. one

D. zero

Answer: D

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26. Which of the following oxoacids of sulpher has -O-O- linkage ?

A. $H_2S_2O_3$

B. $H_2S_2O_5$

C. $H_2S_2O_6$

D. $H_2S_2O_8$

Answer: D

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27. Which of the following will not be oxidised by O_3?

A. KI

B. $KMnO_4$

C. K_2MnO_4

D. $FeSO_4$

Answer: B

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28. Which gas is evolved when PbO_2 is treated with conc HNO_3 ?

A. NO_2

B. O_2

C. N_2

D. N_2O

Answer: B

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29. Aqueous solution of $Na_2S_2O_3$ on reaction with CI_2, gives

A. $Na_2S_2O_6$

B. $NaHSO_4$

C. $NaCl$

D. $NaOH$

Answer: B

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30. Hydrogen peroxide in its reaction with KIO_4 and NH_2OH respectively, is acting as a

A. reducing agent, oxidising agent

B. reducing agent, reducing agent

C. oxidising agent, oxidising agent

D. oxidising agent, reducing agent

Answer: A

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

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

B. is diamagnetic

C. contains one $N-N$ bond

D. react with Na metal producing a brown gas

Answer: B::D

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

Y and Z are, respectively

A. N_2O_4 and PHO_3

B. N_2O_4 and H_3PO_3

C. N_2O_3 and H_3PO_4

D. N_2O_5 and HPO_3

Answer: D

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33. Upon heating $KCIO_3$ in presence of catalytic amount of MnO_2, a gas W is formed. Excess amount of W reacts with white phosphours to given

X. The reaction of X with pure HNO_3 gives Y and Z.

W and X are, respectively

A. O_2 and P_4O_{10}

B. O_2 and P_4O_6

C. O_3 and P_4O_6

D. O_3 and P_4O_{10}

Answer: A

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Exercise 3 Part Ii Jee Main

1. The number of hydrogen atom(s) attached to phosphorus atom in hypophosphorus acid is

A. zero

B. two

C. one

D. three

Answer: B

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2. Which of the following chemical reactions depicts the oxidizing behaviour of H_2SO_4 ?

A. $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

B. $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$

C. $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

D. $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

Answer: A

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3. Repeated use of which one of the following fertilizers would increase the acidity of the soil?

A. Superphosphate of lime

B. Ammonium sulphate

C. Potassium nitrate

D. Urea

Answer: B

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4. Which of the following statement is wrong ?

A. The stability of hydrides increase from NH_3 to BiH_3 in group 15 of the periodic table

B. Nitrogen cannot form $d\pi - p\pi$ bond

C. Single $N - N$ bond is weaker than the single $P - P$ bond

D. N_2O_4 has two resonance structure

Answer: A::D

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5. Which of the following statements regarding sulphur is incorrect?

A. S_2 molecule is paramagnetic

B. The vapour at $200^\circ C$ consists mostly of S_8 rings

C. At $600^\circ C$ the gas mainly consists of S_2 molecules

D. The oxidation state of sulphur is never less than +4 in its compounds

Answer: D

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6. Which of the following is the wrong statements ?

A. ONCl and ONO^- are not isoelectronic

B. O_3 molecule is bent

C. Ozone is violet -black in solid state

D. Ozone is diamagnetic gas

Answer: A

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7. Which of the following properties is not shwon by NO ?

A. It is dimagnetic in gaseous state

B. It is a neutral oxide

C. It combines with oxygen to form nitrogen dioxide

D. It's bond order is 2.5

Answer: A

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8. From the following statements regarding H_2O_2, choose the incorrect statements:

A. It can act only as an oxidizingg agent

B. It decomposed on exposure to light

C. It has to be stored in plastic or wax lined glass bottles in dark

D. It has to be kept away from dust

Answer: A

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

Statement II The reaction between nitrogen and oxygen requires high temperature.

