Numerical on Hardness

Simple Hardness

1. How many grams of $MgSO_4$ dissolved per litre gives 84ppm of hardness. **Ans: 0.1008 gram**
2. A water sample contains 204ppm of $CaSO_4$. Calculate the hardness. **Ans: 150ppm.**
3. Calculate temporary, permanent and total hardness of water sample containing: $Mg(HCO_3)_2$=14.6mg/L, $MgCl_2$=19.0mg/L, $MgSO_4$=24mg/L, $CaCL_2$=22.2mg/L, NaCl=5.35 mg/L.
   Ans: 10ppm, 60ppm, 70ppm.
4. A water sample on analysis was found to contain the following impurities: $Mg(HCO_3)_2$=7.3mg/L, $Ca(HCO_3)_2$=16.2mg/L, $MgSO_4$=12.0mg/L, $CaSO_4$=13.6,g/L, K_2SO_4=5.35 mg/L. Calculate temporary, permanent and total hardness of water sample.
   Ans: 15ppm, 20ppm, 35ppm.

Zeolite Process

1. A zeolite bed on softening 7000 liters of hard water required 60 liters of 10% NaCl solution for regeneration. Calculate the hardness of water in ppm. **Ans: 732.6 ppm.**
2. A water sample having hardness 250ppm was softened by zeolite process. The exhausted zeolite bed required 50 liters of 15% NaCl solution for regeneration. Calculate the quantity of water softened using the zeolite bed.
   Ans: 25641 liters.
3. A zeolite bed got exhausted after softening 5000 liters of hard water. Hardness of water was 250ppm. How many liters of 10% NaCl solution would be required to regenerate zeolite bed. **Ans: 14.7 liters.**
4. A zeolite softener was 90% exhausted when 10000 liters of hard water was passed through it. The softener required 200 liters of NaCl of strength 5gram/L. Find the hardness of water. **Ans: 85.47ppm.**

Lime-Soda Process

1. Calculate the amount of lime and soda required for softening of 50000 liters of hard water containing: $Mg(HCO_3)_2$=14.6mg/L, $MgCl_2$=19.0mg/L, $MgSO_4$=24mg/L, $CaCL_2$=22.2mg/L.
   Ans: Lime: 2.22 kg, and Soda: 3.18kg
2. Calculate the amount of lime and soda required for softening of 10000 liters of hard water containing: $Mg(HCO_3)_2$=7.3mg/L, $Ca(HCO_3)_2$=16.2mg/L, $MgSO_4$=12.0mg/L, $CaSO_4$=13.6,g/L, HCL=3.65 mg/L.
   Ans: Lime: 0.259 kg, and Soda: 0.265kg
3. Calculate the amount of lime (74% pure) and soda (90% pure) required for softening of 50000 liters of hard water containing: $Mg(HCO_3)_2$=73.0mg/L, $CaCl_2$=222.0mg/L, $MgSO_4$=120.0mg/L, $Ca(NO_2)_2$=164.0mg/L.
   Ans: Lime: 1.0 kg, and Soda: 2.356kg
4. Calculate the amount of lime and soda required for softening of 15000 liters of hard water which analyzed as follows: Temporary Ca Hardness=20ppm, Total Permanent Hardness=15ppm and Permanent Mg Hardness=10ppm. **Ans: Lime: 330gm, and Soda: 238.5gm**