Subject Code: R161105/R16

Set No - 1

I B. Tech I Semester Regular Examinations Dec. - 2016
ENGINEERING CHEMISTRY
(Com. to AE, BOT, CHEM, CE, MM, MET, PE, PCE, AME, ME)

Time: 3 hours   **Max. Marks: 70**

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

1. a) A sample of water has 13.6 ppm of calcium sulphate. If the water is softened by lime and soda process, what would be the quantities of lime and soda required to soften one litre of this water?
   b) Of the two polymers – polythene and phenol-formaldehyde resins – which is a thermoplastic and which is a thermo-set. Suggest one method each for fabrication of these two.
   c) If you want to protect iron from corrosion by cathodic protection method, which of the two metals – Mg and Sn – can be used and what is the reason for your selection?
   d) Give the Dulong's formula for the calorific value of a solid fuel, explaining the terms involved in it.
   e) What are the advantages of phase transfer catalyst over conventional catalyst?
   f) If methanol is used as a fuel in a fuel cell, what would be the reactions at the electrodes?
   g) What are biodegradable polymers and why are they important?   (7×2=14M)

PART-B

2. a) What are fibre reinforced plastics? What are the roles of the reinforcement and the matrix in the properties of these fibre reinforced plastics?
   b) With neat sketches, explain injection moulding and compression moulding.   (7M+7M)

3. a) During proximate analysis of a sample of coal weighing 2.256 grams was heated at 110^OC for one hour and then weighed giving 2.020 grams of product. This product was then burnt completely and the residue weighed 0.450 gram. Another fresh sample of the same coal was heated with vented Lid at 950^OC for exactly seven minutes and the residue weighed 1.600 grams. Calculate the percentages of different constituents.
   b) Differentiate between petrol knocking and diesel knocking.
   c) Why rocket fuels are different from normal fuels?   (6M+5M+3M)

4. a) Describe the construction of calomel electrode.

   b) Explain water line corrosion.

   c) Write briefly about electroless plating.   (5M+4M+5M)

5. a) With suitable examples explain sol-gel method of preparation of nano materials.

   b) What are super conductors? Mention their applications?

   c) Why green chemistry is important for engineers?   (6M+5M+3M)

6. a) Explain the complexometric determination of hardness of water.

   b) A zeolite softener removed completely the hardness of 5,000 litres of hard water. The softener required 55 litres of NaCl solution containing 100grams/ litre of NaCl for regeneration. Calculate the hardness of the hard water sample.

   c) How does chlorination sterilize drinking water?   (7M+5M+2M)

7. a) How are refractories classified? Give one example each for the different classes.

   b) Explain the mechanism of hydrodynamic lubrication.

   c) What are electric insulators? Discuss three important properties of these insulators.

                                                                  (3M+6M+5M)
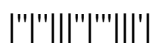
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Set No - 2

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Answering the question in **Part-A** is Compulsory,
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PART-A

1. a) What is the most commonly employed reinforcing material used for producing reinforced plastics? What is the role of the reinforcement?

   b) What is bio-diesel and how is it obtained? How does it differ from normal diesel?

   c) Some metals are passive to corrosion. Give two examples of such metals and explain why they are passive.

   d) Explain the sol-gel method of preparing a nano material.

   e) How in reverse osmosis different from electro-dialysis?

   f) What do you understand by viscosity index of an oil?

   g) Compare natural gas and LPG as fuels.   (7×2=14M)

PART-B

2. a) What are stereo-regular polymers? Explain with a neat representation syndiotactic polymers.

   b) Explain how Bakelite is produced.

   c) Write notes on Buna S rubber.   (5M+5M +4M)

3. a) Explain with a neat sketch the bomb-calorimetric method of determining the calorific value of coal. Indicate the calculations also.

   b) Producer gas has the following volumetric percentage composition;

   H : 14, CH4 : 2, CO : 22, CO2 : 5, N : 55   &   O : 2

   Calculate the volume of air required for the complete combustion of one cubic meter of this producer gas.   (10M+4M)
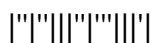
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4. a) Describe the construction of standard hydrogen electrode.

   b) Explain with suitable example, differential aeration corrosion.

   c) Differentiate between cathodic metal coating and anodic metal coating.   (5M+5M+4M)

5. a) Describe the CVD method of preparing carbon nano tubes.

   b) Explain the principles of green chemistry.

   c) Explain Meissner effect.   (5M+6M+3M)

6. a) What are the different types of scales one comes across in boilers? Why are these scales undesirable?

   b) How does a deioniser remove the hardness of water?

