

I B.Tech Supplementary Examinations, November/December 2005**ENGINEERING CHEMISTRY****(Common to Mechanical Engineering, Mechatronics, Production Engineering and Aeronautical Engineering)****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Describe the cathodic protection of corrosion control
(b) Write a note on Electroplating. [8+8]
2. (a) Discuss the compounding of plastics?
(b) Explain the procedures used in the processing of Natural rubber.
(c) Write a note on urea formaldehyde resins. [5+5+6]
3. (a) How is the “chloride” in water estimated?
(b) Write a note on hardness of water. [8+8]
4. Determine the amount of soda and lime required in Kg’s to soften 5000 lit of water containing the following salts $\text{MgCl}_2 = 15.5$ ppm, $\text{Ca}(\text{HCO}_3)_2 = 32.5$ ppm, $\text{Ca}(\text{NO}_3)_2 = 22.4$ ppm, $\text{NaCl} = 50$ ppm, $\text{KCl} = 22.5$ ppm. [16]
5. (a) What is octane number? Explain how the molecular structure will affect the octane number.
(b) What is leaded petrol? Discuss its advantages and disadvantages.
(c) Describe the fractional distillation of petroleum. [6+5+5]
6. (a) Describe the method of determination of calorific value of a solid fuel by bomb calorimeter.
(b) Calculate the gross and net calorific value of a coal sample from the following data obtained from a bomb calorimeter. Weight of coal 0.73 gm, weight of water in the calorimeter 1500 gm, water equivalent of calorimeter 470 gm initial temp 25.0°C , and final temp, 28°C , percentage of hydrogen in coal 2.5%, latent heat of steam 587 cal/gm. [8+8]
7. (a) Explain the differences between the acidic basic and neutral refractories with suitable examples.
(b) What is meant by pyrometric cone equivalent of a cone? Explain. [8+8]
8. (a) Define flash and fire points.
(b) Discuss the important functions of lubricants. [16]

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1. (a) Describe the cathodic protection of corrosion control
(b) Write a note on Electroplating. [8+8]
2. (a) Write a note on properties and uses of Teflon.
(b) Differentiate the Natural Polymer and synthetic polymer.
(c) Write a note on silicone rubbers. [4+6+6]
3. (a) Discuss the important methods used for the prevention of scale formation in industrial boilers.
(b) What is caustic embrittlement and how it can be avoided? [8+8]
4. 2 litres of water obtained from a borewell in Patancheru near Hyderabad gave the following analysis for salts :- $\text{FeSO}_4 = 30.4 \text{ mg}$; $\text{CaSO}_4 = 13.6 \text{ mg}$; $\text{MgCl}_2 = 38 \text{ mg}$; $\text{Ca}(\text{HCO}_3)_2 = 32.4 \text{ mg}$; $\text{Mg}(\text{HCO}_3)_2 = 14.6 \text{ mg}$; $\text{NaCl} = 11.7 \text{ mg}$.
Find out the total hardness of water in ppm units, giving temporary and permanent hardness assuming the atomic mass of Fe to be 56, that of Ca to be 40, that of Mg to be 24 and that of Na to be 23. [16]
5. (a) What is octane number? Explain how the molecular structure will affect the octane number.
(b) What is leaded petrol? Discuss its advantages and disadvantages.
(c) Describe the fractional distillation of petroleum. [6+5+5]
6. (a) With a neat diagram describe the orsat gas analysis method. What are the special precaution to be taken in the measurement .
(b) Define calorific values of a fuel. Distinguish gross and net calorific value. [8+8]
7. Explain the significance of the following properties in the evaluation of a refractory material.
(a) Thermal spalling
(b) Refractoriness-under-load.
(c) Dimensional stability
(d) Heat capacity. [4x4]
8. Explain the mechanisms of different types of lubricating process. [16]

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1. (a) Describe the cathodic protection of corrosion control
(b) Write a note on Electroplating. [8+8]
2. (a) Identify the thermo sets and thermoplastics among the following:
 - i. PVC.
 - ii. Polyethylene.
 - iii. Silicone.
 - iv. Polyester fibre.
 - v. Bakelite.(b) What is bakelite? How is it manufactured and mention its uses? [5+11]
3. (a) What are the important sources of water?
(b) Why is rain water the purest form of natural waters?
(c) How do you estimate dissolved oxygen in water? [4+5+7]
4. Calculate the lime and soda needed for softening 50,000 litres of water containing the following salts:- $\text{CaSO}_4 = 136\text{mg/litre}$; $\text{MgCl}_2 = 95\text{mg/litre}$; $\text{Mg}(\text{HCO}_3)_2 = 73\text{mg/litre}$; $\text{Ca}(\text{HCO}_3)_2 = 162\text{mg/litre}$. Given that the molar mass of $\text{Ca}(\text{HCO}_3)_2$ is 162 and that of MgCl_2 is 95. [16]
5. (a) What are the characteristics of liquid fuels?
(b) Write note on:
 - i. octane number.
 - ii. Thermal cracking.[8+8]
6. (a) With a neat diagram describe the orsat gas analysis method. What are the special precaution to be taken in the measurement .
(b) Define calorific values of a fuel. Distinguish gross and net calorific value. [8+8]
7. What are Refractories? Explain Thermal spalling, strength and porosity of the refractories. [16]
8. Write a note on lubricants with special reference to their classification, mode of action, examples and applications. [16]

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1. (a) What is a drying oil? Give two examples.
(b) Compare the uniform corrosion and pitting corrosion.
(c) Explain Sacrificial anode method in detail. [5+6+5]
2. (a) Write a note on properties and uses of Teflon.
(b) Differentiate the Natural Polymer and synthetic polymer.
(c) Write a note on silicone rubbers. [4+6+6]
3. (a) Describe the ion-exchange process used for softening of water?
(b) Compare the resin process with permutit process for softening of water. [8+8]
4. Calculate the quantities (in Kgs) of lime and soda required to soften 50,000 litres of hard water containing the following salts:-
 $\text{MgCl}_2 = 95 \text{ PPM}$; $\text{Mg}(\text{HCO}_3)_2 = 146 \text{ PPM}$; $\text{CaSO}_4 = 136 \text{ PPM}$; $\text{Ca}(\text{HCO}_3)_2 = 162 \text{ PPM}$
Assume that the lime used is only 85% pure and soda is only 95% pure and the molar masses of $\text{Mg}(\text{HCO}_3)_2$ and CaSO_4 are respectively 146 and 136. [16]
5. (a) What is cracking of petroleum? Explain the fluidized catalytic cracking process.
(b) What are the main constituents of coal? Explain their significance. [8+8]
6. (a) With a neat diagram describe the orsat gas analysis method. What are the special precaution to be taken in the measurement .
(b) Define calorific values of a fuel. Distinguish gross and net calorific value. [8+8]
7. (a) How are the refractories are classified? Give one example for each class.
(b) Write a note on the conditions leading to failure of a refractory material. [8+8]
8. Write a note on lubricants with special reference to their classification, mode of action, examples and applications. [16]
