NCERT Solutions for Class 11 Chemistry Chapter 11 The P-Block Elements

Question 11.1(i) Discuss the pattern of variation in the oxidation states of

$(i)\ B\ to\ Tl$

Answer :

These elements belong to group 13 of the general electronic configuration $ns^2,\ np^1$. These elements have three valence electrons, therefore, they can exhibit a maximum only +3 oxidation state. Boron shows only +3 oxidation state but other elements also show +1 oxidation state. On moving down the group from $B\ to\ Tl$, its stability increases due to inert pair effect. After removal of the last electron from p- orbital, the remaining two electrons behave like inert gases and don't take part in bonding. They are strongly attracted by the nucleus. This reluctance of the s- electron pair to take part in bond formation is called inert pair effect.

Question 11.1(ii) Discuss the pattern of variation in the oxidation states of

$(ii)\ C\ to\ Pb$

Answer :

These elements belong to group 14, of the general electronic configuration $ns^2,\ np^2$. These elements have four valence electrons, therefore, they can exhibit commonly +4 oxidation state. On moving down the group from $B\ to\ Tl$ +2 oxidation state becomes more and more common. Carbon and silicon mostly show +4 oxidation state, its stability

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decreases on moving down the group. It is due to the inert pair effect. Though $Ge,\ Sn,\ Pb$ shows both +2 and +4 oxidation states. The stability of the lower oxidation state decreases down the group.

Question 11.2 How can you explain higher stability of BCl_3 as compared to $TlCl_3$?

Answer :

Both boron and Thallium belong to the 13th group of the periodic table. We know that the stability of lower oxidation state (+1) is increases down the group. Thus BCl_3 is more stable than $TlCl_3$. It is due to the +3 of Boron is more stable than +3 of Thallium. Tl^{3+} is highly oxidising in nature it reverts back to its +1 oxidation state by gaining an electron.

Question 11.3 Why does boron triflouride behave as a Lewis acid ?

Answer :

The electronic configuration of boron is ns^2, np^1 . It has three valance shell electrons. It can form only three covalent bonds. It means Boron has only 6 electrons and its octet is not complete, boron needs 2 more electrons to complete its octet. In BF_3 , its octet is incomplete. Hence it is an electron deficient molecules so it acts as a Lewis acid.

Question 11.4 Consider the compounds, BCl_3 and CCl_4 . How will they behave with water ? Justify.

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Answer :

BCl_3 is a Lewis acid, it is an electron deficient molecules. So, it readily undergoes to hydrolysis. On hydrolysis gives boric acid.

$$BCl_3 + H_2O \rightarrow 3HCl + B(OH)_3$$

CCl_4 does not undergo hydrolysis because carbon has no vacant orbital, so it cannot accept an electron from the water molecule to form intermediate.
CCl_4 + water $\rightarrow$ no reaction

Question 11.5 Is boric acid a protic acid ? Explain.

Answer :

Boric acid is not a protic acid. It is a weak monobasic acid, behaves as a Lewis acid by accepting a pair of an electron from the water molecules(OH^-)
$B(OH)_3 + H_2O \rightarrow [B(OH)_4]^- + H_3O^+$

Question 11.6 Explain what happens when boric acid is heated.

Answer :

On heating boric acid around 370 K, it converts to metaboric acid(HBO_2). If we continue the heating process, it becomes boric oxide.

$$H_3BO_3 \xrightarrow[370K]{\Delta} HBO_2 \xrightarrow[red\ hot]{\Delta} B_2O_3$$

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Question 11.7 Describe the shapes of BF_3 and BH_4^- . Assign the hybridisation of boron in these species.

Answer :

The hybridisation of Boron in BF_3 and BH_4^- is sp^2 and sp^3 respectively.

Question 11.8 Write reactions to justify amphoteric nature of aluminium.

Answer :

amphoteric nature of aluminium means it shows properties of acid as well as the base. Aluminium dissolves in acid and bases.

Reaction with acids-

$$2Al + 6HCl \rightarrow Al^{3+} + 6Cl^- + 3H_2$$

Reaction with the base-

$$2Al + 2NaOH + 6H_2O \rightarrow 2Na^+[Al(OH)_4]^- + 6Cl^- + 3H_2$$

Question 11.9 What are electron deficient compounds ? Are BCl_3 and $SiCl_4$ electron deficient species ? Explain.

