

ASSIGNMENT-4

- Q.1 What do you understand by hardness of water? What are different units of hardness of water? Write relationship between them.
- Q.2 Explain the basic principle of lime-soda process. Calculate the amount of lime and soda required for soften 30,000 litres of water, using 20 ppm of sodium aluminate as coagulant. Impurities in water are as follows: $\text{Ca}^{2+} = 160$ ppm, $\text{Mg}^{2+} = 96$ ppm, dissolved $\text{CO}_2 = 34$ ppm and $\text{HCO}_3^- = 403$ ppm.
- Q.3 Describe Zeolite process of water softening. A Zeolite softener was 90% exhausted by removing the hardness completely when 10,000 litres of hard water was passed through it. The exhausted zeolite bed required 200 litres of 3% sodium chloride solution for its complete regeneration. Calculate the hardness of water sample.
- Q.4 Describe sludge and scale. How they produce in boiler?
- Q.5 100ml of water sample has hardness equivalent to 12.5 ml of 0.08N MgSO_4 solution. Calculate the hardness of water of this water sample.
- Q.6 A water sample contains 408 mg of CaSO_4 per litre. Calculate the hardness in terms of CaCO_3 equivalent.
- Q.7 What are ion exchanger resins? Discuss their role in ion exchange process of water softening. Calculate the temporary, permanent and total hardness of sample of water that is analysed as $\text{Mg}(\text{HCO}_3)_2 = 7.3$ mg/L, $\text{Ca}(\text{HCO}_3)_2 = 8.1$ mg/L, $\text{MgCl}_2 = 9.5$ mg/L and $\text{CaSO}_4 = 6.8$ mg/L
- Q.8 An exhausted zeolite softener was regenerated by passing 150 litres of NaCl, having a strength of 50g/litre of NaCl. How many litres of hard water sample having hardness of 600ppm, can be softened, using this softener?
- Q.9 What are fuels? How are they classed?
- Q.10 Define HCV and LCV. Calculate LCV of a fuel which has 8.9% hydrogen and its HCV is 6500 Cal/gm. (given latent heat of steam = 580cal/gm)
- Q.11 How is calorific value of a fuel is determined using Bomb calorimeter experiment?
On burning .83gm of solid fuel in a bomb calorimeter, the temperature of 3500gm of water increased from 25.5°C to 29.2°C. Water equivalent of calorimeter and latent heat of steam are 385 gm and 587cal/g respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific values.
- Q.12 Explain when will be the value of GCV = NCV.
- Q.13 What is rank of coal? Describe proximate and ultimate analysis of coal.
- Q.14 What are the properties of a good fuel? Define High and Low Calorific values. A 0.80g sample of a solid fuel was completely combusted in the excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was 2.5°C. Calculate the High Calorific value of the fuel, if water taken in calorimeter is 200g and water equivalent of calorimeter is 200g. also calculate lower calorific value if, hydrogen is 32%.
- Q.15 The following data is obtained in a bomb calorimeter experiment:
Weight of crucible = 3,649gm
Weight of crucible + fuel = 4.678gm
Water equivalent of calorimeter = 570gm
Water taken in the calorimeter = 2200gm
Observed rise in temperature = 2.3°C
Cooling correction = 0.0047°C
Acid correction = 62.6°C
Fuse wire correction = 1.6 calories
Calculate the gross calorific value of the fuel sample. If the fuel contains 6.5% H, determine the net calorific value.
- Q.16 Why are gaseous fuel more advantageous than solid fuel?
- Q.17 What are the characteristic of good fuel?
- Q.18 Differentiate between gross calorific value and net calorific value.