Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.TECH(LT)/SEM-2/MLT-201/2012

2012

COLLOID AND SURFACE CHEMISTRY

Time Allotted : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words
as far as practicable.

Answer any *five* questions.   5 × 14 = 70

1. a) Colloids bridge the gap between true solutions and physical mixtures. Justify.   4

    b) Discuss the kinetic, optical and electrical properties of Colloids.   10

2. a) Discuss how HLB can be used to determine the stability of an Emulsion.   4

    b) Calculate the required HLB for the following O/W Emulsions :

    Stearyl alcohol (HLB 14) = 250 gms

    White Petroleum (HLB 12) = 250 gms

    Propylene Glycol (HLB 11·6) = 120 gms

    Emulsifier quantity sufficient.

    Preserved water quantity sufficient to produce 1000 gms.   10

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3. a) Differentiate between Helmholtz Free Energy and Gibbs Free Energy. 4

b) From first principle (i.e. First Law of Thermodynamics), derive an expression showing the relationship between Surface Tension and Free Energy. 10

4. a) Discuss the formation of meniscus in a capillary as a function of the Adhesive and Cohesive forces. 4

b) Ethanol has a surface tension of 22·4 mN/M and a contact angle on glass of 0°. Its density is 0·79 gm/cc. Calculate the rise of ethanol up a capillary of radius 10 mm. 10

5. a) How are Wetting, Contact Angle and Spreading interrelated ? Explain why dewetting is important in Surface Coverage. 4

b) Evaluate the Work of Adhesion of water on Four different solids on which equilibrium Contact Angle have been measured at 30 degree, 60 degree, 120 degree and 180 degree. Comment on your results.

10

6. a) Discuss the phenomenon of Self Nucleation. 4

b) Calculate the minimum size for a bubble of water vapour forming 10 cm beneath the surface of water at 375 degree Kelvin that should remain stable. At this temperature the density of water is 0·957 gm/cc. The surface tension is 59·5 mN/M and the vapour pressure is 108·8 kPa. 10
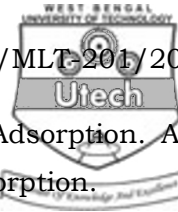
7. a) Differentiate between Absorption and Adsorption. Also differentiate between basic forms of Adsorption.   4

    b) Discuss the mathematical forms and applicability of the Different Adsorption Isotherms.   10

8. Write short notes on any *four* of the following :   4 × 3½

    a) Advancing and Receding Contact Angles

    b) Detergency

    c) Gold No.

    d) CMC

    e) Membrane Technology

    f) Generalized Form of Young's Equation.

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