A. Both assertion and reason are correct, and the reason is the correct explanation for the assetion

B. Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

C. The assertion is incorrect, but the reason is correct

D. Both are assertion and reason are incorrect

Answer: A

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10. The pair in which phosphours atoms have a formed oxidation state of $+3$ is

A. Pyrophosphorous and hypophosphoric acids

B. Orthophosphorous and hypophosphoric acids

C. Pyrophosphorous and pyrophosphoric acids

D. Orthophosphorous and pyrophosphorous acids

Answer: D

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

A. NO_2 and NO

B. NO and N_2O

C. NO_2 and N_2O

D. N_2O and NO_2

Answer: D

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12. Hydrogen peroxide oxidises $\left[Fe(CN)_6\right]^{4-}$ to $\left[Fe(CN)_6\right]^{3-}$ in acidic medium but reduces $\left[Fe(CN)_6\right]^{3-}$ to $\left[Fe(CN)_6\right]^{4-}$ in alkaline medium. The other products formed are, respectively

A. H_2O and $(H_2O + O_2)$

B. H_2O and $\left(H_2O + OH^-\right)$

C. $(H_2O + O_2)$ and H_2O

D. $(H_2O + O_2)$ and $\left(H_2O + OH^-\right)$

Answer: A

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

A. NH_4NO_2

B. $(NH_4)_2SO_4$

C. $Ba(N_3)_2$

D. $(NH_4)_2Cr_2O_7$

Answer: B

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Exercise 3 Jee Main Online Problems

1. Which of the following is not formed when H_2S reacts acidic $K_2Cr_2O_7$ solution ?

A. $CrSO_4$

B. $Cr_2(SO_4)_3$

C. K_2SO_4

D. S

Answer: A

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2. Hydrogen peroxide acts both as an oxidising and as a reducing agent depending upon the nature of the reacting species. In which of the following cases H_2O_2 acts as a reducing agent in acid medium ?

A. MnO_4^-

B. $Cr_2O_7^{2-}$

C. SO_3^{2-}

D. KI

Answer: A

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3. Which of these statements is not true ?

A. NO^+ is not isoelectronic with O_2

B. B is always covalent in its compounds

C. In aqueous solution, the TI^+ ions is much more stable than T(III)

D. $LiAIH_4$ is a versatile reducing agent in organic synthesis

Answer: A

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4. The non-metal that does not exhibit posittve oxidation state is:

A. Fluorine

B. Oxygen

C. Chorine

D. Iodine

Answer: A

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5. Identify the incorrect statement :

A. Rhombic and monoclinic sulphur have S_8 molecules

B. S_8 ring has a crown shape

C. S_2 is paramagnetic like oxygen

D. The $S-S-S$ bond angle in the S_8 and S_6 rings are the same

Answer: D

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6. Identify the pollutant gases largely responsible for the discoloured and lustreless nature of marble of the Taj Mahal.

A. SO_2 and NO_2

B. SO_2 and O_3

C. O_3 and CO_2

D. CO_2 and NO_2

Answer: A

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7. In which of the following reactions, hydrogen peroxide acts as an oxidizing agent ?

A. $PbS + 4H_2O_2 ? PbSO_4 + 4H_2O$

B. $2MnO_4^- + 3H_2O_2 ? 2MnO_2 + 3O_2 + 2H_2O + 2OH^-$

C. $I_2 + H_2O_2 + 2OH^- ? 2I^- + 2H_2O_2 + O_2$

D. $HOCl + H_2O_2 ? H_3O^+ ? H_3O^+ + Cl^- + O_2$

Answer: A

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8. For per gram of reactant, the maximum quantity of N_2 gas is produce in which of the following thermal decomposition reactions ?

(Given : Atomic wt : $Cr = 52u$, $Ba = 137u$)

A. $(NH_4)_2Cr_2O_7(s) \rightarrow N_2(g) + 4H_2O(g) + Cr_2O_3(s)$

B. $2NH_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$

C. $Ba(N_3)_2(s) \rightarrow Ba(s) + 3N_2(g)$

D. $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$

Answer: D

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9. Good reducing nature of H_3PO_2 is attributed to the presence of :

A. one $P - H$ bond

B. One $P - OH$ bond

C. Two $P - OH$ bonds

D. Two $P - H$ bonds

Answer: D

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10. The chemical nature of hydrogen peroxide is :

A. Oxidising agent in acidic medium, but not in basic medium

B. Oxidising and reducing agent in both acidic and basic medium

C. Reducing agent in basic medium, but not in acidic medium

D. Oxidising and reducing agent in acidic medium, but not in basic medium

Answer: B

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11. iodine rects with connentrated HNO_3 to yield Y along with other products , the oxidation state of iodine in Y , is :

A. 7

B. 3

C. 1

D. 5

Answer: D

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Apsp

1. There is considerable increase in covalent radius from N to P. However, from Sb to Bi only small increase (of 7 pm) in covalent radius is observed. This is due to

A. poor shielding by completely filled d-and f-orbitals in Bi

B. similar electronegativity of Sb and Bi

C. the Bi being last element of the group

D. similar densities of Sb and Bi

Answer: A

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2. Which of the following phosphorus is the most reactive?

