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**B.Tech. 2nd Semester End-Term Examination**

**ENGINEERING CHEMISTRY - II**

**(New Regulation)**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

Answer Q.No. 1 and any *four* from the rest.

1. Answer ALL questions : (10 × 1 = 10)
- (a) The crystal systems are classified into
- (i) 32 types                      (ii) 14 types
- (iii) 7 types                      (iv) 5 types
- (b) The porosity is an important property of refractory bricks, it increases
- (i) chemical stability
- (ii) resistance to corrosion
- (iii) thermal conductivity
- (iv) resistance to thermal spalling

[Turn over

- (c) Which of the following is a conducting polymer?
- (i) Polythene
  - (ii) Polytetra fluoroethylene
  - (iii) Poly Acetylene
  - (iv) Poly methyl methacrylate
- (d) The half life period of a second order reaction  $2A \rightarrow \text{product}$  is
- (i) directly proportional to initial concentration
  - (ii) independent of initial concentration
  - (iii) inversely proportional to initial concentration
  - (iv) directly proportional to the square of the initial concentration
- (e) The constituents of cement that causes initial setting is
- (i) dicalcium silicate
  - (ii) tricalcium aluminate
  - (iii) tetra calcium alumino ferrite
  - (iv) tricalcium silicate
- (f) Natural rubber is a high polymer of \_\_\_\_\_.
- (g) Doping germanium with phosphorus produces \_\_\_\_\_ type semi conductors
- (h) Liquid crystals are \_\_\_\_\_ like crystals.
- (i) The calorific values of \_\_\_\_\_ coal is the highest among different coals.
- (j) The catalyst that increases the speed of a reaction is called \_\_\_\_\_ catalyst.

2. (a) Distinguish between number average and weight average molecular weight of a polymer.
- (b) What are the monomers used for each of the following polymers? Give commercial application of each.
- Bakelite
  - Teflon
  - PVC
  - Polymethyl meth acrylate
- (c) Bring out differences between thermoplastic and thermo setting plastics. (4 + 8 + 3 = 15)
3. (a) Calculate the miller indices of the plane whose intercepts are  $(2a, 3b, 2c)$  and  $\left(\frac{1}{2}a, \frac{1}{2}b, \infty\right)$ .
- (b) Supposing the edge length of a cube to be 'a' calculate the interplanar distance  $d_{(hkl)}$  between the set of planes
- 200
  - 222.
- (c) Derive Bragg's equation for diffraction of x-rays by crystals.
- (d) In Bragg's reflection of X-rays a reflection was found at  $30^\circ$  with lattice plane spacing  $1.87\text{Å}$ . If this is a second order reflection calculate the wave length of X-rays. (2 + 3 + 5 + 5 = 15)
4. (a) Define order and molecularity of a reaction. Distinguish between the two.
- (b) Derive rate constant for a first order reaction. Calculate the half life period of first order reaction.

- (c) The specific rate constant of a first order reaction is  $4.0 \times 10^{-5} \text{ min}^{-1}$  at  $25^\circ\text{C}$  and  $8.0 \times 10^{-4} \text{ min}^{-1}$  at  $45^\circ\text{C}$ . Calculate the energy of activation for the reaction. (5 + 5 + 5 = 15)
5. (a) What are liquid crystals? How are they classified? Discuss the properties of cholesteric liquid crystals. State the application of liquid crystals in
- (i) Thermography
  - (ii) Radiation sensors.
- (b) What are the characteristics of a good fuel? (2 + 2 + 4 + 4 + 3 = 15)
6. (a) What is meant by calorific value of a fuel?
- (b) Calculate the gross and net calorific value of a sample of coal having composition  
 $e = 80\%$ ,  $H = 7\%$ ,  $O = 3\%$ ,  $N = 1.5\%$ ,  $S = 2.5\%$ .
- (c) Define octane number of fuel. How is it related to its chemical constituents?
- (d) How does reforming of petrol increase its octane number? (2 + 5 + 5 + 3 = 15)
7. (a) What are refractories? Explain refractoriness and thermal spalling.
- (b) Discuss in brief the manufacture of port land cement by wet process.
- (c) Based on band theory explain the classification of substances into conductors, semi conductors and insulators. (6 + 6 + 3 = 15)
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