



Question 13.

- Rationalise the given statements and give chemical reactions:
- Lead (II) chloride reacts with Cl_2 to give PbCl_4 .
- Lead (IV) chloride is highly unstable towards heat.
- Lead is known not to form an iodide PbI_4 .

Answer:

- $\text{PbCl}_2 + \text{Cl}_2 \rightarrow \text{PbCl}_4$
This is because Pb can show +2 oxidation state more easily than +4 due to inert pair effect.
- $\text{PbCl}_4 \xrightarrow{\text{heat}} \text{PbCl}_2 + \text{Cl}_2$
Because Pb^{2+} is more stable than Pb^{4+} due to inert pair effect.
- PbI_4 does not exist because I^- ion being a powerful reducing agent reduces Pb^{4+} ion to Pb^{2+} ion in solution.
- $\text{Pb}^{4+} + 2\text{I}^- \rightarrow \text{Pb}^{2+} + \text{I}_2$
Pb(IV) Pb(II)

Question 14. Suggest reason why the B-F bond lengths in BF_3 (130 pm) and BF_4^- (143 pm) differ.

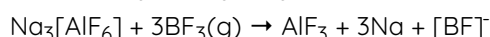
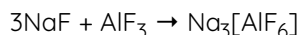
Answer: In BF_3 'B' is sp^2 hybridised and in BF_4^- 'B' is sp^3 hybridised. Thus, the difference in bond length is due to the state of hybridisation.

Question 15. If B-Cl bond has a dipole moment, explain why BCl_3 molecule has zero dipole moment.

Answer: B-Cl bond has dipole moment because of polarity. In BCl_3 since the molecule is symmetrical (planar). Thus the polarities cancel out.

Question 16. Aluminium trifluoride is insoluble in anhydrous HF but dissolves on addition of NaF. Aluminium trifluoride precipitates out of the resulting solution when gaseous BF_3 is bubbled through. Give reason.

Answer: Since, anhydrous HF is covalent compound and weak acid due to high bond dissociation energy. AlF_3 does not dissolve in HF. Whereas NaF is ionic compound.



Question 17. Suggest a reason as to why CO is poisonous.

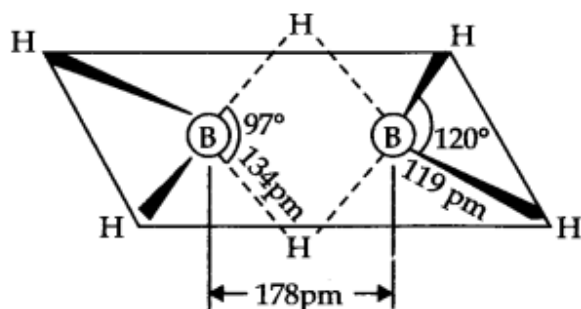
Answer: CO reacts with haemoglobin to form carboxyhaemoglobin which can destroy the oxygen carrying capacity of haemoglobin and the man dies of suffocation.

Question 18. How is excessive content of CO_2 responsible for global warming?

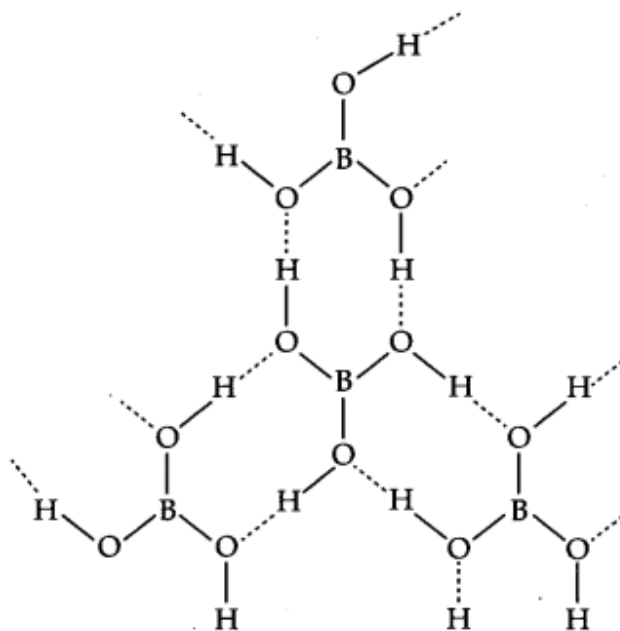
Answer: Excess of CO_2 absorbs heat radiated by the earth. Some of it is dissipated into the atmosphere while the remaining part is radiated back to the earth. As a result, temperature of the earth increases. This is the cause of global warming.

Question 19. Explain structures of diborane and boric acid.

Answer: Boric acid contains planar BO_3^{3-} ions which are linked together through hydrogen bonding shown in the fig.



Structure of Diborane (B_2H_6) molecule

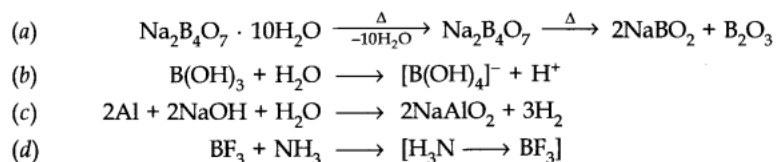


Structure of boric acid

Question 20. What happens when

- Borax is heated strongly
- Boric acid is added to water
- Aluminium is treated with dilute NaOH
- BF_3 is reacted with ammonia?

Answer:

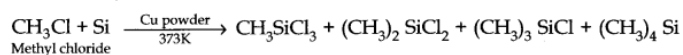


Question 21. Explain the following reactions.

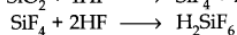
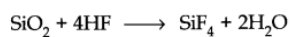
- Silicon is heated with methyl chloride at high temperature in the presence of copper.
- Silicon dioxide is treated with hydrogen fluoride.
- CO is heated with ZnO.
- Hydrated alumina is treated with aqueous NaOH solution.

Answer:

- (a) A mixture of mono-, di- and trimethyl chlorosilanes along with a small amount of tetramethyl silane is formed.



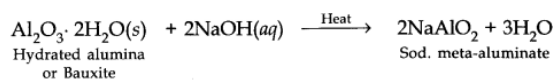
- (b) The initially formed silicon tetrafluoride dissolves in HF to form hydrofluorosilicic acid.



- (c) ZnO is reduced to zinc metal



- (d) Alumina dissolves to form sodium meta-aluminate



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