A. Violet phosphorus

B. Scarlet phosphorus

C. Red phosphorus

D. White phosphorus

Answer: D

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3. Which of the following elements shows highest number of alloptropes:

A. N

B. P

C. S

D. O

Answer: C

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4. Nitrogen gas is prepared :

A. by heating ammonium nitrate

B. by reacting excess chlorine with liquor ammonia

C. by passing HNO_3 vapours on red hot copper

D. by heating lead nitrate

Answer: C

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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_3

D. PH_3 is amphoteric while NH_3 is basic

Answer: B

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6. Phosphorus is manufactred by heating in an electric furnace a mixture of

A. Bone ash and coke

B. Bone ash and silica

C. Bone ash, silica and coke

D. None of these

Answer: C

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7. Which of the following may ignite sphontaneously in air ?

A. White phosphorous

B. Red phosphorus

C. Black Phosphorus

D. Nitrogen

Answer: A

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8. Ozone is obtained from oxygen

A. By oxidation at high temperature

B. By oxidation using a catalyst

C. By silent electric discharge

D. By conversion at high pressure

Answer: C

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9. Crown shape of S_8 molecule is present in

A. Rhombic sulphur

B. Monoclinic sulphur

C. Both 1 & 2

D. None of these

Answer: C

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10. Presence of ozone in a gas sample may be detected by

A. H_2O_2

B. SO_2

C. Hg

D. KI

Answer: C

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11. Amongest H_2O, H_2S, H_2Se and H_2Te the one with highest boiling point is :

A. H_2O because of hydrogen bonding

B. H_2Te because of higher molecular weight

C. H_2S because of hydrogen bonding

D. H_2Se because of lower molecular weight

Answer: A

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12. When ammonia is passed over heated copper oxide, the metallic coper is obtained. The reaction shows that ammonia is :

A. A dehydrating agent

B. An oxidising agent

C. A reducing agent

D. A nitrating agent

Answer: C

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13. phosphine is generally prepared in the laboratory

A. By heating phosphorus in a current of hydrogen

B. By heating white phosphorus with aqueous of caustic potash

C. By decomposition of P_2H_4 at $110^\circ C$

D. By heating red phosphorus with an aqueous solution of caustic soda

Answer: B

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14. Cyanamide process is used in the formation of

A. N_2

B. HNO_3

C. NH_3

D. PH_3

Answer: C

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15. Ammonium nitrate decomposes on heating into

A. Ammonia and nitric acid

B. Nitrous oxide and water

C. Nitrogen, hydrogne and ozone

D. Nitric oxide, nitrogen dioxide and hydrogen

Answer: B

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16. Which one of the following combines with $Fe(II)$ ions to form a brown complex ?

A. N_2O

B. NO

C. CO

D. SO_2

Answer: B

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17. Formula for tear gas is

A. $COCl_2$

B. CCl_3NO_2

C. N_2O

D. None of these

Answer: B

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18. In P_4O_{10}, the number of oxygen atoms bonded to each phosphorus atom are

A. 2

B. 3

C. 4

D. 5

Answer: C

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19. In the reaction, $H_2SO_4 + P_2O_5 \xrightarrow{\Delta} (X) + SO_3$, the product (X) is :

A. PH_3

B. H_3PO_4

C. HPO_3

D. $H_4P_2O_7$

Answer: C

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20. Bleaching action of SO_2 is due to :

A. its reducing nature

B. its oxidising nature

C. its acidic nature

D. its both oxidising as well as reducing nature

Answer: A

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21. Ortho phosphoric acid on heating above $300^{\circ} C$ gives :

A. hypophosphorus acid

B. hypophosphoric acid

C. metaphosphoric acid

D. phosphorous acid

Answer: C

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22. 1 mol of H_3PO_2, H_3PO_3 and H_3PO_4 will neutralise x mol $NaOH$, y mol of $Ca(OH)_2$ and z mol of $Al(OH)_3$ respectively (assuming all as strong electrolytes). x, y, z are in the ratio of:

A. $3:1.5:1$

B. $1:2:3$

C. $3:2:1$

D. $1:1:1$

Answer: D

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23. Which of the following can convert acidified $Cr_2O_7^{2-}$ to green ?

