p-Block Elements

Question1

The correct statements about the compounds of boron are

I. In borax bead test, the colour of cobalt metaborate is blue.

II. Diborane is prepared by the oxidation of sodium borohydride with iodine.

III. In diborane oxidation state of hydrogen is +1 .

IV. Boric acid is a tribasic acid.

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Options:

A.

I and II

B.

III and IV

C.

I and III

D.

II and IV

Answer: A

Solution:

Statement given in I and II are correct regarding boron, while statement III and IV are incorrect.

Their correct forms are,

III. in diborane oxidation state of hydrogen is -1 .

IV. boric acid is not a tribasic acid, it is monobasic acid.

Question2

An oxoacid of phosphorus ' X ' reduces silver nitrate solution to metallic silver and gets oxidised to another compound Y. X and Y respectively are

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Options:

A.

HPO_3, H_3PO_4

B.

H_3PO_2, H_3PO_4

C.

H_3PO_3, H_3PO_2

D.

H_3PO_2, HNO_3

Answer: B

Solution:

The complete reaction is as follows,

$$\underset{\substack{(X)\\ \text{Hypophosphorus acid}}}{H_3PO_2(aq)} + 2AgNO_3(aq) \xrightarrow{H_2O} \underset{(Y)}{H_3PO_4} + 2Ag + 2HNO_3$$

Question3

Zinc on reaction with concentrated nitric acid gives an oxide of nitrogen (A). Zinc with dilute nitric acid gives another oxide of nitrogen (B). Oxidation numbers of nitrogen in (A) and (B) are respectively

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Options:

A.

$+4, +1$

B.

$+4, +2$

C.

$+2, +4$

D.

$+1, +4$

Answer: A

Solution:

The reaction is,

$$\underset{\text{(conc.)}}{Zn + 4HNO_3} \longrightarrow \underset{(A)}{Zn(NO_3)_2 + 2NO_2} + 2H_2O$$

$$\underset{\text{(dil.)}}{4Zn + 10HNO_3} \longrightarrow 4Zn(NO_3)_2 + \underset{(B)}{N_2O} + 5H_2O$$

Oxidation state of nitrogen,

(A) $NO_2 = +4$

(B) $N_2O = +1$

Question4

Identify the reaction related to Deacon's process

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Options:

A.

$2H_2O + 2Cl_2 \xrightarrow{\text{sunight}} 4HCl + O_2$

B.

$4HCl + O_2 \xrightarrow[723\ K]{CuaC_2} 2Cl_2 + 2H_2O$

C.

$2NaCl + H_2SO_4 \xrightarrow{823\ K} Na_2SO_4 + 2HCl$

D.

$Na_2\ S_2O_3 + Cl_2 + H_2O \longrightarrow Na_2SO_4 + 2HCl + S$

Answer: B

Solution:

Deacon's process is a chemical method use to produce chlorine gas from hydrochloric acid.

The reaction is, $4HCl + O_2 \xrightarrow[723\ K]{CuCl_2} 2Cl_2 + 2H_2O$

Question5

Phosphorus on reaction with sulphuryl chloride gives a compound X, which on complete hydrolysis gives Y. X and Y are respectively.

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Options:

A.

PCl_3, H_3PO_3

B.

$PCl_5, POCl_3$

C.

PCl_5, H_3PO_4

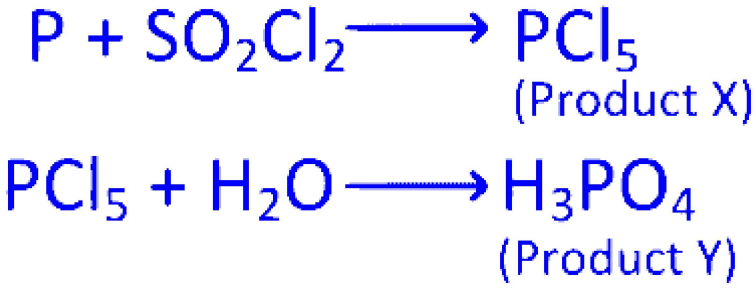
D.

PCl_3, H_3PO_2

Answer: C

Solution:

The complete reaction is as follows,



Complete hydrolysis, Thus, $X = PCl_5, Y = H_3PO_4$.

