

## CHAPTER

## 11

The p-Block Elements  
(Group-13 and 14)

- Alum helps in purifying water by [2002]
  - forming Si complex with clay particles
  - sulphate part which combines with the dirt and removes it
  - coagulating the mud particles
  - making mud water soluble.
- Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite [2003]
  - is an allotropic form of diamond
  - has molecules of variable molecular masses like polymers
  - has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds
  - is a non-crystalline substance
- Glass is a [2003]
  - super-cooled liquid
  - gel
  - polymeric mixture
  - micro-crystalline solid
- For making good quality mirrors, plates of float glass are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal used can be [2003]
  - tin
  - sodium
  - magnesium
  - mercury
- Beryllium and aluminium exhibit many properties which are similar. But, the two elements differ in [2004]
  - forming covalent halides
  - forming polymeric hydrides
  - exhibiting maximum covalency in compounds
  - exhibiting amphoteric nature in their oxides
- Aluminium chloride exists as dimer,  $\text{Al}_2\text{Cl}_6$  in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives [2004]
  - $[\text{Al}(\text{OH})_6]^{3-} + 3\text{HCl}$
  - $[\text{Al}(\text{H}_2\text{O})_6]^{3+} + 3\text{Cl}^-$
  - $\text{Al}^{3+} + 3\text{Cl}^-$
  - $\text{Al}_2\text{O}_3 + 6\text{HCl}$
- Heating an aqueous solution of aluminium chloride to dryness will give [2005]
  - $\text{Al}(\text{OH})\text{Cl}_2$
  - $\text{Al}_2\text{O}_3$
  - $\text{Al}_2\text{Cl}_6$
  - $\text{AlCl}_3$
- In silicon dioxide [2005]
  - there are double bonds between silicon and oxygen atoms
  - silicon atom is bonded to two oxygen atoms
  - each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms
  - each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atoms.

**The p-Block Elements (Group-13 and 14)**

**c-49**

9. The structure of diborane ( $B_2H_6$ ) contains [2005]
- four 2c-2e bonds and four 3c-2e bonds
  - two 2c-2e bonds and two 3c-3e bonds
  - two 2c-2e bonds and four 3c-2e bonds
  - four 2c-2e bonds and two 3c-2e bonds
10. Which one of the following is the correct statement? [2008]
- Boric acid is a protonic acid
  - Beryllium exhibits coordination number of six
  - Chlorides of both beryllium and aluminium have bridged chloride structures in solid phase
  - $B_2H_6 \cdot 2NH_3$  is known as 'inorganic benzene'
11. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is [2008]
- $R_4Si$
  - $R_2SiCl_2$
  - $RSiCl_3$
  - $R_3SiCl$
12. In view of the signs of  $\Delta_r G^\circ$  for the following reactions :
- $$PbO_2 + Pb \rightarrow 2PbO, \quad \Delta_r G^\circ < 0$$
- $$SnO_2 + Sn \rightarrow 2SnO, \quad \Delta_r G^\circ > 0$$
- which oxidation states are more characteristics for lead and tin ? [2011RS]
- For lead + 2, for tin + 2
  - For lead + 4, for tin + 4
  - For lead + 2, for tin + 4
  - For lead + 4, for tin + 2

**Answer Key**

1	2	3	4	5	6	7	8	9	10	11	12			
(c)	(c)	(a)	(d)	(c)	(b)	(b)	(d)	(d)	(c)	(c)	(c)			

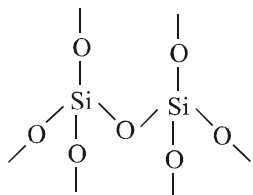
**SOLUTIONS**

- (c) Alum furnishes  $Al^{3+}$  ions which bring about coagulation of negatively charged clay particles, bacteria etc.
- (c) In graphite, carbon is  $sp^2$  hybridized. Each carbon is thus linked to three other carbon atoms forming hexagonal rings. Since only three electrons of each carbon are used in making hexagonal ring, fourth electron of each carbon is free to move. This makes graphite a good conductors of heat and electricity.  
Further graphite has a two dimensional sheet like structure. These various sheets are held together by weak van der Waal's force of attraction. due to these weak forces of attraction, one layer can slip over the other. This makes graphite soft and a good lubricating agent.
- (a) Glass is a translucent or transparent amorphous supercooled solid solution or we can say super cooled liquid of silicates and borates having a general formula  $R_2O \cdot MO \cdot 6SiO_2$ , where  $R = Na$  or  $K$  and  $M = Ca, Ba, Zn$  or  $Pb$ .
- (d) It is mercury because it exists as liquid at room temperature.
- (c) The maximum valency of beryllium is +2 while that of aluminium is +3.
- (b)  $Al_2Cl_6 + 12H_2O \rightleftharpoons 2[Al(H_2O)_6]^{3+} + 6Cl^-$
- (b) The solution of aluminium chloride in water is acidic due to hydrolysis.  
 $AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$ .  
On heating it till dryness  $Al(OH)_3$  is converted into  $Al_2O_3$

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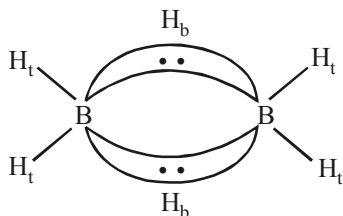
Chemistry

8. (d)  $\text{Al(OH)}_3 \xrightarrow{\Delta} \text{Al}_2\text{O}_3 + 3\text{H}_2\text{O}$   
In  $\text{SiO}_2$  (quartz), each of O-atom is shared between two  $\text{SiO}_4^{4-}$  tetrahedra.

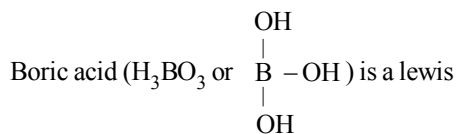


9. (d) In diborane structure  $\text{B}_2\text{H}_6$  there are two  $2c-2e$  bonds and two  $3c-2e$  bonds (see structure of diborane).

Structure of  $\text{B}_2\text{H}_6$ :



10. (c) The correct formula of inorganic benzene is  $\text{B}_3\text{N}_3\text{H}_6$  so (d) is incorrect statement

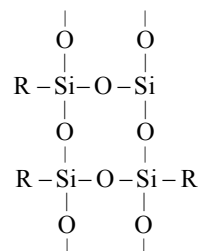
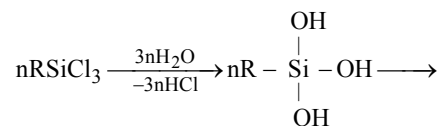


acid so (a) is incorrect statement.

The coordination number exhibited by beryllium is 4 and not 6 so statement (b) is incorrect.

Both  $\text{BeCl}_2$  and  $\text{AlCl}_3$  exhibit bridged structures in solid state so (c) is correct statement.

11. (c) The cross linked polymers will be formed by  $\text{RSiCl}_3$



(Cross linked polymer)

12. (c) Negative  $\Delta_r G^\circ$  value indicates that + 2 oxidation state is more stable for  $\text{Pb}^{2+}$ . Also it is supported by inert pair effect that + 2 oxidation state is more stable for Pb and + 4 oxidation state is more stable for Sn.  
i.e.  $\text{Sn}^{++} < \text{Pb}^{++}$ ,  $\text{Sn}^{4+} > \text{Pb}^{4+}$