A. $SO_2 / H_2SO_3 / H_2SO_4$

B. $SO_3 / H_2SO_3 / H_2S$

C. $SO_3^{2-} / H_2S / Fe^{2+}$

D. $S(2)O_3^{2-} / SO_3 / Fe^{3+}$

Answer: C

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24. Which of the following statements is true for HNO_2?

A. It can be prepared by acidifying an aqueous solution of nitrite

B. It is unstable weak acid which is known only in aqueous solution

C. N_2O_3 is an anhydride of HNO_2

D. All of these

Answer: D

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25. The compound which has ionic nature in solid state is

A. PCl_5

B. $POCl_3$

C. P_4O_{10}

D. PCl_3

Answer: A

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26. Phosphorus trichloride, PCl_3 undergoes, hydrolysis at room temperature to produce an oxoacid. It has the formula :

A. HPO_3

B. H_3PO_3

C. H_3PO_4

D. H_3PO_2

Answer: B

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27. Which of the following dissolves in water but does not give any oxyacid solution?

A. SO_2

B. OF_2

C. SCl_4

D. SO_3

Answer: B

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28. Hypo is used in photography to

A. Reduce AgBr grains to metallic silver

B. Convert the metallic silver to silver salt

C. Remove undecomposed silver bromide as a soluble complex

D. Remove reduced silver

Answer: C

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29. Sulphur on boiling with $NaOH$ solution gives

A. $Na_2S_2O(3) + NaSO_3$

B. $Na_2S_2O_3 + Na_2S$

C. $Na_2SO_3 + H_2S$

D. $Na_2SO_3 + SO_2$

Answer: B

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1. Sodium thiosulphate is prepared by

A. reducing Na_2SO_3 solution with H_2S

B. Boiling Na_2SO_3 with S in alkaline medium

C. Neutralising $H_2S_2O_3$ solution with NaOH

D. Boiling Na_2SO_3 with S in an acidic medium

Answer: B

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2. Which element of group V A shows maximum oxidation states ?

A. bismuth

B. phosphorus

C. nitrogen

D. arsenic

Answer: C

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3. Which of the halide is unstable ?

A. Nl_3

B. Asl_3

C. Bil_3

D. Pl_3

Answer: A

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4. Platinum metal (Pt) dissolves in aqua-regia but not in concentrated HCl ot HNO_3 because

A. HCl oxidises Pt in the presence of HNO_3

B. HNO_3 reacts with HCl to form chlorine which attacks Pt

C. HNO_3 oxidises Pt which is followed by formation of a chloro complex

D. HCl and HNO_3 together give O_2 that oxidises Pt

Answer: B

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5. The reaction $3O_{2(g)} \rightarrow 2O_{3(g)}$ is endothermic. What can be concluded about the average per bond in O_2 and O_3 ?

A. the average energy per bond in O_2 greater than that in O_3

B. the average energy per bond in O_2 is less than in O_3

C. the average energy per bond in O_2 is equal to that in O_3

D. on conclusion can be drawn about the average bond energies from this information alone

Answer: A

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6. The anhydride of nitric acid is

A. nitric oxide

B. nitrous oxide

C. dinitrogen trioxide

D. dinitrogen pentoxide

Answer: D

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7. The geometry of ammonia molecule can be best described as

A. nitrogen at one vertex of a regular tetrahedron, the other three vertices being occupied by the three hydrogens

B. nitrogen at the centre of the tetrahedron, three of the vertices being occupied by three hydrogen

C. nitrogen at the centre of an equilateral triangle, three corners beings occupied by three hydrogens

D. nitrogen at the junction of a T, three open ends being occupied by three hydrogens

Answer: B

View Text Solution

8. Bone glow in the dark. This is due to

A. the presence of red phosphorus

B. conversion of white phosphorus into red phoshporus

C. the presence of calcium carbonate

D. the presence of calcium phosphate

Answer: D

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9. Inert pair effect plays an important role in the case of