Answer :

Electron-deficient compounds are those in which the octet of the central atom is not completed. Therefore, the metal wants to complete its octet by accepting an electron from a donor molecule.

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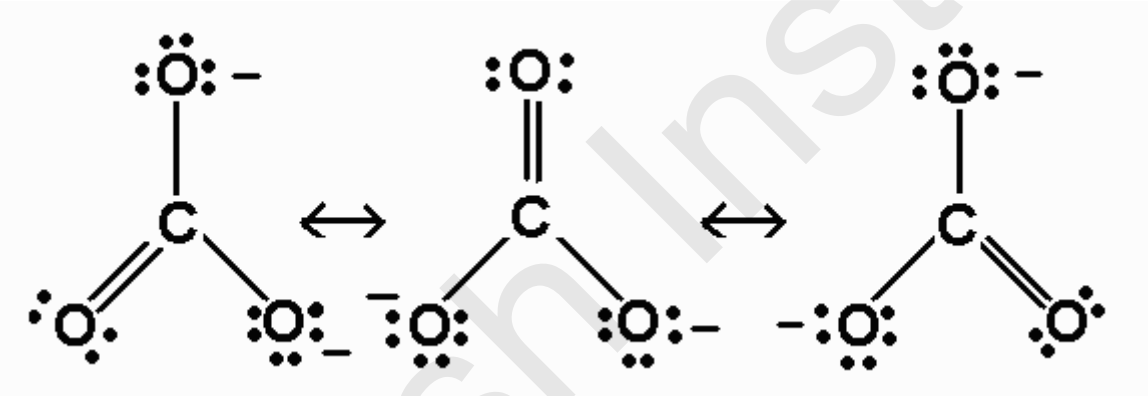
BCl_3 is an electron-deficient compound because of the central atom, Boron has only 6 electrons, two electrons are needed to complete its octet.

$SiCl_4$ silicon has 4 valence electrons and by covalent bonding, it gets 4 electrons from four chlorine atom. Hence, $SiCl_4$ is not an electron-deficient molecule.

Question 11.10 Write the resonance structures of CO_3^{2-} and HCO_3^- .

Answer :

The resonance structure of the CO_3^{2-} and HCO_3^- -





Question 11.11(a) What is the state of hybridisation of carbon in

$(a)\ CO_3^{2-}$

Answer :

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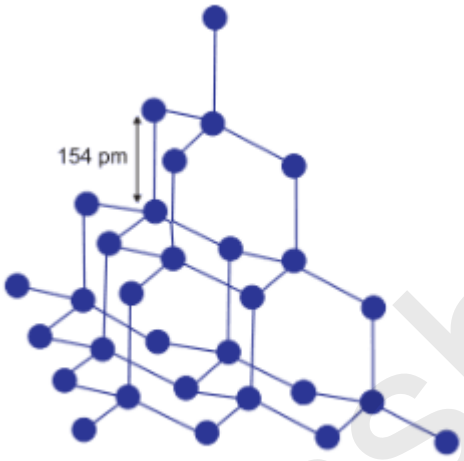
The state of hybridization of Carbon in CO_3^{2-} **is** sp^2 **and** it is bonded with three oxygen in a same plane.

Question 11.11(b) What is the state of hybridisation of carbon in

diamond ?

Answer :

Each carbon in diamond is sp^3 hybridised and four carbon is attached to one central carbon.



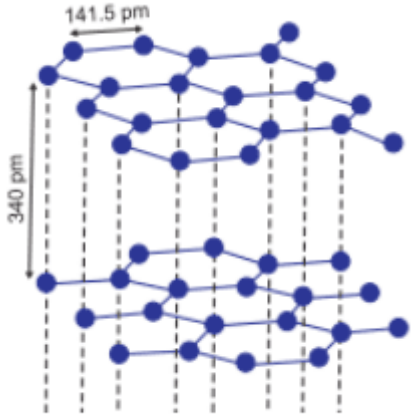
Question 11.11(c) What is the state of hybridisation of carbon in

graphite?

