

(c) Define catalysis. Explain five important industrial applications of catalytic reactions.

6. Attempt any **two** parts of the following :

(a) What is hardness of water ? A sample of water on analysis was found to contain the following impurities :

$\text{Ca}(\text{HCO}_3)_2 = 40.5 \text{ ppm}$, $\text{Mg}(\text{HCO}_3)_2 = 29.1 \text{ ppm}$,
 $\text{CaCl}_2 = 11.1 \text{ ppm}$, $\text{MgCl}_2 = 15.82 \text{ ppm}$.

Calculate carbonate and non carbonate hardness.

(b) What is alkalinity of a water sample ? Give its determination.

(c) 50 ml of standard hard water (1.2 gm CaCO_3/L) requires 32 ml of EDTA solution. 100 ml of water sample consumes 14 ml of EDTA solution. 100 ml of boiled water sample consumes 8.5 ml EDTA solution. Calculate total, temporary and permanent hardness of water sample.

7. Attempt any **two** parts of the following :

(a) What is H-Bonding ? Discuss various types of H-Bonding. Explain why alcohols are water soluble.

(b) What is nanotechnology ? Write a note on nano materials.

(c) A compound having molecular formula $\text{C}_4\text{H}_8\text{O}_2$ shows absorption bands at 1130 cm^{-1} , 1260 cm^{-1} and 1670 cm^{-1} in the IR spectrum. In ^1H NMR spectrum it has three signals at $\delta 1.25$ (t, 3 H), $\delta 2.03$ (s, 3H) and $\delta 4.12$ (q, 2 H). It gave negative test with NaHCO_3 . Identify the compound.