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University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2012
Program: B. Sc. Engineering (Civil)

Course Title: Chemistry
Time: 3 Hours

Course Code: CHEM 111
Full Marks: 150

Section-A

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

1. (a) Define proton number (Z) and mass number (A). Establish a relation between Z and A. 5
- (b) What is meant by solar system atom model? Describe the Rutherford's gold foil experiment. 10
- (c) What is Balmer spectra of hydrogen? Explain how the atomic spectra of hydrogen results on irradiation it with UV, visible and IR light. 10
2. (a) State ionic bond. Explain how ionic bonds are formed in:
i) $MgCl_2$ ii) K_2S and iii) $CaCl_2$ 5
- (b) Define 'single bond', 'double bond' and 'triple bond' with suitable example. Draw the molecular orbital of O_2^+ . 10
- (c) Discuss the valence bond theory of covalent bonding and show the formation of covalent bonds in:
i) H_2 , ii) HF , iii) F_2 , and iv) N_2 10
3. (a) Define mathematically the change in internal energy (ΔE) and enthalpy (ΔH). How ΔE and ΔH are related? How a solution differs from a suspension? 5
- (b) Deduce various forms of Kirchoff's equations and thus explain why heat of reaction vary with temperature. 10
- (c) What is Hess's law? Explain the law with a suitable example. Discuss heat of formation of C_2H_5OH which cannot be determined directly by experiment but can be found by applying Hess's law. 10
4. Write note on: 25
- i) Quantum numbers of orbital
- ii) Chemical bonding by hybridization.
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Section-B

There are FOUR questions in this section. Answer any THREE.

5. (a) Differentiate between hard water and heavy water. 5
Draw the associated structure of water.
- (b) What is meant by catalytic action of water? 10
Show the possible chemical reactions of water with basic oxides chlorides and carbides.
- (c) Discuss softening of water by i) calgon process ii) permutit process and iii) ion-exchange process. 10
6. (a) What is sol? How a sol can be distinguished from a true solution? 5
- (b) Describe the preparation of sol by peptization and Bredig's are methods. 10
- (c) How the sols are purified by i) dialysis ii) electro dialysis and iii) ultrafiltration methods 10
7. (a) What is wet corrosion? 5
How wet corrosion takes place in a battery?
- (b) Discuss the mechanistic aspects of dry corrosion by oxygen and hydrogen. 10
- (c) What is atmospheric corrosion? Explain how i) under water corrosion and ii) microbiological corrosion occurs. 10
8. Write note on: 25
- i) Tyndall effect and Brownian movement of colloids
- ii) Pitting and differential aeration corrosion
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