Total No. of Questions : 4]

SEAT No. :

PB2

[Total No. of Pages : 2

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F.E. (All Branches) (Insem)

ENGINEERING CHEMISTRY

(2019 Pattern) (Semester - II) (107009)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q1 or Q2 and Q3 or Q4.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, jf necessary.***

Q1) a) Define scales. Explain four causes of deposit formation in boilers. **[5]**

b) Give the ion-exchange and regeneration reactions involved in the deionisation of water containing $MgCl_2$. **[4]**

c) Define : **[3]**

i) Permanent hardness

ii) Foaming

iii) Caustic embrittlement

d) 25 ml. of hard water sample required 11.2ml of 0.01MEDTA to reach the end-point. 25ml of the same water sample after boiling and filtrations required 7.9ml of the same EDTA to reach the end-point. Calculate total, temporary and permanent hardness of water. **[3]**

OR

Q2) a) Define hardness. Give the structure of Na_2EDTA. Explain the EDTA method for determination of total hardness of water with reactions and formula. **[5]**

b) What is reverse osmosis? Explain the process of reverse osmosis with figure. **[4]**

P.T.O.

c) 50 ml. of alkaline water required 5.7 ml of 0.02 NHCl to reach the phenolphthalein end-point and further 5.7 ml of the same acid to reach the methyl orange end-point. Calculate the type and amount of alkalinity of water. **[3]**

d) A zeolite bed was exhausted by passing 5100 lit. of hard water. It required 120 lit. of brine containing 15g/lit. of Nacl for regeneration. Calculate the hardness of water. **[3]**

Q3) a) Explain the three stages of PH metric titration between strong acid and strong base. Give the reaction and draw the titration curve. **[5]**

b) What are ion-selective electrodes? Give the composition of the ISE membrane for determination of F^-, Cl^- and urea. **[4]**

c) Give construction with neat, labelled diagram and representation of glass electrode. **[3]**

d) Explain the construction of conductivity cell with neat labelled diagram. **[3]**

OR

Q4) a) Explain the three stages of conductometric titration between CH_3COOH and NH_4OH with titration curve and reaction. **[5]**

b) Define the following terms : **[4]**

i) Specific conductance

ii) Reference electrode

iii) Molar conductance

iv) Buffer

c) Explain why : **[3]**

i) In pH metric titration of HCl against NaOH the pH at equivalence point is 7.

ii) In conductometric titration of HCl vs NaOH the conductance decreases rapidly till equivalence point.

d) Which electrodes are used in pH metric titration of HCl vs NaOH? Give the procedure for calibration of pH meter. **[3]**