

Subject Code: R13104/R13

Set No - 1

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

ENGINEERING CHEMISTRY

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, AME, Min E, PE, and 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) Calculate the amount of lime (82% pure) and soda (91% pure) for treatment of 60, 000 litres of water, whose analysis is as follows: $\text{Ca}(\text{HCO}_3)_2 = 40 \text{ ppm}$, $\text{Mg}(\text{HCO}_3)_2 = 30 \text{ ppm}$, $\text{MgSO}_4 = 10 \text{ ppm}$, $\text{CaSO}_4 = 40 \text{ ppm}$, $\text{CaCl}_2 = 25 \text{ ppm}$, $\text{NaCl} = 8 \text{ ppm}$ and also calculate carbonate and non carbonate hardness of water sample.
- (b) Discuss the properties of liquid crystals.
- (c) Write notes on (i) Ni-Cd battery (ii) Sacrificial anodic protection
 (iii) Atactic and syndiotactic polymers (iv) CNG

[7+3+12]

PART -B

2. (a) Explain permutit process for removal of hardness of water.
 - (b) Explain the mechanism of anionic polymerization with a suitable example.
 - (c) Discuss the constituents of paints and their functions.
- [6+5+5]
3. (a) Discuss the construction and working of fuel cells.
 - (b) Discuss proximate analysis of coal.
 - (c) Write notes on breakpoint chlorination.
- [6+5+5]
4. (a) Describe dry theory of corrosion.
 - (b) Explain with a neat sketch arc discharge method involved in synthesis of carbon nanoparticles.
 - (c) Write notes on single electrode potential.
- [6+5+5]
5. (a) Write notes on compounding of rubber.
 - (b) Define Kohlrausch law and discuss its applications.
 - (c) A gas has the following composition by volume: $\text{H}_2 = 28\%$, $\text{CH}_4 = 13\%$, $\text{N}_2 = 42\%$, $\text{O}_2 = 17\%$. If 20% excess air is used, find the weight of air actually supplied per m^3 of this gas.
- [6+5+5]
6. (a) Explain with a neat sketch moving bed catalytic cracking method to produce gasoline.
 - (b) Differentiate between anodic and cathodic coatings.
 - (c) Write notes on biodegradable polymers.
- [6+5+5]
7. (a) Discuss the reactions occurring during setting and hardening of cement.
 - (b) How is water purified for drinking purposes by municipalities?
 - (c) Discuss the preparation, properties and uses of PVC.
- [6+5+5]



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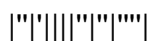
Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

1. (a) Explain the effect of CO₂ and SO₂ on cement concrete.
 - (b) A gaseous fuel has the following composition by volume: H₂ = 28%, CH₄ = 32%, ethane 13%, O₂ = 7%, N₂ = 15% and butane = 5%. Find out the analysis of dry products of combustion using 30 % excess air.
 - (c) Describe the principle of EDTA method in determination of hardness of water.
 - (d) Write notes on
 - (i) Specific and molar conductance
 - (ii) stereo regular polymers
 - (iii) Impressed current cathodic protection
- [4+6+3+9]

PART -B

- 2.(a) Discuss the various reactions occurring in lime soda process.
 - (b) With a neat sketch discuss compression moulding technique used for fabrication of plastics.
 - (c) Write notes on cladding and electroplating of metal.
- [6+5+5]
- 3.(a) Explain the construction and working of lead acid battery.
 - (b) Discuss refining of petroleum.
 - (c) Explain scale and sludge formation in boilers. How are they removed?
- [6+5+5]
- 4.(a) Describe wet theory of corrosion.
 - (b) Discuss the types of liquid crystals.
 - (c) The equivalent conductance of 0.01 N acetic acid is 17.30 ohm⁻¹cm²eq⁻¹. The ionic conductance of H⁺ and CH₃COO⁻ ions at infinite dilution are 278 and 87 ohm⁻¹cm²eq⁻¹ respectively. What percentage of acetic acid dissociates at this concentration.
- [6+5+5]
- 5.(a) Discuss the preparation, properties and uses of BUNA-S.
 - (b) Explain with an example concentration cells.
 - (c) Write notes on petrol knocking and diesel knocking.
- [6+5+5]
- 6.(a) Explain analysis of carbon and sulphur present in coal.
 - (b) Explain differential aeration corrosion.
 - (c) Explain phase transfer method in green synthesis.
- [6+5+5]
- 7.(a) Write notes on doped conducting polymers.
 - (b) What are the advantages and limitations of softening of water by ion-exchange process compared to other methods?
 - (c) Write notes on mechanical properties of polymers.
- [6+5+5]