Question6

Xenon hexafluoride on partial hydrolysis gives ' X ' and HF . The shape of ' X ' is

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Options:

A.

pyramidal

B.

tetrahedral

C.

square pyramidal

D.

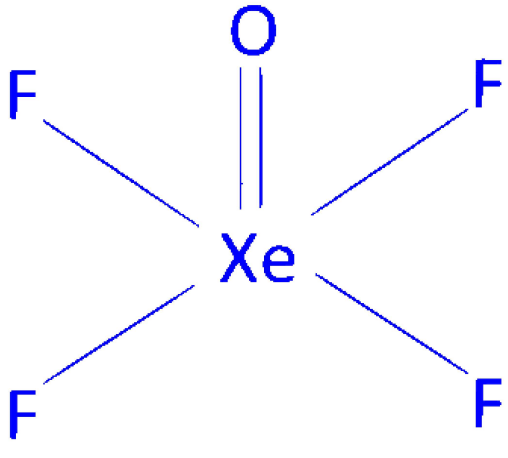
linear

Answer: C

Solution:

The reaction involved is,

$$XeF_6 + H_2O \longrightarrow \underset{(\text{Product } X)}{XeOF_4} + 2HF$$



Thus the shape of $(X)XeF_4$ is square pyramidal.

Question7

Which of the following pairs of oxoacids have basicity as 2?

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Options:

A.

H_3PO_3, H_2SO_4

B.

H_3PO_2, H_2SO_3

C.

H_3PO_4, H_3PO_2

D.

$H_2\ S_2O_8, H_3PO_2$

Answer: A

Solution:

H_3PO_3 and H_2SO_4 both have basicity of 2. H_3PO_3 has two $P-OH$ bond meaning it can donate two $\left[OH^-\right]$ ions when in solution.

H_2SO_4 also have two ionisation H -atom attached to oxygen, giving it a basicity of 2 .

Question8

Among the oxides SiO_2, SO_2, Al_2O_3 and P_2O_3, the correct order of acidic strength is

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Options:

A. $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$

B. $SO_2 < P_2O_3 < Al_2O_3 < SiO_2$

C. $Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

D. $Al_2O_3 < P_2O_3 < SiO_2 < SO_2$

Answer: C

Solution:

The correct order of acidic strength is,

$Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

As electronegativity difference between element and oxygen decreases the acidic character of oxides increases. The electronegativity also increases with increasing oxidation number. In general, as non-metallic character increases across the period, the acidic character of their oxides increases.

Question9

The correct formula of borax is $Na_2\left[B_4O_5(OH)_x\right] \cdot yH_2O$. The sum of x and y is

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Options:

A. 14

B. 09

C. 12

D. 10

Answer: C

Solution:

Borax, scientifically referred to as sodium tetraborate decahydrate, is commonly used as a household cleaner and a booster for laundry detergent.

Chemical Formula

The chemical formula for borax is:

$Na_2\left[B_4O_5(OH)_4\right] \cdot 8H_2O$

Here, the values are:

$x = 4$ (the number of hydroxyl groups)

$y = 8$ (the number of water molecules)

Adding these values gives:

$x + y = 4 + 8 = 12$

Question10

Which among the following oxoacids of phosphorous will have $P - O - P$ bonds?

I. $H_4P_2O_5$

II. $H_4P_2O_6$

III. $H_4P_2O_7$

IV. $(HPO_3)_3$

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Options:

