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B.Tech.
EVEN SEMESTER
Major Examination 2017-2018
Subject Name: Engineering Chemistry

Time: 3 hrs. **Max. Marks: 50**

Note: Attempt all questions. All questions carry equal marks.

Q.1 Attempt any five of the following.

(a) Account for paramagnetic behavior of oxygen on the basis of molecular orbital theory. 2

(b) What is meant by inter-molecular and intra-molecular H-bonding? 2

(c) Calculate the number of atoms per unit cell in simple cubic (SC), body centred cubic (BCC) and face centred cubic (FCC). 2

(d) Calculate the angle at which first order reflection and second order reflection will occur in X-ray spectrometer when X-rays of wavelength 1.54Å are diffracted by the atom of a crystal, given that the interplaner distance is 4.04 Å. 2

(e) In the phase diagram of water system, explain i) a bivariant system, ii) an univariant system. 2

(f) Draw the potential energy diagram for the various conformations of n-butane. 2

(g) Write short note on Aldol condensation. 2

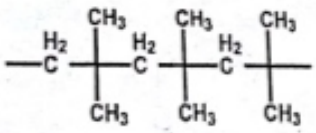
Q.2 Attempt any two of the following.

(a) Differentiate between thermoplastics and thermosets. 2
Write the difference between addition polymer and condensation polymer with example. 5
216g of 1, 3-butadiene is copolymerized with 104g of styrene. Determine the molecular formula of the copolymer?

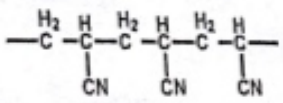
(b) Write short note on the following 5
a) PMMA b) Atactic polymer c) Isotactic polymer
d) Vulcanization of natural rubber

(c) Identify the repeating unit in the following structure and state the name of the monomer. 5

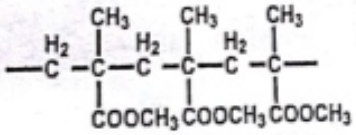
a)



b)



c)



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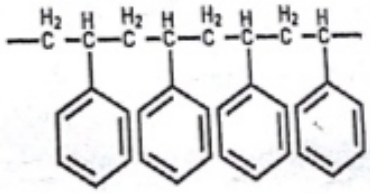
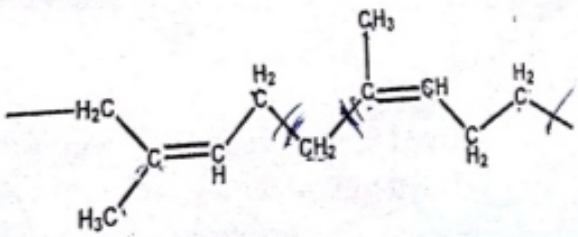


e)



Q. 3 Attempt any two of the following.

(a) Write notes on.
i) Free radical polymerization ii) Nylon-6 iii) Nylon-6, 10 5

(b) What is meant by calorific value of a fuel? What is difference between gross calorific value and net calorific value? 5
In an experiment in a bomb calorimeter, a solid fuel of 0.90g is burnt. It is observed that increase of temperature is 10°C of 5000g of water. The fuel contains 10% of H. Calculate the gross calorific value and net calorific value (Equivalent weight of water = 1000g, Latent heat of steam = 587 cal/g).

(c) Give the structure of the following polymers.
a) SBR b) NBR c) Orlon d) Nylon-6,6 e) Polyurethane 5

4 Attempt any two of the following.

(a) Write the Lambert–Beer law of UV-vis spectroscopy. The solution of compound having concentration 0.0001g/l gave 0.2 absorbance value when measuring using 1.0cm cell. Calculate molar extinction coefficient. 5

(b) Define the terms chromophore, bathochromic shift, auxochrome, and hypsochromic shift in UV spectroscopy. Write the application of UV spectroscopy. 5

(c) What do you understand by hard and soft water? What are the permanent and temporary hardness? Write the constituents responsible for hardness in water. Explain the lime-soda process used for removing hardness in water. 5

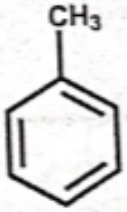
5 Attempt any two of the following.

(a) Describe the zeolite process for water softening. Explain the advantages and disadvantages of the zeolite and lime-soda processes for water softening. 5

(b) Write the application IR spectroscopy. Describe the various molecular vibrations in the technique. 5
Find the number of fundamental vibrations for the following molecules as under.
Monoatomic (Ne), Diatomic (HCl), triatomic linear molecule (CO_2) and triatomic non-linear (H_2O) molecules.

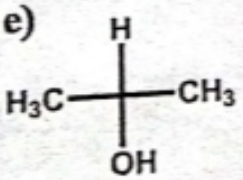
(c) Define chemical shift. Show the expected NMR signals and their splitting in the following compounds. 5

a) $H_3C-\overset{H_2}{C}-\overset{H_2}{C}-OH$

b) 

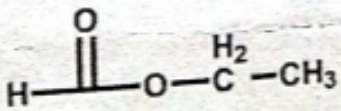
c) $H_3C-O-CH_3$

d) $H_2C=CHCl$

e) 

f) $H_3C-\overset{H_2}{C}-\overset{H_2}{C}-Cl$

g) $H_3C-\overset{H_2}{C}-OH$

h) 

i) $H_3C-O-\overset{H_2}{C}-CH_3$

j)