A. P

B. Bi

C. Sb

D. As

Answer: B

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10. In the presence of an anthraquinone derivatives as a catalyst, the aqueous solution of sodium dithionite $Na_2S_2O_4$ (Fieser's solution) effectively remove oxygen and forms

A. $Na_2S_2O_6$

B. $Na_2S_2O_5$

C. Na_2SO_4

D. $Na_2S_2O_8$

Answer: A

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11. In the above reaction (in Q.99) $Na_2S_2O_4$ acts as a

A. 2 electron reducing agent

B. 1 electron reducing agent

C. 3 electron reducing agent

D. 4 electron reducing agent

Answer: A

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12. The ozone hole in the upper atmosphere of the earth is due to the breakdown of ozone to oxygen. The reaction is catalyzed by

A. chlorofluorocarbons

B. oxygen generated during the reaction

C. carbon dioxide present in the atmosphere

D. chlorine formed by the decomposition of chlorofluorocarbons

Answer: D

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13. The electron -pair geometry of the central oxygen atom of ozone is

A. linear

B. trigonal planar

C. tetrahdral

D. trigonal bipyramidal

Answer: B

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14. $P_4(s) + 3OH^-(aq) + 3H_2O(I) \rightarrow PH_3(g) + 3H_2PO_2^-(aq)$

In the above equation, the species getting oxidized and reduced respectively are

A. P_4 and OH^-

B. OH^- and P_4

C. P_4 and H_2O

D. P_4 and P_4

Answer: D

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15. The compound which can act as an oxidizing agent as well as reducing agent is

A. HNO_2

B. Hl

C. HCN

D. HCOOH

Answer: A

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16. When an inert atmosphere is required in metallurgical operation nitrogen is commonly used. However in the extraction of titanium from $TiCl_4$ using magnesium, helium is used as nitrogne rects with

A. $TiCl_4$ to form tianium nitride

B. magnesium to form magnesium nitride

C. titanium to form titanium nitride

D. chlorine to form nitrogne chloride which inhibits the reaction

Answer: B

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17. The nitrogen compound formed when $CaCN_2$ reacts with steam or hot water is

A. N_2O

B. NO

C. NO_2

D. NH_3

Answer: D

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18. The element that has the highest tendency to catenate is

A. silicon

B. germanium

C. sulpur

D. boron

Answer: C

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19. The chemical formula of 'laughing gas' is

A. NO

B. N_2O

C. N_2O_4

D. N_2O_5

Answer: B

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20. Phosphine is prepared by the action of

A. P and HNO_3

B. P and H_2SO_4

C. P and $NaOH$

D. P and H_2S

Answer: C

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21. The reddish -brown gas formed when nitric oxide is oxidized by air is

A. NO_2

B. N_2O_4

C. N_2O_5

D. N_2O_3

Answer: A

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22. Which of the following salt/s of H_3PO_3 exists ?

(I)) NaH_2PO_3 (II) Na_2HPO_3 (III) Na_3PO_3

A. I and II only

B. I, II and III

C. II and III only

D. III only

Answer: A

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23. Acidity of diprotic acids in aqueous solutions increases in the order

A. $H_2S < H_2Se < H_2Te$

B. $H_2Se < H_2S < H_2Te$

C. $H_2Te < H_2S < H_2Se$

D. $H_2Se < H_2Te < tH_2S$

Answer: A

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24. Upon long standing concetrated HNO_3

A. remains colourless, but gives out NO

B. turns yellow brown due to formation NO_2

C. turns yellow brown due to the formation of N_2O_4

D. remains colourless, but gives N_2O

Answer: B

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25. The reaction that doses not produce nitrogen is :

A. heating $(NH_4)_2Cr_2O_7$

B. $NH_3 +$ excess of Cl_2

C. heating of NaN_3

D. heating of NH_4NO_3

Answer: B

Watch Video Solution

26. White phosphorous on reaction with $NaOH$ gives PH_3 and

A. Na_2HPO_3

B. NaH_2PO_2

C. NaH_2PO_3

D. Na_3PO_4

Answer: B

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27. P,Q, R and S are four metals whose typical reaction are given below

(I)

(II) When Q is added to a solution containing the ions of the other metals, metallic P, R, and S are formed

(III) P reacts with concentrated HNO_3 but S does not

The correct order of their reducing character is

A. $S < P < R < Q$

B. $S < R < P < Q$

C. $R < Q < P < S$

D. $Q < P < S < R$

Answer: A

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28. The following compounds are heated (i) KNO_3 (ii) $Cu(NO_3)_2$ (iii) $Pb(NO_3)_2$ (iv) NH_4NO_3 . Which of the following statement/s is/are

correct ?

