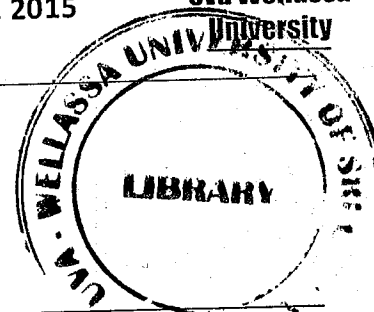


Uva Wellassa University of Sri Lanka  
Faculty of Science and Technology  
Department of Science and Technology  
300 Level First Semester Examination – Sep/Oct 2015  
SCT 331-3 Material Chemistry I



Uva Wellassa  
University



Instructions to candidates  
Duration: Three (03) hours  
Number of questions: Six (06)  
Answer All Questions  
Mark allocation: 100 mark

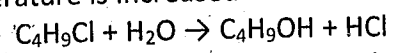
1.
  - a. Describe 'Collision cross-section' for two spherical molecules colliding with each other. Write an expression for collision cross-section in terms of the radii of two molecules being collided.
  - b. Describe the 'Collision Theory' and the 'Activated Complex Theory' stating assumptions made, advantages and disadvantages in each. (15 mark)
  
2.
  - a. Calculate the total electron charge required to plate 10.0 g of Cu onto a metal electrode from a  $\text{CuSO}_4$  solution.
  - b. What is the current needed to deposit 2.00 g of Cr (s) from a solution of  $\text{Cr}(\text{NO}_3)_3$  in 1.00 minute? (15 mark)
  
3.
  - a. Write the anode, cathode and the overall reactions for the Hydrogen-Oxygen Fuel Cell
  - b. The Standard Free Energy for this reaction is -228.6 kJ/mol. Calculate the standard cell potential. ( $\text{Cu} = 63.5 \text{ g/mol}$ ,  $\text{Cr} = 52.0 \text{ g/mol}$ ,  $F = 96,485 \text{ C/mol}$ ) (20 mark)
  
4.
  - a. Describe how to separate a mixture of two volatile components into its pure components by using a temperature-composition diagram.
  - b. Defining all the terms, write the Debye-Hückel equation used to calculate the activity coefficient of an electrolyte. (15 mark)

5. Define following terms related to phase diagrams.

- a. Eutectic
- b. Eutectoid
- c. Peritectic

(15 mark)

6. The rate constant for the substitution reaction increases by a factor of 10.6 when the temperature is increased from 298 K to 308 K.



a. Write the Arrhenius equation and define all terms.

b. Calculate the activation energy of the reaction.

(20 mark)