A. III and IV

B. I and II

C. I and III

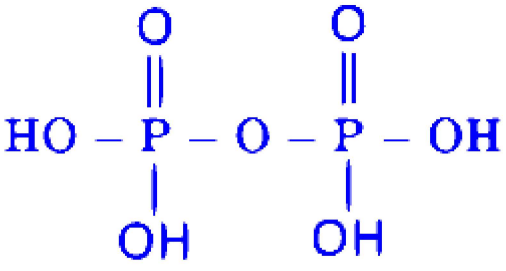
D. II and IV

Answer: A

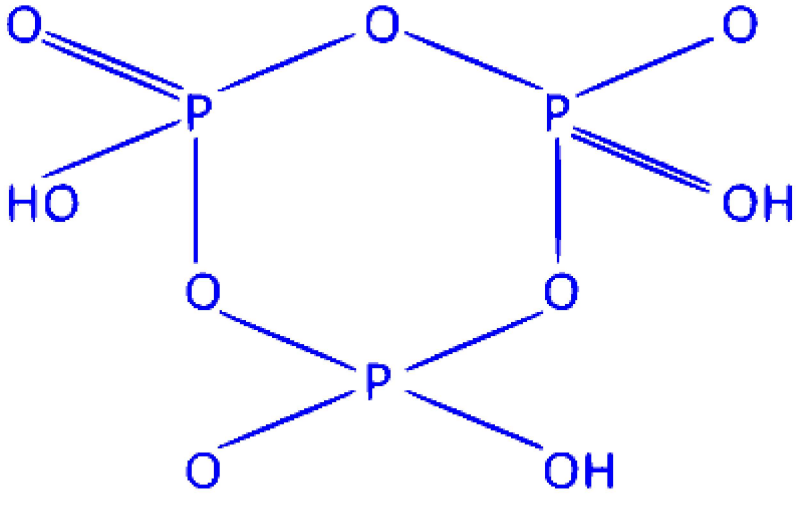
Solution:

$H_4P_2O_5, H_4P_2O_7$ and $(HPO_3)_3$

oxoacids of phosphorous contain $P - O - P$ bonds.



Pyrophosphoric acid $(H_4P_2O_7)$



$(HPO_3)_3$

Trimer of metaphosphoric acid

Question11

What are X and Y respectively in the following reactions ?

$$X \xleftarrow{CO} B_2H_6 \xrightarrow[(C_2H_5)_2O]{NaH} Y$$

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Options:

A. $BH_3 \cdot 2CO; NaBO_2$

B. $BH_3 \cdot CO; NaBH_4$

C. $BH_3 \cdot CO; NaBO_2$

D. $BH_3 \cdot CO; Na_2B_4O_7$

Answer: B

Solution:

Diborane undergoes cleavage reaction with Lewis base (CO) to give borane adduct, $BH_3 \cdot CO$ which is compound X. When alkyl metal hyaride

(NaH) react with diborane in presence of ether, a tetrahedral compound ($NaBH_4$) is formed.

The complete reaction is as follow

$$2CO + B_2H_6 \longrightarrow \underset{\text{Compound } X}{2BH_3CO}$$

$$2NaH + B_2H_6 \xrightarrow{\text{Ether}} \underset{\text{Compound } Y}{2NaBH_4}$$

Question12

Which of the following statements are correct?

(i) CCl_4 undergoes hydrolysis easily

(ii) Diamond has directional covalent bonds

(iii) Fullerene is thermodynamically most stable allotrope of carbon

(iv) Glass is a man-made silicate

The correct answer is

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Options:

A. i, iii only

B. ii, iv only

C. ii, iii, iv only

D. i, ii only

Answer: B

Solution:

(ii) Diamond has directional covalent bonds.

Diamonds are structured with each carbon atom forming strong covalent bonds with four other carbon atoms, creating a tetrahedral lattice. This arrangement results in directional covalent bonding, contributing to diamond's extreme hardness and high melting point.

(iv) Glass is a man-made silicate.

Glass is an amorphous solid primarily composed of silica (SiO_2) and is synthesized through the high-temperature melting and cooling of sand and other materials. It fits into the category of silicates because it includes silicon and oxygen.

Option B: ii, iv only

Question13

Observe the following reactions (unbalanced)

$$P_2O_3 + H_2O \longrightarrow X$$
$$P_4O_{10} + H_2O \longrightarrow Y$$

The number of $P = O$ bonds present in X, Y are respectively

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Options:

A. 1,3

B. 1, 2

C. 2,1

D. 1,1

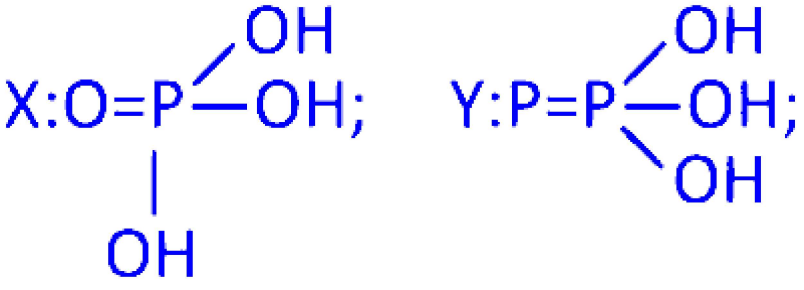
Answer: D

Solution:

