

Subject Code: R13104/R13
Set No - 1
I B. Tech I Semester Regular Examinations Feb./Mar. - 2014
ENGINEERING CHEMISTRY
(Common to CE,ME,CSE,PCE,IT,Chem E,Aero E,AME,Min E,PE,Metal E)
Time: 3 hours
Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

- 1.(a) Discuss (i) p-type doped conducting polymers (ii) phosphate conditioning (iii) antiknocking agents
- (b) Write a note on protection (against corrosion) of a metal by metallic coatings.
- (c) A 0.1 M KCl solution, whose specific conductance is $0.01571 \text{ mho cm}^{-1}$, has a conductance of 0.014 mho. When the same conductivity cell is used a 0.1 M chloroacetic acid solution has a conductance of $7.84 \times 10^{-3} \text{ mho}$. If the ionic conductance of $\text{ClCH}_2\text{COO}^-$ and H^+ are 59.8 and $449.8 \text{ mho cm}^2 \text{equiv}^{-1}$, find the degree of dissociation of chloroacetic acid.

[12+4+6]

PART-B

- 2.(a) Describe cold and hot lime soda processes with a neat diagram.
 - (b) A sample of water on analysis has been found to contain the following in ppm: $\text{Ca}(\text{HCO}_3)_2 = 4.86$; $\text{Mg}(\text{HCO}_3)_2 = 5.84$, $\text{CaSO}_4 = 6.8$, $\text{MgSO}_4 = 8.4$. Calculate the temporary and permanent hardness of water.
 - (c) Discuss (i) stereospecific polymers (ii) mechanical properties of polymers
- [6+4+6]
- 3.(a) What is ion-selective electrode? Explain its working.
 - (b) Discuss potentiometric titrations.
 - (c) Write notes on (i) Refining of petrol (ii) reforming
- [6+4+6]
- 4.(a) Explain the factors effecting the rate of corrosion.
 - (b) Write notes on Electroplating
 - (c) Discuss (i) bullet proof plastics (ii) green house effects
- [6+4+6]
- 5.(a) Explain compounding and vulcanization of rubber.
 - (b) What is copolymerization. Give any two examples.
 - (c) Write notes on (i) caustic embrittlement (ii) galvanizing
- [7+3+6]
- 6.(a) Write notes on (i) LPG (ii) diesel knocking (iii) Ni-Cd battery
 - (b) A sample of coal was found to contain the following constituents: C = 81%; O=7%; S=2%; N=5.5% and ash=4.5%. Calculate the minimum amount of air required for complete combustion of 1 kg of coal.
 - (c) Explain break-point chlorination of water.
- [9+4+3]
- 7.(a) Write any four applications of carbon nanotubes.
 - (b) Explain the working of photovoltaic cells with a neat sketch.
 - (c) Write notes on (i) Impressed current cathodic protection (ii) galvanic cell
- [5+5+6]

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PART-A

- 1.(a) Name the various fractions obtained during fractional distillation of crude oil and indicate their boiling point ranges and uses of various fractions.
- (b) The ion conductance of H^+ and butyrate ions are 339.8 and $30.6 \text{ Scm}^2 \text{ equiv}^{-1}$ respectively. When same conductance cell is employed 0.1 M KCl and 0.1 M butyric acid recorded conductances of 1.3×10^{-2} and $5.25 \times 10^{-4} \text{ Scm}^2$ respectively. If the conductivity of the above KCl solution is 0.0121 S cm^{-1} , calculate the degree of dissociation of butyric acid.
- (c) Write notes on (i) turbine deposits (ii) Anodized coatings (iii) Solar reflectors

[6+7+9]

PART-B

- 2.(a) Describe (i) zeolite process (ii) Priming and foaming
 - (b) Calculate the amount of lime and soda required for the softening of 150 liters of water, which is analyzed as: temporary hardness = 20 ppm; permanent hardness = 15 ppm; permanent Mg hardness = 10 ppm.
 - (c) Discuss the preparation of Bakelite and Thiokol and mention their uses.
- [6+4+6]
- 3.(a) Explain with neat diagrams the working of (i) glass electrode (ii) concentration cell (iii) Leclanche cell
 - (b) Describe any one method of catalytic cracking process for obtaining gasoline.
- [10+6]
- 4.(a) Explain electrochemical corrosion.
 - (b) Explain galvanizing and tinning.
 - (c) Describe any two methods of synthesis in green chemistry.
- [6+4+6]
- 5.(a) Describe with neat sketches, any two moulding techniques of plastics.
 - (b) What are the drawbacks of natural rubber.
 - (c) What are the different constituents of paints and give their function.
 - (d) Write notes on caustic embrittlement.
- [6+4+3+3]
- 6.(a) Define calorific value, HCV and LCV. Calculate the gross and net calorific value of coal having the following compositions C = 83%; H = 10%; S = 1%, N = 3%, Ash = 3%. Latent heat of steam = 587 cal/g.
 - (b) Discuss (i) applications of Kohlrausch law (ii) scales and sludges
- [10+6]
- 7.(a) Write notes on (i) deterioration of cement concrete (ii) Types of Liquid crystals (iii) Need of green chemistry
 - (b) Explain (i) electrochemical cell (ii) metal cladding
- [10+6]

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Question Paper Consists of **Part-A** and **Part-B**
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PART-A

- 1.(a) Write notes on (i) CNG (ii) properties of Thiokol (iii) phosphate coatings
- (b) Explain the mechanism of setting and hardening of cement.
- (c) Calculate the amount of lime (84% pure) and soda (92% pure) required for softening 10,000 litres of water containing the following salts per litre:
 $\text{Ca}(\text{HCO}_3)_2 = 40.5 \text{ mg}$; $\text{Mg}(\text{HCO}_3)_2 = 36.5 \text{ mg}$; $\text{MgSO}_4 = 30 \text{ mg}$; $\text{CaSO}_4 = 34 \text{ mg}$;
 $\text{CaCl}_2 = 27.75 \text{ mg}$ and $\text{NaCl} = 10 \text{ mg}$. Also calculate the temporary hardness and permanent hardness of the water sample.