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PART-A

1. (a) Explain supercritical fluid extraction method in green synthesis.
 - (b) A sample of coal was found to contain the following C = 80%, H = 7%; O = 3%, N = 5% remaining being ash. (i) Calculate the amount of minimum air required for complete combustion of kg of coal sample. (ii) If 30% excess air is supplied, estimate the % composition of dry products of combustion.
 - (c) Discuss the chemical reactions occurring during charging and discharging of lead acid storage battery.
 - (d) Write notes on (i) priming and foaming (ii) physical properties of polymers
- [4+7+5+6]

PART -B

2. (a) Discuss demineralization process of softening of water.
 - (b) With a neat sketch discuss injection moulding technique used for fabrication of plastics.
 - (c) Write notes on galvanic series and passivity.
- [6+5+5]
3. (a) What are primary and secondary batteries. Explain the construction and working of dry battery cell.
 - (b) Explain the construction of Orsat apparatus for the estimation of flue gases.
 - (c) Discuss electro dialysis with a neat sketch diagram.
- [6+5+5]
4. (a) Explain the factors affecting the rate of corrosion.
 - (b) Discuss green house effect.
 - (c) What is the emf of the following cell at 25⁰C, Zn (s)/ Zn²⁺ (0.1 M) // Ag⁺ (0.002M)/Ag(s).
 The standard emf of the cell is 1.54V
- [6+5+5]
- 5.(a) Discuss the preparation, properties and uses of Bakelite.
 - (b) Discuss the working of the glass electrode.
 - (c) Write notes on octane and cetane number.
- [6+5+5]
6. (a) Describe with a neat sketch fixed bed catalytic cracking method to produce petrol.
 - (b) Differentiate between galvanizing and tinning.
 - (c) With a help of neat figure explain the working of photovoltaic cells.
- [6+5+5]
7. (a) Write notes on fiber reinforced plastics.
 - (b) Describe a method of desalination of brackish water.
 - (c) Write notes on free radical mechanism of addition polymerization.
- [6+5+5]



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PART-A

- 1.(a) Calculate the volume of air required for complete combustion of 1 m³ of gaseous fuel having the following composition : CO = 40, CH₄ = 15%, H₂ = 35 %, C₂H₂ = 3%, N₂ = 1 % and remaining is CO₂.
- (b) How is rubber vulcanized? What are its advantages?
- (c) Write notes on (i) ion selective fluoride electrode (ii) alkaline batteries
- (d) Discuss (i) types of carbon nanotubes (ii) requirements of potable water

[5+3+6+8]

PART -B

2. (a) Discuss the various types of boiler troubles. How can they be minimized?
- (b) With a neat sketch discuss extrusion moulding technique used for fabrication of plastics.
- (c) Discuss Pilling Bed worth rule.

[6+5+5]

3. (a) Write notes on conductometric titrations.
- (b) Calculate the lime and soda required per litre for the chemical treatment of water containing Ca²⁺ = 82 ppm, Mg²⁺ = 30 ppm, K⁺ = 40 ppm, HCO₃⁻ = 200 ppm; FeSO₄.7H₂O = 62 ppm.
- (c) Write notes on antiknocking agents and thermal cracking of gasoline.

[6+5+5]

4. (a) Explain the electroless plating and electroplating of metals.
- (b) Write short notes on solar reflectors and solar dishes.
- (c) Define specific conductivity, equivalent conductivity. Explain how these are affected by dilution.

[6+5+5]

5. (a) Discuss the preparation, properties and uses of Thiokol.
- (b) Discuss concentration cells.
- (c) What are the advantages and disadvantages of liquid fuels.

[6+5+5]

6. (a) Write a short note on Orsat method of flue gas analysis and its significance.
- (b) How could proper design and selection of material inhibit corrosion?
- (c) Explain the properties of fullerenes.

[6+5+5]

7. (a) Explain aqueous phase method in green synthesis.
- (b) Describe zeolite process of softening of hard water.
- (c) Write notes on stereo specific polymers.

[6+5+5]

