Time : 2 Hrs **Marks : 60**

N.B. 1. Question No.1 is compulsory.
2. Attempt any three from Q.2 to Q.6
3. Draw neat diagram and write chemical reactions where necessary.
4. Figures to right indicate full marks.

Atomic weights:
H = 1, C = 12, N = 14, O = 16, Na = 23, Mg = 24, S = 32, Cl = 35.5, K = 39, Ca = 40

Q.1] Answer **any five** from the following:- **15**

(a) Write a brief note on Reverse Osmosis.

(b) Write methods of preparation, properties and uses of polyurethane rubber.

(c) Define and discuss giving significance of the following
(i) Viscosity (ii)Cloud Point

(d) Write advantages and drawback of Phase Rule.

(e) A hard water sample contains following impurities (in mg/L)
$Mg(HCO_3)_2$ = 150 ; NaCl = 77 ; $CaCl_2$ = 135; $MgSO_4$ = 85.
Calculate temporary, permanent and total hardness of the given sample of water.

(f) Discuss the effect of temperature on polymers.

(g) Why gypsum is added during manufacturing of the cement?

Q.2] (a) A hard water sample has following composition **6**
$CaSO_4$ = 170mg/L; $Ca(HCO_3)_2$ = 130mg/L; $Mg(HCO_3)_2$ = 95mg/L;
HCl = 58mg/L; KNO_3 = 75mg/L
Calculate lime (90% pure) and soda (95% pure) required for complete softening of one million liters of above hard water sample.

(b) (i) What is Glass transition temperature? **3**

(ii) What are semi sold lubricants? Under which conditions they are used? **2**

(c) Explain briefly Carbon nanotubes by CVD method. **4**

Q.3] (a) What is Natural rubber? What is vulcanized of rubber? Compare the properties of vulcanized rubber over natural rubber. **6**

(b) (i) What is 'Triple Point'? Write the condition at which triple point exists for water system. **3**

(ii) What are Fullerenes? Write important properties and uses of Fullerene. **2**

(c) In the process of determination of hardness, a standard hard water sample was prepared by dissolving 2.5g $CaCO_3$ and making solution upto one liter. 50ml of above hard water required 45 ml of EDTA. 50ml of unknown hard water sample was titrated it required 30ml of same EDTA. The unknown hard water sample was boiled and filtered. 50ml of this boiled sample required 20ml of EDTA. Calculate hardness of all types of unknown hard water sample. **4**

Q.4] (a) Draw a neat labeled diagram and explain zeolite process of softening of hard water. Discuss its merits and demerits. **6**

(b) (i) 10g of lubricating oil was heated with 25ml of 50%alcohol, the resultant mixture required 25ml of N/10 KOH. The blank reading was obtained to be 8ml of same KOH. Calculate acid value of the lubricating oil. **3**

(ii) Explain the terms: (a) Concrete (b) RCC **2**

(c) Explain the importance of polymers in the field of surgery and medicine. **4**

Q.5] (a) What is compounding of plastic? Explain the role played by various constituents used during manufacturing of plastic. **6**

(b) (i) Define and briefly explain **3**

Biological Oxygen Demand (BOD)

Chemical Oxygen Demand (COD).

(ii)Write important functions of lubricants. **2**

(c) Draw and explain phase diagram of Pb-Ag system. **4**

Q.6] (a) Draw a neat diagram and explain the mechanism of thick film lubrication. **6**

(b) (i) Write Gibb's mathematical equation of phase rule and define the terms involved in it. **3**

(ii) With chemical equations, explain role played by bleaching powder in water treatment. **2**

(c) Explain manufacturing of the cement by wet process materials **4**

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