Answer :

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The hybridisation of each carbon in graphite is sp^2 . Each carbon is attached with three neighbour carbon atoms.



Question 11.12 Explain the difference in properties of diamond and graphite on the basis of their structures.

Answer :

The difference in the properties of carbon and graphite-

Diamond	**Graphite**
It has a crystalline structure	Layered structure
Each carbon atom is sp^3 hybridised	Carbon has sp^2 hybridisation
Made up of tetrahedral units	Planner in geometry
Act as an electrical insulator.	Good conductor of electricity

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C-C bond length is 154 pm	C-C bond length is 141.5 pm

Question 11.13(a) Rationalise the given statements and give chemical reactions :

Lead (II) chloride reacts with Cl_2 to give $PbCl_4$.

Answer :

Pb is belong to the group 14th and it has two oxidation states +2 and +4. On moving down the group, the stability of the +2 oxidation state is more than the +4 oxidation state, it is due to the inert pair effect. This $PbCl_4$ is less stable than $PbCl_2$. However, the formation of $PbCl_4$ takes places when the chlorine gas is bubbled by a saturated solution of $PbCl_2$.

$$PbCl_2 + Cl_2 \rightarrow PbCl_4$$

Question 11.13(b) Rationalise the given statements and give chemical reactions :

Lead(IV) chloride is highly unstable towards heat.

Answer :

On moving down the group the +4 oxidation of lead has less stable than +2 oxidation due to the inert pair effect. Thus on heating, the lead(IV) will be reduced to lead(II).

$$PbCl_4(l) \xrightarrow{\Delta} PbCl_2(s) + Cl_2(g)$$

Question 11.13(c) Rationalise the given statements and give chemical reactions

Lead is known not to form an iodide, PbI_4.

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Answer :

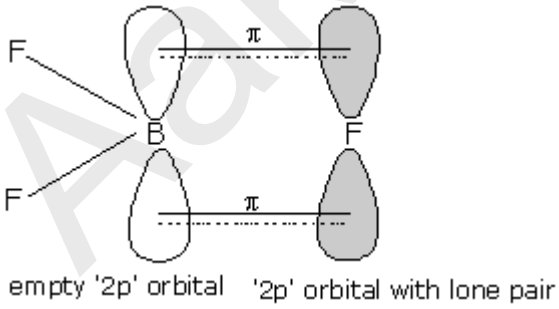
Lead is not form PbI_4. Pb(+4) is oxidising in nature and I^- is reducing in nature. So the PbI_4. is not stable in this state. $Pb(+4)$ oxidises I^- to I_2 and itself get reduced to $Pb(+2)$.

$$PbI_4 \rightarrow PbI_2 + I_2$$

Question 11.14. Suggest reasons why the B–F bond lengths in BF_3 (130 pm) and BF_4^- (143 pm) differ.

Answer :

The B-F bond length in BF_3 is shorter than the B-F bond length in BF_4^- . BF_3 is an electron deficient species, in which p orbital is vacant in Boron. To overcome this problem the fluorine and the boron atom undergoes $p\pi - p\pi$ back bonding. Due to this a partial double bond character is imparts on them. Because of this double bond character, the B-F bond in BF_3 molecule is shortened. On the other hand, In the case of BF_4^- , the hybridization changes from $sp^2 \rightarrow sp^3$. Now boron has 4- sigma bonds and it lose its partial double bond character. Due to this reason, the B-F bond length in BF_4^- is 143 pm.

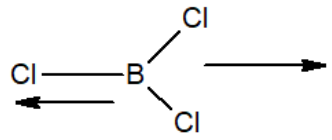


Question 11.15. If B–Cl bond has a dipole moment, explain why BCl_3 molecule has zero dipole moment.

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Answer :

Due to differences in electronegativities of Boron and chlorine, the partial charges develop in B-Cl bond. BCl_3 is a non-polar compound. This molecule is trigonal planner shape (symmetrical) and we know that dipole moment is a vector quantity. In fig. we can see that, they can cancel out each other.



Question 11.17. Suggest a reason as to why CO is poisonous.

