

P-Block Elements

(IVA Group Elements)

Very Short Answer Questions:

1. What is allotropy? Give the crystalline allotropes of carbon?

Ans. The property due to which an element exists in two or more forms that differ in their physical and some of the chemical properties is known as allotropy. The crystalline allotropes of carbon are diamond, graphite and Buckminsterfullerene.

2. Diamond has high melting point. Why?

Ans. Diamond has a three-dimensional net work involving strong C-C bonds, which are very difficult to break and, in turn has high melting point.

3. Diamond is insulator, but graphite is a good conductor. Why?

Ans. Diamond has no free electrons. Hence it does not exhibit electrical conductivity. Graphite has free delocalised p-electrons. Hence it is a conductor.

4. How does graphite function as a lubricant?

Ans. Graphite is used as a solid lubricant, because it is soft. Due to weak van der Waals forces between the layers of graphite, the layers have a sliding nature.

6. What are silicones? Give their uses?

Ans. Silicones are synthetic organosilicon compounds containing Si - O - Si linkages with R_2SiO as repeating units. So their general formula is $(R_2SiO)_n$, where R is alkyl or aryl group.

Uses: 1. In the preparation of water proof clothes and papers as alkyl groups are water repelling in nature,

2. used in paints and enamels as they can withstand high temperature and chemical inertness

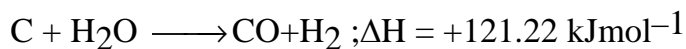
3. Used in surgical and cosmetic plants as they are bio-compatible.

7. Write the use of ZSM-5?

Ans. ZSM-5 is one type of zeolite used to convert alcohols directly into gasoline.

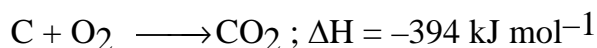
8. What is synthesis gas? How is it prepared?

Ans. A mixture of carbon monoxide (40-50%) and hydrogen (45-50%) is called synthesis gas or Water gas. It is prepared by passing super heated steam over red hot coke or coal.



9. What is producer gas? How is it prepared?

Ans. Producer gas is a mixture of carbon monoxide (33%) and nitrogen (64%) It is prepared by passing air over White coke in a furnace called gas producer.



10. Producer gas is less efficient than water gas-explain?

Ans. Producer gas is less efficient than water gas as it contains non combustible N_2 gas in larger proportion.

11. Explain the structure of silica?

Ans. Silica is giant molecule with three dimensional structures. Each silicon is tetrahedrally linked to four oxygen atoms by covalent bonds using SP^3 hybrid orbitals.

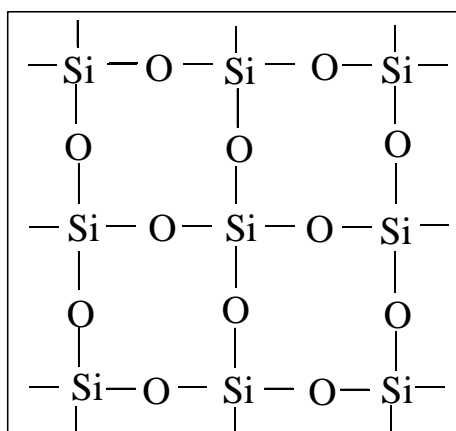


Fig.4. Structure of silica

12. CCl_4 does not act as Lewis acid while SiCl_4 and SnCl_4 act as Lewis acids. Why?

Ans. SiCl_4 and SnCl_4 act as Lewis acids. This is because they can extend their coordination number beyond four due to the presence of vacant d-orbitals in the valence shell.

13. $\text{Si}[\text{F}_6]^{2-}$ is known whereas $[\text{SiCl}_6]^{2-}$ not. Give possible reasons?

Ans. Six large chloride ions cannot be accommodated around Si^{4+} due to limitation of its size. Interaction between lone pair of chloride ion and Si^{4+} is not very strong.

14. What are silicates? Name any two man-made silicates?

Ans. Silicates are metal derivatives of silicic acid. The silicates are mainly divided into six types depending on the manner in which different SiO_4^{4-} units are linked together. Two important man made silicates are glass and cement.

15. Classify the following into neutral, acidic, basic or amphoteric?

a. CO b. B_2O_3 c. SiO_2 d. CO_2 e. Al_2O_3 f. PbO_2 g. Tl_2O_3

Ans. i. CO is a neutral oxide

ii. B_2O_3 , SiO_2 and CO_2 are acidic oxides

iii. Al_2O_3 and PbO_2 are amphoteric

iv. Tl_2O_3 is a basic oxide.

16. Give the Hybridisation of carbon in

a. CO_3^{2-} b. Diamond c. Graphite d. Fullerene

Ans. The Hybridisation of carbon in

CO_3^{2-} , Fullerene and graphite is same i.e. Sp^2 where as in diamond is Sp^3