The complete reaction is as follows

$$\underset{(\text{Product } X)}{2H_3PO_3} \longleftarrow P_2O_3 + 3H_2O$$

$$\underset{(\text{Product } Y)}{4H_3PO_4} \longleftarrow P_4O_{10} + 6H_2O$$



Product X and Y both consist of one $P = O$ bond each.

Question14

Carbon on reaction with hot conc. H_2SO_4, gives two oxides along with H_2O. What is the nature of these two oxides?

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Options:

A. Both are acidic

B. Both are basic

C. Both are neutral

D. Both are amphoteric

Answer: A

Solution:

Carbon reaction with hot and conc. H_2SO_4 gives,

$$C + 2H_2SO_4 \longrightarrow CO_2 + 2SO_2 + 2H_2O$$

Both the oxides, CO_2 and SO_2 are acidic in nature.

Question15

Observe the following species.

(i) NH_3

(ii) $AlCl_3$

(iii) $SnCl_4$

(iv) CO_2

(v) Ag^+

(vi) HSO_4^-

How many of the above species act as Lewis acids?

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Options:

A. 5

B. 3

C. 4

D. 2

Answer: C

Solution:

Among the given species there are total 4 Lewis acids, these are $AlCl_3$, $SnCl_4$, CO_2, Ag^+.

HSO_4^- is amphoteric compound.

NH_3 is Lewis base.

Question16

An organic compound containing phosphorous on oxidation with Na_2O_2 gives a compound ' X '. This ' X ' when boiled with HNO_3 followed by treatment with a reagent gives yellow precipitate Y. X and Y respectively are

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Options:

A. $Na_3PO_4, (NH_4)_2MoO_3$

B. $Na_3PO_4, (NH_4)_2MoO_4$

C. $H_3PO_4, (NH_4)_2MoO_4$

D. $Na_3PO_4, (NH_4)_3PO_4 \cdot 12MoO_3$

Answer: D

Solution:

When an organic compound containing phosphorus is oxidised with Na_2O_2 it gives Na_3PO_4.

Na_3PO_4 when treated with HNO_3 will form phosphoric acid (H_3PO_4). When H_3PO_4 is treated with ammonium molybdate in presence of nitric acid, it forms a yellow ppt. The reaction is as follow

$$\underset{(C \text{ Compound } X)}{Na_3PO_4} + 3HNO_3 \longrightarrow H_3PO_4 + 3NaNO_2$$

$$H_3PO_4 + 12(NH_4)_2MoO_4 + 21HNO_3 \longrightarrow$$

$$21NH_4NO_3 + (NH_4)_3PO_4 \cdot 12MoO_3 \downarrow$$

Yellow ppt

(Product Y)

Question17

Among the hydrides NH_3, PH_3 and BiH_3, the hydride with highest boiling point is X and the hydride with lowest boiling point is Y. What are X and Y respectively?

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Options:

A. PH_3, NH_3

B. NH_3, PH_3

C. BiH_3, PH_3

D. NH_3, BiH_3

Answer: C

Solution:

Boiling points of nitrogen family generally increases on moving down the group due to increase in number of shell but boiling point of NH_3 is higher than PH_3 due to hydrogen bonding. Hence, highest boiling point $-BiH_3$ Lowest boiling point $-PH_3$

Question18

Xenon (VI) fluoride on complete hydrolysis gives an oxide of xenon ' O '. The total number of σ and π-bonds sin **' O ' is i"**

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Options:

A. 2

B. 4

C. 6

D. 8

Answer: C

Solution:

XeF_6 on complete hydrolysis gives

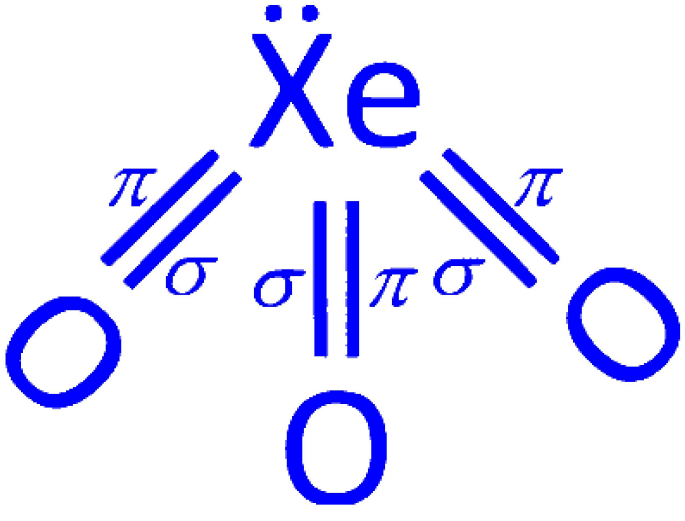
XeO_3.

$$XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$$

$$XeOF_4 + H_2O \longrightarrow XeO_2F_2 + 2HF$$

$$XeO_2F_2 + H_2O \longrightarrow XeO_3 + 2HF$$

So, the compound formed on complete hydrolysis of xenon is XeO_3.



XeO_3 has three double bond and each double bond has 1σ and 1π bond.

Total $\sigma + \pi = 3 + 3 = 6$

Question19

Consider the following reactions (not balanced).

$$BF_3 + NaH \xrightarrow{450\ K} X + NaF$$
$$X + H_2O \longrightarrow Y + H_2\uparrow$$

The correct statements about X and Y are

I. X is an electron deficient molecule.

II. in $X, B-B$ bond is present.

III. Y is a weak tribasic acid.

IV. Y acts as a Lewis acid.

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Options:

A. I and IV

B. II and III

C. II and IV

D. I and III

Answer: A

Solution:

The complete balanced reaction is as follows,

$$2BF_3 + 6NaH \xrightarrow{450\ K} \underset{\substack{\text{Diborane} \\ \text{(Product } X\text{)}}}{B_2H_6} + 6NaF$$

$$B_2H_6 + 6H_2O \longrightarrow \underset{\substack{\text{Boric acid} \\ \text{(Product } Y\text{)}}}{2H_3BO_3} + 6H_2 \uparrow$$

Hence, X is electron deficient molecule while Y is an Lewis acid.

Question20

Which of the following does not exist?

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Options:

A. $[GeCl_6]^{-2}$

B. $[SiF_6]^{2-}$

C. $[SCl_6]^{2-}$

D. $[Sn(OH)_6]^{2-}$

Answer: C

Solution:

In$[SiCl_6]^{2-}$, the chlorine atoms are much larger which does not allow the six chlorine to surround the silicon due to repulsion between chlorine atom. Hence, due to interelectron repulsion between chlorine atom the compound $[SiCl_6]^{2-}$ is unstable and does not exists.

Question21

Consider the following reactions.

$X + O_2 \rightarrow Cu_2O + SO_2, Cu_2O + X \rightarrow Cu + Y \uparrow$

The shape of the molecule Y is

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Options:

A. linear

B. tetrahedral

C. pyramidal

D. angular

Answer: D

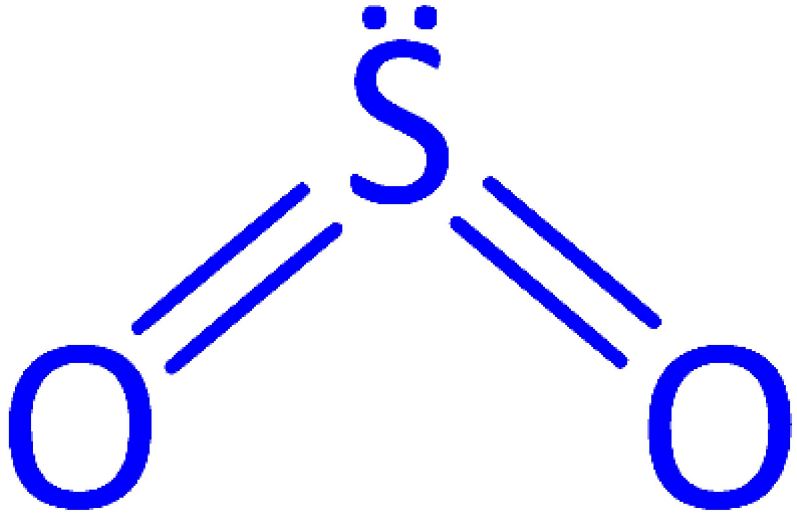
Solution:

The complete balance reaction is as follows,

$$\underset{\substack{\text{Molecule}\\X}}{2Cu_2S} + 3O_2 \longrightarrow 2Cu_2O + SO_2$$

$$2Cu_2O + \underset{(\text{M}_{\text{olecule}}\quad X)}{Cu_2S} \xrightarrow{\Delta} 6Cu + \underset{(\text{Product}\quad Y)}{SO_2(g)}$$

The product Y is SO_2 which has bent or angular geometry.



Question22

In contact process of manufacture of H_2SO_4, the arsenic purifier used in the industrial plant contains

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Options:

A. $Al_2O_3 \cdot xH_2O$

B. $FeO \cdot XH_2O$

C. $Cr_2O_3 \cdot xH_2O$

D. $Fe_2O_3 \cdot xH_2O$

Answer: D

Solution:

In contact process of manufacture of H_2SO_4, the arsenic purifier used in industrial plant consist of $Fe_2O_3 \cdot xH_2O$. It is used to remove arsenic impurities formed in contact process.

Question23

Observe the oxides $CO, B_2O_3, SiO_2, CO_2, Al_2O_3. PbO_2, Tl_2O_3$. The number of acidic oxides in the list is

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Options:

A. 3

B. 4

C. 5

D. 2

Answer: A

Solution:

Among the given oxides, only three oxides namely B_2O_3, SiO_2 and CO_3 are acidic oxides.

$$B_2O_3 + 2NaOH \longrightarrow NaBO_3 + H_2O$$
$$SiO_2 + 2NaOH \longrightarrow Na_2SiO_3 + H_2O$$
$$CO_2 + 2NaOH \longrightarrow Na_2CO_3 + H_2O$$

while Tl_2O_3 is basic oxide.

CO is neutral oxide and Al_2O_3 and PbO_2 are amphoteric oxides.

Question24

Which of the following when subjected to thermal decomposition will liberate dinitrogen ?

(i) Sodium nitrate

(ii) Ammonium dichromate

(iii) Barium azide

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Options:

A. (i), (ii) only

B. (ii), (iii) only

C. (i), (iii) only

D. (i), (ii), (iii)

Answer: B

Solution:

Ammonium dichromate and barium azide when subjected to thermal decomposition will liberate dinitrogen.

$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} Cr_2O_3 + N_2 \uparrow + 4H_2O \uparrow$$
$$Ba(N_3)_2 \longrightarrow Ba + 3\,N_2 \uparrow$$

Question25

Identify the set which is not correctly matched in the following.

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Options:

A. PH_3, colourless gas, rotten fish smell.

B. Cl_2, greenish yellow gas, pungent smell.

C. Ne , fluoresent green gas, rotten egg smell.

D. SO_2, colourless gas, pungent smell.

Answer: C

Solution:

Matching given in option (c) is incorrect. The correct form is:Neon gas is colourless and odourless, but it has a bright red orange glow (discharge) when electricity is applied.

Question26

The dioxides and monoxides of elements X and Y are amphoteric in nature. X and Y are respectively

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Options:

A. C, Si

B. Si, Ge

C. Sn, Pb

D. Ge, Pb

Answer: C

Solution:

$SnO_2 + 4HCl \longrightarrow SnCl_2 + 2H_2O$

$SnO_2 + 2NaOH \longrightarrow Na_2SnO_3 + H_2O$

SnO_2 is amphoteric in nature.

$SnO + 2HCl \longrightarrow SnCl_2 + H_2O$
$SnO + 2NaOH \longrightarrow Na_2SnO_2 + H_2O$

SnO is also amphoteric in nature.

$\therefore$ The dioxide and monoxide of Sn , both are amphoteric in nature.