A. (ii) and (iii) liberate NO_2

B. (iv) liberates N_2O

C. (i), (ii) and (iii) liberate O_2

D. All statements are correct

Answer: D

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29. Nitrogen exists as diatomic molecule and phosphorus as P_4. Why ?

A. N_2 has valence electrons only in bonding and nonbonding orbitals, while P has valence electrons in both bonding and antibonding orbitals

B. higher electronegativity of N favours formation of multiple bonds

C. bigger size of P does not favour multiple bonds

D. P has preference to adapt structures with small bond angles

Answer: C

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30. Which of the following cannot act as an oxidising agent ?

A. S^{2-}

B. Br_2

C. HSO_4^-

D. SO_3^{2-}

Answer: A

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Part Iii Practice Test 2 Jee Advanced Pattern

1. An unknown substance (P) functions as weak base in water. It produces silver mirror test. It reacts with dilute HCl to produce (Q) which turns blue litmus red (P) may be:

A. NH_3

B. PH_3 is less basic than NH_3

C. NH_2OH

D. HPO_3

Answer: C

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2. The compound which gives oxygen on moderate heating is

A. Cupric oxide

B. Mercuric oxide

C. Zinc oxide

D. Aluminium oxide

Answer: B

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3. Which of the following compounds does give N_2 on heating ?

A. NH_4NO_2

B. NH_4NO_3

C. NaN_3

D. Both (A) and (C)

Answer: D

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4. Which of the following cannot result in the formation of NO ?

A. $N_2 + O_2$ (Electric arc)

B. $NH_3 + O_2$, (Pt/Rh catalyst/1200 K)

C. $NaNO_3 / HCl$

D. None of these

Answer: C

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5. A gaseous substance dissolve in water giving a pale blue solution which decolouises $KMnO_4$ and oxidises Kl to l_2 in acidic medium :

A. N_2O_5

B. NH_3

C. N_2O_3

D. HNO_3

Answer: C

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6. Which of the following will not decolourise acidified $KMnO_4$?

A. $S_2O_4^{2-}$

B. $S_2O_5^{2-}$

C. $S_2O_3^{2-}$

D. $S_2O_7^{2-}$

Answer: D

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7. Which of the following statements is not true about ozone ?

A. It is a pale blue gas at room temperature

B. It oxidises sulphur and phosphorus evolving oxygen gas

C. It is odourless

D. It turns dry KOH red

Answer: C

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8. Sulphuric acid reacts with PCl_5 to give

A. Thionyl chloride

B. Sulphur monochloride

C. Sulphuryl chloride

D. Sulphur tetrachloride

Answer: C

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9. Which is greater for P_4 (white) tan P_4 (red)

A. Molar entropy

B. Melting point

C. Solubility in CS_2

D. Ignition temperature

Answer: A::C

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10. What is//are not true abut phosphine (PH_3)?

A. It turns red litmus blue

B. It reacts with HCl (aq.) to give PH_4Cl

C. Phosphonium compounds are obtained when anhydrous phosphine reacts with anhydrous HBr or HI

D. It is prepared by hydrolysis of metal phosphides with acids

Answer: A::B

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11. Which of the following is/are correct regarding nitrogen family

A. Nitrogne is restricted to a maximum covalency of 4 as only four orbitals are available for bonding

B. The single $N-N$ bond is weaker than the single $P-P$ bond

C. The catenation tendency is weaker in nitrogen as compared to phosphorous

D. Nitrogen forms $p\pi-p\pi$ bond as well as $p\pi-d\pi$ bonds

Answer: A::B::C

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12. P_2O_5 can dehydrate

A. H_2SO_4

B. HNO_3

C. $HClO_4$

D. HPO_3

Answer: A::B::C

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13. What products are formed when H_3PO_2 is heated at $415K$ and at $435K$ respectively.

