Set No. 1

Code No: R10104 / R10

I B.Tech I Semester Regular Examinations January 2012

ENGINEERING CHEMISTRY - I
(Common to all branches)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Why there is a decrease in temperature of a real gas when it undergoes expansion through a porous plug?
(b) What is osmosis and what is osmotic pressure?
(c) Explain the concept of solubility product with a suitable example.
[5M + 5M + 5M]

2.(a) Explain briefly the Tyndall effect.
(b) Give (any four) the important characteristics of enzymes.
(c) What are the factors that influence the viscosity of a liquid?
[5M + 5M + 5M]

3.(a) Using Jablonski diagram explain fluorescence.
(b) What is an ion selective electrode? Give at least two examples.
(c) Explain any two important applications of NMR spectroscopy.
[5M + 5M + 5M]

4.(a) Differentiate between insulators, conductors and semi-conductors in terms of valance band and conduction band.
(b) Discuss two important applications of super conductors.
(c) Explain two important applications of liquid crystals.
[6M + 4M + 5M]

5.(a) Briefly explain the important characteristics of a good fuel.
(b) Explain briefly how the By-product Oven method of producing coke differs from Beehive oven process.
(c) Calculate the gross and net calorific values of coal having the following composition:
Carbon: 87% Hydrogen: 5% Sulphur : 0.5% Nitrogen : 0.5% Oxygen : 3% Ash :4% ; latent heat of steam : 587 cal / gram.
[4M + 5M + 6M]

6.(a) Derive the Nernst equation for the potential of a reduction electrode.
(b) Describe the construction of calomel electrode.
(c) How is a fuel cell better than a battery?
[5M + 5M + 5M]

Code No: R10104 / R10 **Set No. 1**

7.(a) Explain the terms: (i) Mass defect and (ii) Binding energy
(b) Explain briefly how a fission reaction leads to release of large amount of energy.
(c) What functions are served by the moderator and coolant in a nuclear reactor?
[5M + 5M + 5M]

8.(a) How do the photovoltaic cells work?
(b) Describe how the solar power plants are used to harness solar energy.
(c) Explain the reasons for the green house effect felt by earth.
[5M + 5M + 5M]

Set No. 2

Code No: R10104 / R10

I B.Tech I Semester Regular Examinations January 2012

ENGINEERING CHEMISTRY - I
(Common to all branches)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) What is Joule- Thomson effect? What is the reason for the effect?
(b) How do you use the phenomenon of osmosis to produce pure water?
(c) Find out the solubility product of PbI_2 whose solubility is $4x\ 10^{-3}$ moles per litre.
[5M + 5M + 5M]

2.(a) How do the catalytic poisons function, particularly in contact catalysis?
(b) Explain the process of electrophoresis of a colloidal solution; mention two of its applications.
(c) Describe briefly the production of acetic acid by fermentation process (diagrams are not necessary).
[5M + 5M + 5M]

3.(a) What is phosphorescence? Give two important applications of the phenomenon.
(b) What are the important applications of a bio-sensor?
(c) Explain the basic principles of proton nuclear magnetic resonance.
[5M + 5M +

5M] 4.(a) What are extrinsic semiconductors? Explain how conduction takes place in them.
(b) What is 1,2,3 super conducting compound? How is it prepared?
(c)Explain very briefly the different classes of liquid crystals.
[5M + 5M + 5M]

5.(a) Calculate the calorific value of the coal given the following data:
Wt. of the fuel burnt : 0.945 g Initial temp. : 13.25^{o}CFinal temp.: 19.2^{o}C
Water in the calorimeter: 1458 g. Water equivalent of the calorimeter: 144 g.
(b) How sulphur present in coal is determined? Is the presence of sulphur desirable and why so?
(c) Briefly explain the production of coke by Hoffman's process.
[4M + 5M + 6M]

6.(a) Highlight three important applications of electrochemical series.

(b) Explain how a concentration cell, using solutions of the same electrolyte but of different concentrations, works.

(c) What are the reactions that take place when Nickel-Cadmium cell is recharged?
[5M + 5M + 5M]

Code No: R10104 / R10 **Set No. 2**

7.(a) How does the concept of Binding energy explain the stability of different nuclei?
(b) Schematically represent a nuclear reactor and indicate the main parts of it.
(c) With a suitable example explain a nuclear fusion reaction.
[5M + 5M + 5M]

8.(a) Write a short note on solar thermal power plant's working.
(b) What is green house effect and what are the advantages and disadvantages of the effect.
(c) What is the basic principle of solar cells?
[5M + 5M + 5M]

Set No. 3

Code No: R10104 / R10

I B.Tech I Semester Regular Examinations January 2012

ENGINEERING CHEMISTRY - I
(Common to all branches)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Explain briefly the basic refrigeration cycle.