$PbO_2 + 4HCl \longrightarrow PbCl_4 + 2H_2O$
$PbO_2 + 2NaOH \longrightarrow Na_2PbO_3 + H_2O$

PbO_2 is amphoteric in nature

$PbO + 2HCl \longrightarrow PbCl_2 + H_2O$
$H_2O + PbO + Ca(OH)_2 \longrightarrow Ca[\,Pb(OH)_3]_2$

PbO is also amphoteric in nature.

$\therefore$ The dioxide and monoxide of Pb both are amphoteric in nature.

Question27

Assertion (A) : In group 15 elements nitrogen does not form pentahalides.

Reason (R) : Nitrogen can exhibit +5 oxidation state.

The correct option among the following is

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Options:

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

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

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

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

Answer: B

Solution:

In Group 15 elements, nitrogen does not form pentahalides. This is because nitrogen has the electronic configuration of $1s^2, 2s^2, 2p^3$, indicating it only possesses s and p orbitals. Nitrogen lacks d orbitals, which are required to expand its covalency beyond four. Consequently, it cannot form pentahalides.

Nitrogen can attain a +5 oxidation state, achieving a stable electronic configuration of $1s^2$.

Thus, although both the assertion that nitrogen does not form pentahalides and the reasoning that nitrogen can exhibit a +5 oxidation state are true, the reason does not logically explain the assertion.

Question28

Which of the following reaction represents Deacon's method?

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Options:

A. $2H_2O + 2Cl_2 \xrightarrow{\text{Sunlight}} 4HCl + O_2$

B. $4HCl + O_2 \xrightarrow[723\ K]{CaCl_2} 2H_2O + Cl_2$

C. $2NaCl + 2H_2O \xrightarrow{\text{Electrolysis}} 2NaOH + H_2 + Cl_2$

D. $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 \cdot H_2O$

Answer: B

Solution:

In Deacon's method, hydrogen chloride (HCl) is passed into a blast furnace and burnt with air to produce chlorine and heat.

$4HCl + O_2 \xrightarrow[723\ K]{CuCl_2} 2H_2O + Cl_2$

Question29

The nitrate of which of the following metals does mot liberate NO_2 gas on heating?

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Options:

A. Pb

B. Ba

C. Li

D. K

Answer: D

Solution:

The nitrate of potassium metal of heating liberates KNO_2 and O_2, the reaction involved is as follows:

$2KNO_3(s) \xrightarrow{\Delta} 2KNO_2(s) + O_2(g)$

So, nitrate of potassium does not librate NO_2 gas on heating.

Question30

What are the correct statements about the elements of group 13 given below?

(I) The stability of +1 oxidation state follows the order $Tl > In > Ga$.

(II) Boron has the lowest melting point and boiling point as it is a non-metal.

(III) Boron shows a maximum covalency of 4 in its compounds.

(IV) The order of atomic radius is $Ga > Al > In$.

(V) Aluminium is passive to concentrated nitric acid.

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Options:

A. I, III and V only

B. II, IV and V only

C. I, II and IV only

D. III, IV and V only

Answer: A

Solution:

Let's analyze each statement one by one:

(I) "The stability of +1 oxidation state follows the order $Tl > In > Ga$."

In group 13, the inert pair effect increases as we go down the group. This makes the +1 oxidation state particularly stable in thallium (Tl), moderately stable in indium (In), and least stable in gallium (Ga).

Thus, statement (I) is correct.

(II) "Boron has the lowest melting point and boiling point as it is a non-metal."

Even though boron is a non-metal (or more correctly a metalloid), it is unique in having very high melting and boiling points. For example, boron has a melting point over 2000°C, contrary to the idea that non-metals have low melting and boiling points.

Therefore, statement (II) is incorrect.

(III) "Boron shows a maximum covalency of 4 in its compounds."

Being a second-period element, boron does not have d-orbitals to expand its octet. Hence, it can accommodate at most four electron pairs around it. This is seen in species like the tetrahydroborate ion, BH_4^-, where boron forms four bonds.

So, statement (III) is correct.

(IV) "The order of atomic radius is $Ga > Al > In$."

Generally, atomic radii increase down a group. For group 13, the expected order is:

$Al < Ga < In$.

The given order is not consistent with the trend (in fact, indium should be larger than gallium), so statement (IV) is incorrect.