A. H_3PO_3

B. H_3PO_4

C. HPO_3

D. PH_3

Answer: A::B::D

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14. $4AgNO_3 + 2H_2O + H_3PO_2 \xrightarrow{\text{boil}} 4Ag + 'X' + 'Y'$

If X is oxyacid of nitrogen and Y is oxyacid of phosphorous then correct statement(s) is/are

A. X is HNO_2

B. Y is H_3PO_4

C. H_3PO_2 act as good reducing agent

D. The oxidation number of 'P' change from $+1 \text{ to } +5$

Answer: B::C::D

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15. Cold dilute nirtic acid would dissolved how many of the following without significant evolution of any gas:

$Pb, Mg, Sb, Au, Ag, Fe, Mn, Sn, P_4$

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16. Which of the following on heating will produce an oxide of nitrogen

$(NH_4)_2SO_4$, $(NH_4)_2Cr_2O_7$, NH_4NO_3, KNO_3, $Pb(NO_3)_2$, $(NH_4)_2HPO_4$

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17. $NaPO_3$ can significantly react with how many of the following ?

$CaCl_2$, $MgSO_4$, CaO, Na_2CO_3, dry HCl, $(HCO_3)_2$, Na_3PO_4

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18. One mole of PCl_3 is dissolved in excess of water. No. of moles of NaOH required to neutralise this solution completely is

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19. When hypo solution react with $CuSO_4$ and produce soluble complex, then how many no. moles of atoms present in one mole of soluble complex in co-ordination sphere

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20. How many of the following reaction yield $POCl_3$?

$(i) PCl_3 + O_2 \rightarrow$ $(ii) PCl_5 + CO_2 \rightarrow$ $(iii) PCl_5 + CH_3COOH$

$(iv) PCl_5 + H_3BO_3 \rightarrow$ $(v) PCl_3 + SO_2Cl_2 \rightarrow$ $(vi) P_4O_{10} + NaCl \rightarrow$

$(vii) PCl_5 + H_2O \rightarrow$ $(viii) PCl_5 + SO_2 \rightarrow$ $(ix) PCl_3 + SO_3 \rightarrow$

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21. An orange solid (A) on heating gives a green residue (B), a colourless gas (C) and water vapours. The dry gas (C) on passing over heated Mg gave a white solid (D). (D) on reaction with water gave a gas (E) which formed black preciptate with mercurous nitrate solution.

Select the incorrect statement.

A. The central atom (s) of the anion of solid (A) has sp^3 hybridisation

B. The orange solid (A) is diamagnetic in nature

C. The anion of organe solid (A) is oxidising in nature

D. All metal oxygen bond lengths are equal in anion of solid (A)

Answer: D

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22. An orange solid (A) on heating gives a green residue (B), a colourless gas (C) and water vapours. The dry gas (C) on passing over heated Mg gave a white solid (D). (D) on reaction with water gave a gas (E) which formed black preciptate with mercurous nitrate solution.

which of the following is true ofr the gas (E)?

A. It gives a deep blue coluration with $CuSO_4$ solution

B. It is oxidised to a colourless gas (neutral oxide) at 1200 K in presence of a catalyst Pt/Rh in air

C. It gives the same gas (C) with potassium permanganate solution

D. It gives black precipitate with $HgCl_2$

Answer: D

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23. Match the reaction listed in coloumn-I with characteristic(s) listed in column-II

Column-I		Column-II
(1) $2NO_2 \xrightarrow{Cool}$	(p	One of the products is a mixed anhydride.
(2) $ClO_2 + O_3 \xrightarrow{H^+}$	(q)	One of the products is an acidic oxide.
(3) $K_4[Fe(CN)_6] + H_2SO_4$ (conc.) $+ H_2O \xrightarrow{\Delta}$	(r)	The oxidation state of the central atom of one of the products is +6.
(4) $KOH + O_3 \longrightarrow$	(s)	One of the products is a colourless paramagnetic gas.

A. $1-p, q, 2-p, q, s, 3-r, 4-s$

B. $1-p, q, 2-p, q, r, s, 3-r, 4-s$

C. $1-p, 2-p, q, r, s, 3-r, 4-s$

D. $1-p, q, 2-q, r, s, 3-s, 4-r$

Answer: B

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