University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2011
Program: B. Sc. Engineering (Civil)

Course Title: Chemistry   Course Code: CHEM 111
Time: 3 Hours   Full Marks: 150

[THIS QUESTION IS DIVIDED INTO TWO SECTIONS, SECTION A AND SECTION B.   ANSWER 3 QUESTIONS FROM EACH SECTION]

Section-A
There are FOUR questions in this section. Answer any **THREE**.

1. (a) What is internal energy ($\dot{E}$)?   5
       Show graphically how internal energy changes endothermically and
       exothermically in the chemical reactions.
   (b) Explain the term enthalpy (H).   10
       Derive thermodynamically the Kirchhoff's equation.
   (c) What is heat of combustion?   10
       Draw and describe a bomb calorimeter used for the determination of heat
       change in the combustion of octane fuel.

2. (a) What is associated liquid?   5
       Draw and explain the associated structure of water.
   (b) What is water of crystallization?   10
       Explain that NH_3 dissolves in water very easily whereas CH_4 do not.
       Discuss the chemical action of water with metal carbides.
   (c) Differentiate between hard water and heavy water.   10
       Discuss the preparation and exchange reactions of heavy water.

3. (a) A solution is not always be said a homogeneous system – explain.   5
       How does a solution conflict with the concept of a compound?
   (b) What is super saturated solution (SSS)?   10
       Describe the preparation and important characteristics of SSS.
   (c) What is solubility curve? Draw and explain different types of solubility curves.   10
       Show that solubility of a solid in liquid is constant at a constant temperature.

4. (a) What is reaction rate? Distinguish between instantaneous and average rates.   5
   (b) Define order and molecularity. How molecularity differs from order?   10
       Classify molecularity based on chemical reactions.
   (c) State rate law and half-life ($t_{1/2}$) of a reaction. Derive expressions for integrated   10
       rate law and $t_{1/2}$ of a first order reaction.
       For a certain first order reaction, $t_{1/2}$ is 100s. How long will it take for the reaction
       to be completed 75% ?