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**Question Paper Code : 77103**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

First Semester

Civil Engineering

CY 6151 — ENGINEERING CHEMISTRY — I

(Common to all branches except Marine Engineering)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the functionality of (a) propylene (b) Phenol towards polymerisation?
2. Define polydispersity index.
3. What happens to entropy of the following?
  - (a) A gaseous nitrogen is converted to liquid nitrogen.
  - (b) Solid iodine is sublimed to its vapour.
4. Calculate the entropy change involved in converting one mole of water at 373 K to its vapour at the same temperature. (Molar heat of vaporisation of water = 40.66 kJ k<sup>-1</sup> mole<sup>-1</sup>).
5. State Stark–Einstein law of photochemistry.
6. Mention the possible electronic transitions that can occur in organic molecules.
7. What do you understand by reduced phase rule?
8. What is hardening of steel? Mention its purpose.
9. Mention the difference between a nanorod and a nanowire.
10. Write any two applications of carbon nanotubes.



PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the mechanism of polymerization through free radicals. (8)  
(ii) What are the different types of molecular mass of polymers? Explain each type with significance. (8)

Or

- (b) (i) What are the differences between thermoplastic polymers and thermosetting polymers? (8)  
(ii) Explain the following :  
(1) Emulsion polymerisation. (4)  
(2) Solution polymerisation. (4)
12. (a) (i) Derive Gibb's – Helmholtz equations. (8)  
(ii) Define free energy. Explain its significance. (4)  
(iii) At what temperature will water boil when the atmospheric pressure is 528 mm Hg? Latent heat of vaporisation of water is 545.5 cal/g. (4)

Or

- (b) (i) Derive Maxwells relations (any four). (8)  
(ii) Derive the relation,  $\Delta G^\circ = -RT \ln K_{eq}$ . Calculate the standard entropy change for the reaction,  $A \rightleftharpoons B$ , if the value of  $\Delta H^\circ = 28.4 \text{ kJ/mol}$  and equilibrium constant is  $1.8 \times 10^{-7}$  at 298 K. (8)
13. (a) (i) Explain the instrumentation of a uv-visible spectrophotometer. (8)  
(ii) What is quantum efficiency? How is it determined? (8)

Or

- (b) (i) Explain the following :  
(1) Flourescence. (4)  
(2) Phosphorescence. (4)  
(ii) State Lambert - Beer Law. Derive its mathematical form. What are its limitations? (2 + 4 + 2)

14. (a) (i) Apply phase rule to water system and explain the characteristics. (8)  
(ii) What are the purposes of alloy making? Illustrate with suitable examples. (4 + 4)

Or

- (b) (i) Discuss the phase diagram of silver-lead system and explain the eutectic mixture, characteristics and uses. (8)  
(ii) Give the composition and applications (two each) of the following alloys : (4 × 2)  
(1) Brass  
(2) Bronze  
(3) Nichrome  
(4) Stainless steel.

15. (a) (i) What are the properties that change from its bulk form to nano size form? Explain each with example. (8)  
(ii) Explain chemical vapour deposition technique of synthesis of nano particles. (8)

Or

- (b) (i) Discuss the solvothermal and laser ablation methods of synthesis of nano materials. (8)  
(ii) Compare the properties of molecules, nanoparticles and bulk materials. (8)

