

I B.Tech Supplementary Examinations, Aug/Sep 2008

ENGINEERING CHEMISTRY

(Common to Mechanical Engineering, Mechatronics, Production Engineering, Aeronautical Engineering and Automobile Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) What are the various factors which influence corrosion?
(b) Write any four corrosion control methods. [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) Explain the difference between municipal water and the water used for industrial purposes such as the one used in steam boilers.
(b) Describe the sand filter used for the purification of municipal water. [8+8]
4. A sample of Water contains the following impurities per lit: $\text{Mg}(\text{HCO}_3)_2 = 73\text{g}$, $\text{CaCl}_2 = 222\text{mg}$, $\text{MgSO}_4 = 120\text{ mg}$, $\text{Ca}(\text{NO}_3)_2 = 164\text{ mg}$. Calculate the amounts of lime and soda needed for 50,000 lit of water if the lime is 70% pure and soda is 85% pure and 10% excess chemicals are to be added. [16]
5. (a) How petroleum is formed in nature? Discuss the classification of petroleum based on their composition:-
(b) What is cetane number? How the cetane number of the Fuel can be improved. [8+8]
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. What are Refractories? Explain Thermal spalling, strength and porosity of the refractories. [16]

Code No: RR10301

Set No. 1

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) Write down the equation for the hydrogen evolution in an electro chemical corrosion reaction.
(b) What are fillers and extenders? Give examples.
(c) Describe the process
 - i. galvanizing
 - ii. anodizing.[5+5+6]
2. (a) Write down any two distinguishing features of PVC.
(b) Explain the differences between thermo set and thermo plastics.
(c) What is moulding of plastics? Explain compression moulding technique in detail. [5+5+6]
3. (a) Write a note on the use of coagulants used in sedimentation of water.
(b) Give the reactions involved in lime-soda process. [8+8]
4. Calculate the amount of soda and lime required to soften 15,000 lit of water which showed the following analysis.
NaCl= 15.5 ppm, KCl = 25 ppm, CO₂ = 5.5 ppm, Mg SO₄ = 120 ppm, CaCl₂ = 22ppm, Ca(HCO₃)₂ = 15ppm, Mg (HCO₃)₂ = 3.30 ppm, Suspended matter =15 ppm, Organic impurities = 35 ppm. [16]
5. (a) How is coal is graded? Explain what is calorific value of coal.
(b) Give the advantages and disadvantages of Coal over gaseous fuels. [8+8]
6. (a) Discuss in detail Bergius procedure for the manufacture of synthetic petrol.
(b) What are the characteristics of a good Fuel? [8+8]
7. What are Refractories? Explain Thermal spalling, strength and porosity of the refractories. [16]
8. Explain the following two theories for the mechanism of the lubricants.
 - (a) Boundary lubrication
 - (b) Extreme pressure lubrication. [8+8]

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1. (a) Describe the cathodic protection of corrosion control
(b) Write a note on Electroplating. [8+8]
2. (a) What are the draw backs of raw rubber? How are its properties improved?
(b) How is Buna - S Rubber prepared? Write its uses. [8+8]
3. (a) What is meant by “softening” of water?
(b) How is the “Softening” of water carried out using the Zeolite Process?
(c) What is alkalinity of water due to and how it is estimated? [4+6+6]
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 coal? How it is formed? Discuss the qualities of a good coal.
(b) Give the Classification of coal and explain each class with example. [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. Explain the following two theories for the mechanism of the lubricants.
(a) Boundary lubrication
(b) Extreme pressure lubrication. [8+8]

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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 the repeat unit in Bakelite, PVC and Nylon?
(b) Mention any two important compounding ingredients of rubber.
(c) Write a note on Silicones. [5+6+5]
3. (a) What is meant by “hardness” of water?
(b) What are the major disadvantages of hard water when used for
 - i. domestic purposes.
 - ii. industrial purposes and
 - iii. steam generation in boilers? [4+12]
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 are the Constituents of petroleum? Describe the Origin of petroleum.
(b) Give an account of production of petrol from crude oil. [8+8]
6. (a) The analysis of fuel gases was found to contain the following percentage by Volume $\text{CO}_2 = 13\%$, $\text{O}_2 = 6\%$. Find the air per kg of coal if the carbon content of coal is 85%.
(b) A producer gas has the following composition by volume. $\text{H}_2 = 10.4\%$, $\text{CH}_4 = 35\%$, $\text{CO} = 25\%$, $\text{CO}_2 = 10.8\%$, $\text{N}_2 = 50.3\%$. Calculate the quantity of air required per m^3 of gas. If 20% excess air is supplied, find the percentage composition of the products of combustion. [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]

Code No: RR10301

Set No. 4

8. Write a note on lubricants with special reference to their classification, mode of action, examples and applications. [16]

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