NCERT EXERCISES

9.1 Justify the position of hydrogen in the periodic table on the basis of its electronic configuration.

9.2 Write the names of isotopes of hydrogen. What is the mass ratio of these isotopes?

9.3 Why does hydrogen occur in a diatomic form rather than in a monoatomic form under normal conditions?

9.4 How can the production of dihydrogen, obtained from 'coal gasification', be increased?

9.5 Describe the bulk preparation of dihydrogen by electrolytic method. What is the role of an electrolyte in this process ?

9.6 Complete the following reactions:

(i) $H_2(g) + M_mO_o(s) \xrightarrow{\Delta}$

(ii) $CO(g) + H_2(g) \xrightarrow[\text{catalyst}]{\Delta}$

(iii) $C_3H_8(g) + 3H_2O(g) \xrightarrow[\text{catalyst}]{\Delta}$

(iv) $Zn(s) + NaOH(aq) \xrightarrow{\text{heat}}$

9.7 Discuss the consequences of high enthalpy of H–H bond in terms of chemical reactivity of dihydrogen.

9.8 What do you understand by (i) electron-deficient, (ii) electron-precise, and (iii) electron-rich compounds of hydrogen? Provide justification with suitable examples.

9.9 What characteristics do you expect from an electron-deficient hydride with respect to its structure and chemical reactions?

9.10 Do you expect the carbon hydrides of the type (C_nH_{2n+2}) to act as 'Lewis' acid or base? Justify your answer.

9.11 What do you understand by the term "non-stoichiometric hydrides"? Do you expect this type of the hydrides to be formed by alkali metals? Justify your answer.

9.12 How do you expect the metallic hydrides to be useful for hydrogen storage? Explain.

9.13 How does the atomic hydrogen or oxy-hydrogen torch function for cutting and welding purposes ? Explain.

9.14 Among NH_3, H_2O and HF, which would you expect to have highest magnitude of hydrogen bonding and why?

9.15 Saline hydrides are known to react with water violently producing fire. Can CO_2, a well known fire extinguisher, be used in this case? Explain.

9.16 Arrange the following

(i) CaH_2, BeH_2 and TiH_2 in order of increasing electrical conductance.

(ii) LiH, NaH and CsH in order of increasing ionic character.

(iii) H–H, D–D and F–F in order of increasing bond dissociation enthalpy.

(iv) NaH, MgH_2 and H_2O in order of increasing reducing property.

9.17 Compare the structures of H_2O and H_2O_2.

9.18 What do you understand by the term 'auto-protolysis' of water? What is its significance?

9.19 Consider the reaction of water with F_2 and suggest, in terms of oxidation and reduction, which species are oxidised/reduced.

9.20 Complete the following chemical reactions.

(i) $PbS(s) + H_2O_2(aq) \rightarrow$

(ii) $MnO_4^-(aq) + H_2O_2(aq) \rightarrow$

(iii) $CaO(s) + H_2O(g) \rightarrow$

(v) $AlCl_3(g) + H_2O(l) \rightarrow$

(vi) $Ca_3N_2(s) + H_2O(l) \rightarrow$

Classify the above into (a) hydrolysis, (b) redox and (c) hydration reactions.

9.21 Describe the structure of the common form of ice.

9.22 What causes the temporary and permanent hardness of water ?

9.23 Discuss the principle and method of softening of hard water by synthetic ion-exchange resins.

9.24 Write chemical reactions to show the amphoteric nature of water.

9.25 Write chemical reactions to justify that hydrogen peroxide can function as an oxidising as well as reducing agent.

9.26 What is meant by 'demineralised' water and how can it be obtained ?

9.27 Is demineralised or distilled water useful for drinking purposes? If not, how can it be made useful?

9.28 Describe the usefulness of water in biosphere and biological systems.

9.29 What properties of water make it useful as a solvent? What types of compound can it (i) dissolve, and (ii) hydrolyse ?

9.30 Knowing the properties of H_2O and D_2O, do you think that D_2O can be used for drinking purposes?

9.31 What is the difference between the terms 'hydrolysis' and 'hydration' ?

9.32 How can saline hydrides remove traces of water from organic compounds?

9.33 What do you expect the nature of hydrides is, if formed by elements of atomic numbers 15, 19, 23 and 44 with dihydrogen? Compare their behaviour towards water.

9.34 Do you expect different products in solution when aluminium(III) chloride and potassium chloride treated separately with (i) normal water (ii) acidified water, and (iii) alkaline water? Write equations wherever necessary.

9.35 How does H_2O_2 behave as a bleaching agent?

9.36 What do you understand by the terms:

(i) hydrogen economy (ii) hydrogenation (iii) 'syngas' (iv) water-gas shift reaction (v) fuel-cell ?