

I B.Tech Semester Regular Examinations, June 2009
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) Define carbonate and non carbonate hardness of water. Mention the various dis-advantages of hard water for domestic use.
(b) What is meant by sterilization of water? Explain how sterilization of water is carried out by using chlorine and ozone. [6+10]
2. (a) Discuss the disadvantages of using hard water for various industries.
(b) Explain the factors responsible for the corrosion of a boiler. Discuss the measures for its prevention. [8+8]
3. (a) What is oxidation corrosion and how does it take place? Describe the mechanism of oxidation corrosion.
(b) Describe the various factors influencing the rate of chemical corrosion. [8+8]
4. Explain in detail the various methods of Chemical conversion coatings. [16]
5. (a) Explain the process of Extrusion moulding with a neat diagram?
(b) How are the following polymers prepared? Mention their properties and uses.
 - i. PVC
 - ii. LDPE. [6+10]
6. (a) Describe the engineering applications of thermal and electrical insulators.
(b) What is the main advantage of liquid insulating materials over solid insulating materials?
(c) What are the advantages of SF₃ gas? [8+4+4]
7. (a) What is meant by blended oils? Explain the functions of various additives added to the lubricants?
(b) What are viscosity & viscosity index of lubricating oil? [12+4]
8. (a) What is meant by hydrogenation of coal? Describe Bergius process with a neat diagram.
(b) Explain
 - i. Why is net calorific value less than gross calorific value.
 - ii. Water gas is superior to produce gas. [8+8]

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1. Discuss briefly the following :
 - (a) Estimation of hardness of water
 - (b) Dis-infection of water. [8+8]
2. Write a note on the following:
 - (a) Caurtic embrittlement
 - (b) Phosphate conditioning
 - (c) Carry over and its disadvantages. [6+6+4]
3. (a) Discuss the corrosion involved in
 - i. Wire fence and
 - ii. RIVETTED joint.
(b) What are the guide lines to be followed during the design of an equipment to control corrosion? [8+8]
4. (a) Why chromium anodes are not used in chromium plating?
(b) Distinguish between galvanizing and sheradizing.
(c) Discuss the role of following factors on the nature of electrodeposit :
 - i. Current Density
 - ii. pH. [2+6+8]
5. (a) Write the properties and uses of different types of silicones.
(b) Write short notes on synthetic rubbers. [8+8]
6. (a) What is pyrometric cone equivalent? How it is determined for a refractory? What is its significance?
(b) Write a short note on:
 - i. porosity
 - ii. Thermal Conductivity
 - iii. Dimensional Stability.
 - iv. strength [8+8]
7. (a) Distinguish between extreme pressure lubrication & boundary lubrication.

- (b) Describe the functions of viscosity index improvers? Give examples.
- (c) In what situations semi-solid lubricants are preferred. [8+4+4]
8. (a) Explain how fuels are classified with suitable examples.
- (b) Explain the significance of the following constituents present in coal.
- i. Moisture
 - ii. Volatile matter
 - iii. Ash and
 - iv. Fixed carbon. [8+8]

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1. (a) 20 ml of standard hard water (containing 15 g of CaCO_3 per litre) required 25 ml of EDTA solution for titration. 100 ml of water sample required 18 ml of EDTA solution; While same water after boiling required 12 ml of EDTA solution. Calculate carbonate and non carbonate hardness of water.
(b) What is hardness of water? Mention various units used for its expression and state their relation . [8+8]
2. (a) What are external treatment and internal treatment of water? Describe ion exchange process of softening of water.
(b) Write a note on mechanical deaeration. [12+4]
3. (a) What is oxidation corrosion and how does it take place? Describe the mechanism of oxidation corrosion.
(b) Describe the various factors influencing the rate of chemical corrosion. [8+8]
4. (a) What are paints? Mention the ingredients of paint?
(b) Write the requisites of a good paint?
(c) What is pigment volume concentration? Explain its significance. [4+4+8]
5. (a) What are elastomers? Give the preparation, properties and uses of Buna S.
(b) Describe a method for moulding of thermoplastic resin. [8+8]
6. (a) Define Refractories and what are the criteria of a good refractory?
(b) Give the classification of refractories with suitable examples. [6+10]
7. (a) What are synthetic lubricants? How are they superior to petroleum based lubricants?
(b) Define Grease. Under what conditions they are used as lubricants?
(c) What is the effect of temperature on viscosity? Explain with an example. [6+6+4]
8. (a) Compare petrol and diesel oil with respect to
 - i. Knocking characteristics
 - ii. Octane number and cetane number
 - iii. Blending and doping agents.

- (b) The determination of calorific value of a coal sample gave the following data:
Weight of coal sample = 0.9 gm; Water equivalent of calorimeter = 440 gm;
Weight of water = 2560 gm; Rise in temperature = 2.42°C ;
Cooling correction = 0.052°C ; Fuse wire correction = 10.0 calories.
Calculate GCV and NCV, if the coal contains 6% hydrogen and assume latent heat of steam is equal to 600 cal/gm. [8+8]

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1. (a) Estimation of free chlorine in water samples.
(b) Discuss the impurities in water and their effects. [9+7]
2. (a) What are the chemical reactions involved in the conditioning of water by lime soda process? Explain the hot lime soda process with a neat diagram.
(b) What are the requirements of boiler feed water? [12+4]
3. (a) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion. With an example.
(b) How corrosion is controlled by material selection. Give an example. [8+8]
4. (a) What are the characteristics of good pigment?
(b) Distinguish between drying oils and semi-drying oils.
(c) What are drying oils? Give its functions. [4+6+6]
5. (a) Teflon is an addition polymer, it behaves like a thermosetting polymer. Give Reasons.
(b) What are the different kinds of additives used in the fabrication of plastics? Write their functions, with examples.
(c) What is crepe rubber and reclaimed rubber? [4+8+4]
6. (a) What is pyrometric cone equivalent? How it is determined for a refractory? What is its significance?
(b) Write a short note on:
 - i. porosity
 - ii. Thermal Conductivity
 - iii. Dimensional Stability.
 - iv. strength[8+8]
7. (a) Give the functions of lubricants.
(b) Describe the mechanism of extreme pressure lubrication.
(c) How a viscous lubricant is converted into grease? [6+6+4]
8. (a) Explain how fuels are classified with suitable examples.

(b) Explain the significance of the following constituents present in coal.

- i. Moisture
- ii. Volatile matter
- iii. Ash and
- iv. Fixed carbon.

[8+8]