Answer :

carbon monoxide is more poisonous than carbon dioxide, (non-toxic in nature). CO has the ability to block delivery of oxygen to the organ and tissue. Also, it binds to haemoglobin to form a complex carboxyhaemoglobin, which is 300 times more stable than the oxygen-haemoglobin complex. If the concentration of these complex reaches to 3-4% then the capacity of blood to carry oxygen is reduced. On the other hand, CO_2 is not poisonous, it is harmful only at high concentration.

Question 11.18. How is excessive content of CO_2 responsible for global warming ?

Answer :

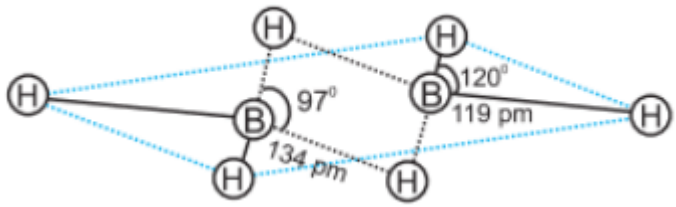
Carbon dioxide can ability to trap the heat emitted by the sun radiation. Higher the amount of CO_2 , higher the amount of heat trapped. Therefore, this results in an increase in temperature of the atmosphere causing global warming. Hence, excessive content of carbon dioxide is a threat to us.

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Question 11.19. Explain structures of diborane and boric acid.

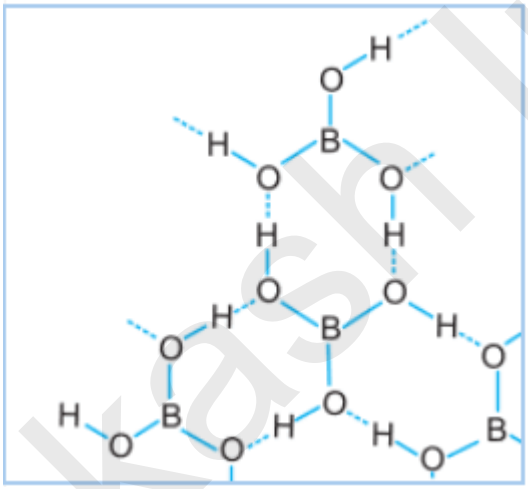
Answer :

Diborane-



The four terminal H atom and Boron lie in the same plane but two bridge H atom is below the plane. The four terminal B-H bonds are regular **two centre-two electron bonds. T** he two (B-H-B) bonds are known as banana bonds(3-centre-2-electron bonds).

Boric acid-



It is a weak monobasic acid. It is Lewis acid, not protic acid. It has a layered structure, the BO_3 molecule is linked by hydrogen-bonding with another BO_3 molecule. The dotted line represents H-bonding.

Question 11.20(a) What happens when

Borax is heated strongly?

Answer :

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The molecular formula of borax is $Na_2B_4O_7.10H_2O$. On heating, it loses water molecules and converts into sodium metaborate($Na_2B_4O_7$) and if we continue the heating process it becomes anhydride, called as boric anhydride B_2O_3 .

$$Na_2B_4O_7.10H_2O \rightarrow Na_2B_4O_7 \rightarrow 2NaBO_2 + B_2O_3$$

Question 11.20(b) What happens when

(b) Boric acid is added to water?

Answer :

When boric acid is added to water it accepts electrons from the water molecule(OH^-)and forms($[B(OH)_4]^-$)

$$B(OH)_3 + H_2O \rightarrow [B(OH)_4]^- + H_3O^+$$

Question 11.20(c) What happens when

Aluminium is treated with dilute $NaOH$?

Answer :

Aluminium is treated with dilute $NaOH$ hydrogen gas is liberated and form sodium tetrahydroxy aluminate(III)

$$2Al + 2NaOH + 6H_2O \rightarrow 2Na^+[Al(OH)_4]^- + 3H_2$$

Question 11.20(d) What happens when

BF_3 is reacted with ammonia ?

