

HOTS (Higher Order Thinking Skills)

(1 mark each)

Q.1. Diamond is covalent, yet it has high melting point. Why?

Ans. Diamond has three-dimensional network structure involving strong C-C bonds. These bonds are difficult to break and hence the melting point of diamond is very high.

Q.2. PH_3 forms bubbles when passed slowly in water but NH_3 dissolves. Explain.

Ans. NH_3 forms hydrogen bonds with water and hence is soluble in water. But PH_3 cannot form hydrogen bonds with water and hence is not soluble in water. It escapes as gas.

(3 marks each)

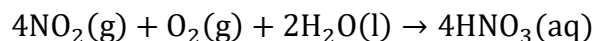
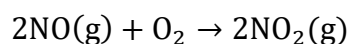
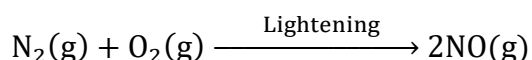
Q.1. Which one is more soluble in diethyl ether, anhydrous AlCl_3 or hydrous AlCl_3 ?

Ans. Anhydrous AlCl_3 will dissolve in diethyl ether because it is a good Lewis acid. It is electron deficient. The lone pair of diethyl ether will be donated to the anhydrous AlCl_3 due to which it is soluble. On the other hand, hydrous AlCl_3 has the water molecules which make it a poor Lewis acid.

So, anhydrous AlCl_3 is more soluble in diethyl ether.

Q.2. Some farmers feel that lightning helps in producing a better crop. What is the scientific reason behind this?

Ans. Lightning taking place from time to time helps in converting atmospheric nitrogen and oxygen into nitric acid as a result of series of reactions.

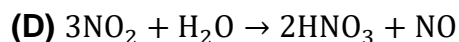
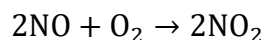
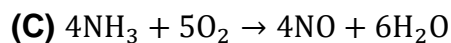
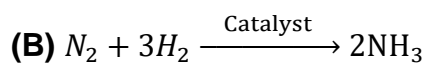
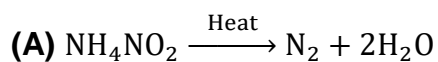


Nitric acid dissolves in rain water and is converted into calcium nitrate by reacting with calcium salts present in the soil. Calcium nitrate and other nitrates are the nutrients for the soil which gives better yield of crop.

(5 marks each)

Q.1. On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with 3 mol of hydrogen (H_2) in the presence of a catalyst gives another gas (C) which is basic in nature. Gas C on further oxidation in moist condition gives a compound (D) which is a part of acid rain. Identify compounds (A) to (D) and also give necessary equations of all the steps involved.

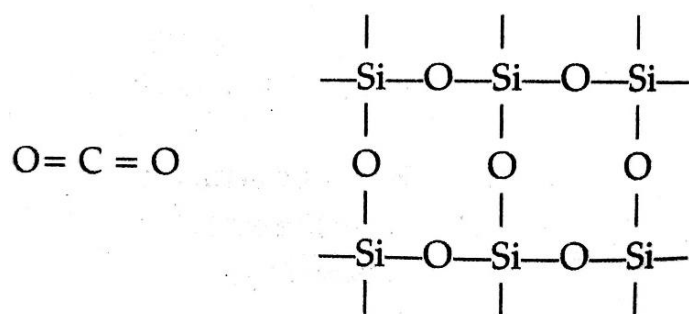
Ans. (A) NH_4NO_2 , (B) N_2 , (C) NH_3 , (D) HNO_3



Q.2. (i) CO_2 is a gas while SiO_2 is a solid. Explain.

(ii) Why CCl_4 is resistant to hydrolysis but SiCl_4 is readily hydrolysed?

Ans. (i) Carbon atom being small in size forms double bonds with O-atoms ($p\pi - p\pi$ bonding) and hence exists as monomeric linear molecules. Silicon atom and is linked to four O-atoms formatting a three-dimensional network structure.



(ii) Due to presence of d-orbitals in Si, SiCl_4 accepts electrons donated by H_2O molecules and hence undergoes hydrolysis. However, due to absence of d-orbitals in C, CCl_4 does not undergo hydrolysis with water.