[7+6+9]

PART-B

- 2.(a) Describe with neat sketch ion exchange process of softening of water.
 - (b) Write notes on (i) scales and sludges (ii) tacticity
 - (c) What is condensation polymerization? Explain with example.
- [6+8+2]
- 3.(a) Describe the construction and working of hydrogen-oxygen fuel cell.
 - (b) At 25°C , the equivalent conductivities at infinite dilution of HCl , CH_3COONa and NaCl are 428.03, 93.3, and $125.78 \text{ ohm}^{-1}\text{cm}^2 \text{equiv}^{-1}$ respectively. Calculate the equivalent conductance of acetic acid at infinite dilution
 - (c) Discuss the ultimate analysis of coal
- [7+3+6]
- 4.(a) Discuss the mechanism of dry corrosion. Explain the role of oxide film in dry corrosion.
 - (b) Explain the importance of design and selection of materials in controlling corrosion.
 - (c) Describe any two preparation methods for carbon nanotubes with neat sketch diagrams.
- [6+4+6]
- 5.(a) Explain free radical mechanism of addition polymerization.
 - (b) Write the preparation and uses of (i) PVC (ii) Bakelite
 - (c) Write notes on (i) Reverse Osmosis (ii) anodic and cathodic inhibitors
- [4+6+6]
6. Write notes on (i) refining (ii) octane number (iii) antiknocking agents (iv) cold lime soda process (v) calomel electrode
- [16]
- 7.(a) Write any four applications of (i) green chemistry (ii) liquid crystals (iii) fullerenes
 - (b) Write notes on (i) drying, semidrying and nondrying oils (ii) Kohlrausch law
- [10+6]

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Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

- 1.(a) Write notes on (i) breakpoint chlorination (ii) ionic liquids as green solvents for green synthesis (iii) electroless plating
- (b) A sample of coal containing 93% C; 5% H; 2% ash. When this coal was tested in the laboratory for its calorific value in the bomb calorimeter, the following data was obtained: Weight of coal burnt = 0.95 g; Weight of water taken = 600g water equivalent of bomb and calorimeter = 2,000 g, rise of temperature = 2.84°C ; Cooling correction = 0.02°C ; Fuse wire correction = 12.0 cal; acid correction = 55 cal. Calculate the net and gross calorific value of the coal in cal/g. (Assume the latent heat of condensation of steam as 580 cal/g)
- (c) Compare galvanic series with electrochemical series.

[12+5+5]

PART-B

- 2.(a) Write notes on (i) demineralization process (ii) sterilization of water
 - (b) A sample of water contains the following dissolved salts per litre: $\text{Mg}(\text{HCO}_3)_2 = 25 \text{ mg}$; $\text{MgCl}_2 = 28 \text{ mg}$; $\text{CaSO}_4 = 24 \text{ mg}$; $\text{CaCl}_2 = 84 \text{ mg}$. Calculate the temporary and permanent hardness.
 - (c) Discuss the physical and mechanical properties of polymers.
- [6+4+6]
- 3.(a) What are secondary batteries? Give an example and explain its construction and working.
 - (b) Describe conductometric titrations of acids and bases.
 - (c) Write notes on (i) petrol knocking and diesel knocking (ii) characteristics of a good fuel.
- [5+5+6]
- 4.(a) Discuss on differential aeration corrosion
 - (b) Write notes on (i) Pilling- Bed worth rule (ii) passivity (iii) solar cells (iv) chemical vapour deposition method of CNTs
- [4+12]
- 5.(a) Write notes on (i) stereospecific polymers (ii) Injection moulding (iii) vulcanization
 - (b) Explain (i) metal cladding (ii) calgon and phosphate conditioning
- [10+6]
- 6.(a) Describe moving bed catalytic cracking method with a neat labeled diagram.
 - (b) Write notes on flue analysis and its significance.
 - (c) Explain how specific and equivalent conductances of a strong electrolyte vary with dilution.
 - (d) Discuss boiler corrosion.

[6+4+3+3]

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- 7.(a) Write notes on (i) applications of liquid crystals (ii) any one method of green synthesis (iii) fiber reinforced plastics
- (b) Discuss sacrificial anodic protection method.
- (c) Calculate the emf of the following cell: $\text{Zn (s)}/\text{Zn}^{2+} (0.1 \text{ M})//\text{Cu}^{2+} (1.50\text{M})/\text{Cu(s)}$ at 25°C . $E^\circ_{\text{Zn}^{2+}/\text{Zn(s)}} = -0.76 \text{ V}$ and $E^\circ_{\text{Cu}^{2+}/\text{Cu(s)}} = +0.34 \text{ V}$.

[10+3+3]