Answer :

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When BF_3 is reacted with ammonia they form an borane adduct and due to that, the boron atom completes its octet.

$$F_3B+:NH_3 \rightarrow F_3B \leftarrow :NH_3$$

Question 11.21(a) Explain the following reactions

Silicon is heated with methyl chloride at high temperature in the presence of copper;

Answer :

Silicon is heated with methyl chloride at high temperature in the presence of copper; as a catalyst at a temperature around 573K different types of methyl substituted chlorosilane are formed. for example- $MeSiCl_3, Me_2SiCl_2, Me_3SiCl$ and a small amount of Me_4Si

$$2CH_3Cl + Si \xrightarrow[Cu\ \ powder]{573K} (CH_3)Si(Cl)_2 \overset{hydrolysis}{\rightarrow} (CH_3)_2Si(OH)_2$$

Question 11.21(b) Explain the following reactions

Silicon dioxide is treated with hydrogen fluoride;

Answer :

When Silicon dioxide is treated with hydrogen fluoride, it forms silicon tetrafluoride

$$SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O$$

and SiF_4 further reacts with the HF to form hydrofluorosilic acid.

$SiF_4 + 2HF \rightarrow H_2SiF_6$???????

Question 11.21(c) Explain the following reactions

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CO is heated with ZnO ;

Answer :

When CO reacts with ZnO , it acts as a reducing agent and reduces the ZnO to zinc.

$$ZnO + CO \rightarrow Zn + CO_2$$

Question 11.21(d). Explain the following reactions

Hydrated alumina is treated with aqueous $NaOH$ solution;

Answer :

Hydrated alumina is treated with an aqueous $NaOH$ solution leads to the formation of sodium meta aluminate

$$Al_2O_3.2H_2O + 2NaOH \rightarrow 2NaAlO_2 + 3H_2O$$

Question 11.22(i) Give reasons

Conc. HNO_3 can be transported in aluminium container.

Answer :

Conc. HNO_3 can be transported in an aluminium container because when it reacts with the aluminium it forms a thin layer of oxide on the surface. This layer renders aluminium passive.

Question 11.22(ii) Give reasons :

A mixture of dilute $NaOH$ and aluminium pieces is used to open drain.

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Answer :

When the mixture of dilute $NaOH$ and aluminium pieces reacts, they formed sodium tetrahydroxy aluminate (III)and dihydrogen gas. To open the drains, we use the pressure produced by the hydrogen gas.

$$2Al + NaOH + 6H_2O \rightarrow 2Na + [Al(OH)_4]^- + 3H_2$$

Question 11.22(iii) Give reasons :

Graphite is used as lubricant.

Answer :

Graphite has a layered structure and each layer is bonded by the weak van der Waals forces. These layers can slide over each other that's why graphite can be used as a lubricant.

Question 11.22(iv) Give reasons :

Diamond is used as an abrasive.

Answer :

The carbons of the diamond are in sp^3 hybridisation. Each carbon is attached with the four neighbour carbon atom by a strong covalent bond. This covalent bond gives the diamond a very rigid structure and it is very difficult to break this covalent bond and due to this reason it is the hardest substance and used as an abrasive

Question 11.22(v) Give reasons :

Aluminium alloys are used to make aircraft body.

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Answer :

Aluminium has very good tensile strength and is very light in weight also. It can be alloyed with the various metals such as copper, manganese and Silicon etc. Al is malleable and ductile. Because of these properties of Aluminium, it can be used in making aircrafts bodies.

Question 11.22(vi) Give reasons :

Aluminium utensils should not be kept in water overnight.

Answer :

Aluminium utensils should not be kept in water overnight because it reacts with water with the help of atmospheric oxygen and forms an oxide layer on the surface of utensils. When we kept water on this utensils for a long period of time, some amount of oxide dissolved in water which is harmful(water become basic in nature).

Question 11.22(vii) Give reasons :

Aluminium wire is used to make transmission cables.

Answer :

Aluminium wires are good conductors of electricity and also it is cheap metal easily available, light in weight and also very good ductility. All these properties of aluminium make it better to make transmission cables.

Question 11.23 Explain why is there a phenomenal decrease in ionization enthalpy from carbon to silicon ?