(b) Ammonia is synthesized by Haber's process using a pressure of about 200 atmospheres, a temperature of about 450^{o} C and removing ammonia from the equilibrium. Justify these conditions.

(c) The solubility product of $BaSO_4$ is 1.5×10^{-9}. What is the solubility of the salt in terms of moles per litre.

[5M + 5M + 5M]

2.(a) What are catalytic promoters and catalytic poisons?

(b) Explain the important applications (at least three) of colloid science.

(c) How do you use the measurement of relative viscosity of a solution of a polymer, to find out the molecular weight of the polymer?

[5M + 5M +

5M] 3.(a) What is fluorescence? Give two important applications of this phenomenon.

(b) Write a brief note on fluoride ion-selective electrode.

(c) Explain any two important applications of NMR spectroscopy.

[5M + 5M + 5M]

4.(a) How does doping improve the conduction of semi conductors?
What are the important types of extrinsic semi-conductors?

(b) What are the important properties of super conductors?

(c) Compare the compact discs and floppy discs as storage devices.

[5M + 5M + 5M]

5.(a) Describe the Bomb calorimetric method of determining the calorific value of a solid fuel.

(b) Describe the desirability or otherwise of moisture and ash of coal.

(c) Calculate the gross and net calorific value of coal having the following composition: Carbon : 85% Hydrogen : 8% Sulphur : 1% Nitrogen : 2% Oxygen : 2% Ash : 2% and Latent heat of steam : 587 cals per gram.

[6M + 3M + 6M]

Code No: R10104 / R10 **Set No. 3**

6.(a) What is single electrode potential?
A Nickel electrode (E^{o} = -0.13 volt) is combined with an Aluminium electrode (standard oxidation potential is 1.66 volts) to form a cell. What would be the potential of the cell?
(b) Describe the construction of standard hydrogen electrode?
(c) Discuss the working of lead storage battery.
[5M + 5M + 5M]

7.(a) Write notes on Mass defect and Binding energy
(b) What are the important differences between nuclear fission and nuclear fusion?
(c) Explain briefly how a nuclear reactor works (Figures are not required).
[5M + 5M + 5M]

8.(a) Explain how solar energy can be harnessed by using pv cells.
(b) Write notes on solar collectors.
(c) What are green house gases and how do these gases produce green house effect?
[5M + 5M + 5M]

Set No. 4

Code No: R10104 / R10

I B.Tech I Semester Regular Examinations January 2012

ENGINEERING CHEMISTRY - I
(Common to all branches)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Briefly explain how air-conditioning differs from refrigeration.
(b) What are the advantages of reverse osmosis process of purifying brackish water?
(c) What is common ion effect? Explain two of its uses.

[5M + 5M + 5M]

2.(a) Give examples of two enzymes indicating the specific reactions they catalyse.
(b) Briefly discuss the important conditions for the fermentation process to take place.
(c) What are relative viscosity, specific viscosity and intrinsic viscosity of a solution?

[5M + 5M + 5M]

3.(a) Differentiate fluorescence and phosphorescence.
(b) How are photoelectric detectors useful in fire alarms or smoke detectors?
(c) Discuss briefly the importance of ion-selective electrodes.

[5M + 5M + 5M] 4.(a) What are super-conductors? How do they differ from normal conductors?
(b) Differentiate primary and secondary storage devices used in computers.
(c) What are the important common characteristics of liquid crystal materials?

[5M + 5M + 5M]

5.(a) What is calorific value of a fuel? How and why do the higher and lower calorific values differ?
(b) A sample of coal weighing 1.232 g was heated at 105^{o}C for an hour and the residue weighed 1.186 g. The residue was then heated in a muffle furnace at 940^{o}C for seven minutes and the residue now weighed 1.126 g. Finally the residue was heated in presence of air at 750^{o}C till a constant weight (0.080 g.) was attained. Calculate the results and explain what conclusions can you draw.
(c) Describe the production of metallurgical coke by beehive oven process.

[5M + 6M + 4M] 6.(a) Derive an equation for relating the potential and concentration of the electrolyte for a reduction electrode.
(b) What are concentration cells? Explain with an example.
(c) Explain how a dry battery functions and what are its limitations.

[5M + 5M + 5M]

Code No: R10104 / R10 **Set No. 4**

7.(a) How do you explain the stability of different nuclei on the basis of binding energy?
(b) Using a line diagram indicate the important parts of a nuclear reactor?
(c) Write notes on control rods and moderators used in nuclear reactors

[5M + 5M + 5M]

8.(a) Heating water on large scale with solar energy is becoming very popular. How is this achieved?
(b) Write a short note on solar panels.
(c) Explain green house effect and suggest methods to control this.

[5M + 5M + 5M]