(V) "Aluminium is passive to concentrated nitric acid."

Aluminium forms a thin, adherent oxide layer that protects it from reacting with concentrated nitric acid.

Thus, statement (V) is correct.

Summing up, the correct statements are (I), (III), and (V).

The answer is Option A: I, III and V only.

Question31

Consider the reaction,

$$P_4 + 3NaOH + 3H_2O \longrightarrow Q + 3NaH_2PO_2$$

Identify the reaction in which Q is not the product. (equations are not balanced)

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Options:

A. $Ca_3P_2 + H_2O \longrightarrow$

B. $H_3PO_3 \xrightarrow{\Delta}$

C. $PH_4I + KOH \longrightarrow$

D. $PCl_3 + H_2O$

Answer: D

Solution:

First, let us identify what the species Q is in the given reaction:

$$P_4 + 3\,NaOH + 3\,H_2O \longrightarrow Q + 3\,NaH_2PO_2.$$

This is a classic reaction in which white phosphorus P_4 reacts with a base (e.g., NaOH) and water to form **phosphine** (PH_3) and sodium hypophosphite (NaH_2PO_2):

$$P_4 + 3\,NaOH + 3\,H_2O \longrightarrow PH_3 + 3\,NaH_2PO_2.$$

Hence, $Q = PH_3$ (phosphine).

Checking Each Option

We want to find the reaction **that does NOT produce phosphine** (PH_3).

Option A: $Ca_3P_2 + H_2O$

Calcium phosphide and water react to form **phosphine** (PH_3) and calcium hydroxide:

$$Ca_3P_2 + 6\,H_2O \longrightarrow 3\,Ca(OH)_2 + 2\,PH_3.$$

Phosphine is produced. So Q *is* formed here.

Option B: $H_3PO_3 \xrightarrow{\Delta}$

On heating phosphorous acid, it *disproportionates* to form **phosphoric acid** (H_3PO_4) and **phosphine** (PH_3):

$4\,H_3PO_3 \xrightarrow{\Delta} 3\,H_3PO_4 + PH_3.$

Phosphine is produced. So Q is formed here too.

Option C: $PH_4I + KOH$

Phosphonium iodide reacts with a strong base (KOH) to release **phosphine** (PH_3) plus KI and H_2O:

$PH_4I + KOH \longrightarrow PH_3 + KI + H_2O.$

Phosphine is produced. So Q is formed in this reaction as well.

Option D: $PCl_3 + H_2O$

Phosphorus trichloride hydrolyzes (usually vigorously) to form **phosphorous acid** (H_3PO_3) and hydrochloric acid (HCl):

$PCl_3 + 3\,H_2O \longrightarrow H_3PO_3 + 3\,HCl.$

Phosphine (PH_3) is *not* produced in this reaction.

Conclusion

Since we are looking for the reaction in which **phosphine** (Q) **is *not* a product**, the correct choice is:

$\boxed{\text{Option D: } PCl_3 + H_2O \longrightarrow H_3PO_3 + 3\,HCl \text{ (no } PH_3).}$

Question32

The oxidation state of sulphur atoms and numbers of $S-OH$ bonds in peroxydisulphuric acid are respectively

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Options:

A. $(+6, +5), 2$

B. $(+6, +6), 4$

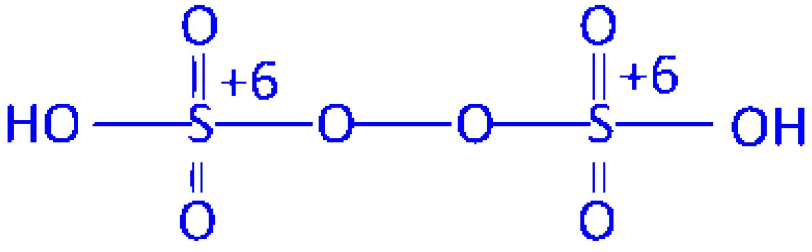
C. $(+6, +6), 2$

D. $(+5, +5), 4$

Answer: C

Solution:

The formula of peroxydisulphuric acid is $H_2\ S_2O_8$. It's structure is given by



From the structure, we can clearly see that, the oxidation state for both the sulphur atom is +6 and it has two $S-OH$ bonds.