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Answer :

Ionisation enthalpy of carbon is quite high because it is small in size. However, on going down the group to silicon, there is a sudden decrease in the enthalpy of the silicon. This is due to the large increase in the atomic size of the silicon element.

Question 11.24 How would you explain the lower atomic radius of Ga as compared to Al ?

Answer :

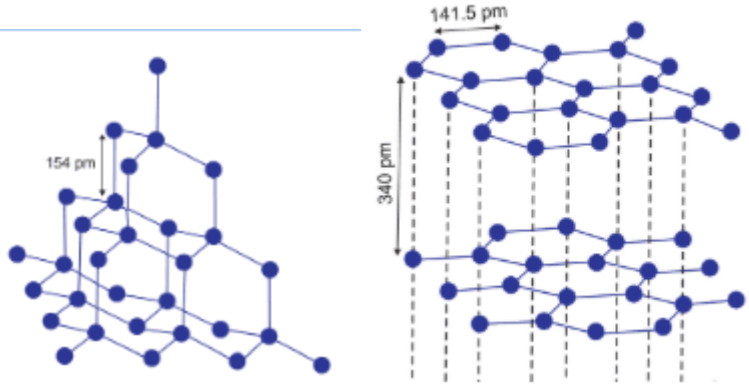
The atomic radius of the gallium is less than the atomic radius of aluminium. This is because of the weak shielding effect of the 3d electron of gallium. The shielding effect of d-electrons are feeble so that the effective nuclear charge experienced by the valence electron in Ga is quite higher than the Al

Question 11.25 What are allotropes? Sketch the structure of two allotropes of carbon namely diamond and graphite. What is the impact of structure on physical properties of two allotropes?

Answer :

The various forms of the same element are known as allotropes. They have the same chemical properties but different physical properties.
Allotropes of carbon -
(i) (ii)

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In diamond, all the carbon is sp^3 hybridised and each of the carbon is attached with the four neighbour carbon atom. by a strong covalent bond. This provides it with a very rigid structure and makes it the hardest substance.

In Graphite, carbon is sp^2 hybridised and attached with three neighbours carbon. It has a layered structure, which is attached with the weak van der Waal forces. These layers can slide over one another so that's why they are soft and used as a lubricant.

Question 11.26 Classify the given oxide as neutral, acidic, basic or amphoteric. Write suitable chemical equations to show their nature.

$CO, B_2O_3, SiO_2, CO_2, Al_2O_3, PbO_2, Tl_2O_3$

Answer :

CO is a neutral

Acidic oxides-

Being acidic, the oxides react with bases to form a salt. So take base = sodium hydroxide ($NaOH$)

$B_2O_3,\ SiO_2,\ CO_2$

these compounds react with a base to form salts. ex.- sodium metaborate, sodium

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silicate and sodium carbonate respectively.

Basic Oxides-

It reacts with an acid to form salts. let acid = hydrochloric acid (HCl). for example thallium chloride.

$$Tl_2O_3 + 6HCl \rightarrow 2TlCl_3 + 3H_2O$$

Amphoteric Oxides-

These oxides have a tendency to react with acid as well as with the base.

$$PbO_2,\ Al_2O_3$$

The reaction of lead oxide with acid and base-

$$PbO_2 + 2NaOH \rightarrow Na_2PbO_3 + H_2O$$
$$PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O + O_2$$

The reaction of aluminium oxide with base and acid-

$$Al_2O_3 + 2NaOH \rightarrow NaAlO_2$$
$$Al_2O_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2O$$

Question 11.27 In some of the reactions thallium resembles aluminium, whereas in others it resembles with group I metals. Support this statement by giving some evidences.

Answer :

Thallium belongs to group 13 of the periodic table. It shows +3 and +1 oxidation state. Due to the inert pair effect, the stability of the +1 oxidation state is more, on moving down the group. We know that aluminium and alkali metals +3 and +1 oxidation states. Thallium

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displays both oxidation states. Therefore it resembles both aluminium and alkali metals. Like Al , it also forms compounds such as $TlCl_3$ and Tl_2O_3 also Tl_2O and $TlCl$

Question 11.28 When metal X is treated with sodium hydroxide, a white precipitate (A) is obtained, which is soluble in excess of $NaOH$ to give soluble complex (B). Compound (A) is soluble in dilute HCl to form compound (C). The compound (A) when heated strongly gives (D), which is used to extract metal. Identify (X), (A), (B), (C) and (D). Write suitable equations to support their identities.