   c) Explain break point-chlorination.   (6M+3M+5M)

7. a) Describe the determination of refractoriness of a refractory brick.

   b) What is a lubricant and what are the different functions of a lubricant?

   c) Give an out-line of the production of cement.   (5M+3M+6M)
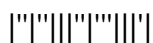
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Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
*****

PART-A

1. a) What are polycarbonates and why are they called engineering plastics?

   b) How, sulphur present in coal is determined?

   c) What are the chemical reactions that take place at the electrodes during discharge of a Nickel – Metal hydride cell?

   d) What are lyotropic liquid crystals? Give two examples of them.

   e) Chlorine is a good disinfectant and sterilizing agent. Explain how it functions in such a way.

   f) What is thermal spalling and how does it affect the stability of refractory bricks?

   g) What are the constituents for which the flue gases are analysed by Orsat apparatus?

   What are the reagents that are used to determine these constituents? (7×2=14M)

PART-B

2. a) Write a brief note on conducting polymers.

   b) What are the important advantages and limitations of plastics as engineering materials?

   c) What is high density polyethylene and how is it produced? (5M+5M +4M)

3. a) Explain fluid bed catalylitic cracking process.

   b) A sample of coal has the following weight percentage analysis:

   C : 84,   S : 1.5,   N : 0.6,   H : 5.5   and the remaining oxygen

   Calculate the HCV and LCV of this fuel, given that the latent heat of steam is 587cals/gram.

   c) How is power alcohol different from normal petrol? (7M+5M +2M)

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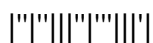
4. a) What is electrochemical series? Explain its applications.

    b) Explain the pitting corrosion.

    c) Write notes on cathodic protection.   (5M+4M +5M)

5. a) Discuss the important properties and applications of carbon nano tubes.

    b) Explain, with examples, two methods of green synthesis.

    c) What are liquid crystals? What are the two important (major)   classes of liquid crystals?

                                                                               (6M+5M +3M)

6. a) Calculate the total hardness of a sample of water having the following analysis:

    $Ca(HCO_3)_2$: 20 mg/litre, $Mg(HCO_3)_2$: !5 mg/lit., $CaCl_2$: 11 mg/lit, &

    $Ca(NO_3)_2$: 16 mg/lit.

     Express the results as ppm and ^{O}Clarke.

    b) Write notes on 'Priming and Foaming' and 'Caustic embrittlement'.   (6M+8M)

7. a) Describe the construction and working of hydrogen – oxygen fuel cell.

    b) Explain the deterioration of cement concrete in presence of Cl^-, CO_2 and SO_2 (8M+6M)
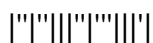
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Set No - 4

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

PART-A

1. a) What is Thiokol rubber and how is it produced?
   b) 0.9 gram of coal was burnt in a bomb calorimeter of water equivalent of 440 grams. The heat liberated is absorbed by 2,560 grams of water and the temperature increases by 0.05 ^{O}C. Calculate the calorific value of the coal.
   c) What are the reactions that take place at anodic and cathodic areas during differential aeration corrosion?
   d) What are superconductors? Give two examples of super conductors
   e) What is caustic embrittlement and what are the reasons for it?
   f) What is the difference between setting and hardening of cement concrete?
   g) What are nematic liquid crystals? Give examples.   (7×2=14M)

PART-B

2. a) Explain 'Emulsion polymerisation'. What are the advantages of this method?
   b) How is PVC produced and explain three of its uses.
   c) What is vulcanisation and how does it improve the properties of rubber.   (5M+5M +4M)

3. a) Explain, with reasons, whether sulphur's presence in a fuel is desirable or not.
   b) Write a brief note on rocket fuels.
   c) A coal sample contains C : 76%, H : 5.2%, O : 12.8%, N : 2.7%, S : 1.2% and remaining ash. Calculate the minimum weight of air required for the complete combustion of one kg. of the fuel.   (5M+4M+5M)

4. a) Write notes on (i) lithium cells and (ii) zinc- air cells
   b) Explain the electrochemical theory of corrosion.   (6M+8M)

5. a) Explain briefly how nano materials are characterised by BET method and TEM method.
   b) Explain R_4M_4 principles.   (8M+6M)

6. a) Describe the lime soda process of softening hard water.
   b) Describe desalination of brackish water by reverse osmosis process.   (7M+7M)

7. a) Discuss the mechanism of thin film lubrication.
   b) What are the important constituents of cement and what is the role of each constituent?
   c) Explain how a fuel cell is different from a normal galvanic cell.   (6M+6M +2M)

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