

Engineering Chemistry

P. Pages : 2

NRJ/KW/17/4338

Time : Two Hours



Max. Marks : 40

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Diagrams and chemical equations should be given whenever necessary.
 7. Illustrate your answers whenever necessary with the help of neat sketches.
 8. Use of non programmable calculator is permitted.

1. a) Calculate : 1+
- i) Temporary and permanent hardness for the given water sample. 7
 - ii) Also calculate the amount lime (86%) and soda (83%) required for softening 1 million litres of water with the following impurities (all are in mg/L)
 $MgCO_3 = 84$; $Ca(HCO_3)_2 = 40$; $SiO_2 = 10$
 $Mg(NO_3)_2 = 37$; $CaSO_4 = 272$; $MgSO_4 = 120$
 $H_2SO_4 = 49$; $Al_2(SO_4)_3 = 17.1$.

- b) Write a short note on softening of water by Demineralization process. 4

OR

2. a) The total hardness of 10,000 litre of water was completely removed by zeolite process. If 30 litres of NaCl solution containing 8.5% NaCl is used for regeneration process. Calculate the hardness of water. 4

- b) Phosphate conditioning is better than carbonate conditioning. Explain. 3

- c) Differentiate between Limesoda, zeolite and Deionization process with respect to their principles, advantages and limitations. 5

3. a) Give reason : 3

- i) Wire mesh corrodes faster at the joints.
- ii) Pitting corrosion is autocatalytic and self stimulating.

- b) Discuss electrochemical theory of corrosion with respect to H_2 liberation and O_2 absorption. 4

- c) How design and material selection helps to control metallic corrosion. 3

OR

4. a) Write short notes on : 5

- i) Water line corrosion.
- ii) Intergranular corrosion.

- b) What is cathodic protection ? How it is done by using impressed current and sacrificial anode. Explain with suitable examples. **5**
- 5.** a) Discuss the characteristics of microscopic constituents of Portland cement. **4**
- b) Write informative notes on : **6**
- i) Cement additives.
- ii) Fly ash as cementing material.
- iii) Soundness of cement.

OR

- 6.** a) Explain the setting and hardening of Portland cement. **5**
- b) Differentiate between Dry and Wet process of cement manufacturing. **3**
- c) Percentage of lime has to be maintained carefully during cement manufacturing. Why. **2**
- 7.** a) Define Green chemistry. State the 12 principles of green chemistry. **3**
- b) What is secondary battery ? Explain constructions, working and application of Ni-Cd battery. **5**

OR

- 8.** a) Discuss CO₂ as a super critical fluid. **4**
- b) Write short note on : **4**
- i) Biocatalysis.
- ii) Carbon credit.