Answer :

In given information, when X is treated with the sodium hydroxide it gives A(white ppt) and it is soluble in excess of $NaOH$. Thus **X** must **be aluminium** . So, the white ppt of **A is aluminium hydroxide.**

The **complex B** is soluble in excess of sodium hydroxide So it means it is a **sodium tetrahydroxy aluminate(II) complex.**

$$2Al + 3NaOH \rightarrow Al(OH)_3 + 3Na^+$$
$$Al(OH)_3 + NaOH \rightarrow Na[Al(OH)_3]^-$$

Now, when we add dilute HCl to aluminium hydroxide it gives the **compound C (Aluminum chloride).**

$$Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$$

(A) (C)

And when compound (A) is heated strongly, it gives D and this compound used to extract metal X

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$2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$

(A) (D)

Question 11.29(a) What do you understand by

inert pair effect

Answer :

Inert pair effect-

On moving down the group in the periodic table, the tendency of s -orbital electron to participate in bonding is decreased. This effect is known as the inert pair effect. For example, in group 13 element (ns^2, np^1)the stability of +1 oxidation is more than the +2 oxidation state due to the poor shielding of the ns^2 electrons by the d and f electron, as a result, ns^2 electrons are strongly held by the nucleus.

Question 11.29(b) What do you understand by

allotropy

Answer :

Allotropy-

The existence of an element in more than one form. The various forms of the same element are known as allotropes. They have the same chemical properties but different physical properties. For example- Carbon exists in three allotropic forms: diamond, fullerene and the graphite.

Question 11.29(c) What do you understand by

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catenation

Answer :

Catenation-

The same atoms of element link with another same atom via a strong covalent bond to form long chains or branches. This type of property is known as catenation. Carbon and silicon show this property.

Question 11.30 A certain salt X, gives the following results.

(i) Its aqueous solution is alkaline to litmus.

(ii) It swells up to a glassy material Y on strong heating.

(iii) When conc. H_2SO_4 is added to a hot solution of X,white crystal of an acid Z separates out.

Write equations for all the above reactions and identify X, Y and Z.

Answer :

As per the given information, the compound X is a salt of a strong base and a weak acid because salt is alkaline to litmus. And when X is heated it swells to become Y. Thus, this must be borax because borax on heating, loses water molecule and swells to form sodium metaborate if we continue to heat it becomes glassy material Y. Hence Y should be a mixture of two compound boric anhydrides and metaborate.

The reactions are shown here-

$Na_2B_4O_7 + 7H_2O \rightarrow 2NaOH + 4H_3BO_3$ (orthoboric acid)

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$$Na_2B_4O_7.10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} B_2O_3 + 2NaBO_2$$

(Borax X) (sodium metaborate) (boric anhydride)

|_____Y_____|

When a concentrated acid is added to borax, white crystals are formed

$$Na_2B_4O_7.10H_2O + H_2SO_4 \xrightarrow{\Delta} Na_2SO_4 + 4H_3BO_3 + 5H_2O$$

(orthoboric acid Z)

Question 11.31 (i) Write balanced equations for:

$$(i)\ BF_3 + LiH \rightarrow$$

Answer :

When boron trifluoride reacts with lithium hydride it gives diborane and lithium fluoride

$$BF_3 + LiH \rightarrow B_2H_6 + 6LiF$$

Question 11.31(ii) Write balanced equations for:

$$(ii)\ B_2H_6 + H_2O \rightarrow$$

Answer :

On treating diborane with water it gives orthoboric as the main product and liberates hydrogen gas.

$$B_2H_6 + H_2O \rightarrow 2H_3BO_3 + 6H_2$$

Question 11.31(iii) Write balanced equations for:

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$(iii)\ NaH + B_2H_6 \rightarrow$

Answer :

When diborane reacts with the sodium hydride in the presence of ether, it gives sodium borohydride.

$NaH + B_2H_6 \rightarrow 2NaBH_4$

Question 11.31(v) Write balanced equations for:

$(v)\ Al + NaOH \rightarrow$

Answer :

Aluminium on reacting with a strong alkali like sodium hydroxide with the presence of moisture gives sodium tetrahydroxoaluminate complex and liberates hydrogen gas.

$Al + NaOH + 6H_2O \rightarrow 2Na^+[Al(OH)_4]^-(aq) + 3H_2$

Question 11.31(vi) Write balanced equations for:

$(vi)\ B_2H_6 + NH_3 \rightarrow$

Answer :

When diborane reacts with the ammonia it forms borazine on strong heating, which is also called inorganic benzene.

$B_2H_6 + 6NH_3 \rightarrow 3[BH_2(NH_3)_2]^+[BH_4]^- \xrightarrow{\Delta} 2B_3N_3H_6 + 12H_2$

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Question 11.32. Give one method for industrial preparation and one for laboratory preparation of CO and CO_2 each.

Answer :

Laboratory method of preparation of CO and CO_2 -

- Carbon dioxide can be prepared by treating calcium carbonate with dil. hydrochloric acid.

$$CaCO_3 + HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

- Carbon monoxide can be prepared by the dehydration of methanoic acid(formic acid) with conc. sulphuric acid at 373K.

$$HCOOH \xrightarrow[H_2SO_4]{373K} H_2O + CO$$

The commercial method of preparation of CO and CO_2 -

- CO_2 can be prepared by heating limestone.

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$$

- CO can be prepared by passing steam over hot coke.

$$C(s) + \ steam(H_2O) \rightarrow CO(g) + H_2(g)$$

|_____|

water gas

Question 11.33. An aqueous solution of borax is

(a) neutral **(b)** amphoteric

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(c) basic **(d)** acidic

Answer :

An aqueous solution of borax is basic in nature. It is salt of a strong base ($NaOH$) and weak acid (H_3BO_3)

Option **C** is the correct answer.

Question 11.34. Boric acid is polymeric due to

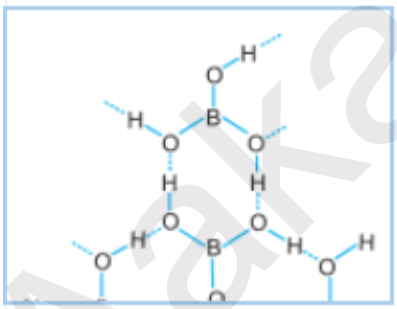
(a) its acidic nature **(b)** the presence of hydrogen bonds

(c) its monobasic nature **(d)** its geometry

Answer :

Option **B** is the correct answer,

Because of the inter-molecular hydrogen bonding in the boric acid, it forms the polymeric chain.



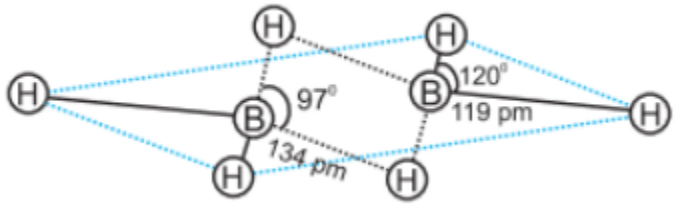
Question 11.35. The type of hybridisation of boron in diborane is

$(a)\ sp\ (b)\ sp^2\ (c)\ sp^3\ (d)\ dsp^2$

Answer :

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In diborane, boron is sp^2 hybridised.



So, the correct option is **C**

Question 11.36. Thermodynamically the most stable form of carbon is

(a) diamond (b) graphite

(c) fullerenes (d) coal

Answer :

Graphite is a thermodynamically most stable form of carbon.

So, the correct option is **B**

Question 11.37. Elements of group 14

(a) exhibit oxidation state of +4 only

(b) exhibit oxidation state of +2 and +4

(c) form M^{2-} and M^{4+} ions

(d) form M^{2+} and M^{4+} ion s

Answer :

Elements of group 14 have 4 valance electrons. so the oxidation state of the group is +4 and +2. Due to the inert pair effect, the stability of +2 is more on moving down the group.

So, the correct option is **B**

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