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B.Sc. Engg. CSE 2nd Semester

09 August 2018 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION — **SUMMER SEMESTER, 2017-2018**

DURATION: 1 Hour 30 Minutes — **FULL MARKS: 75**

Chem 4241: Chemistry

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

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1. a) Derive the integrated rate equation for a second order reaction $2A \rightarrow P$ and prove that the half life for a second order reaction. 7+3

   b) The data of a second order reaction is plotted $1/[A]_t$ against time and the plot is a straight line with a positive slope. If the intercept is $3 \times 10^{3} mol^{-1} lit$ and the slope is $2 \times 10^{-2} mol^{-1} lit.sec^{-1}$, calculate the initial concentration and half-life of the reaction. 8

   c) Discuss any two methods for the determination of order of a reaction. 7

2. a) Define and classify solution. Name the units of concentration and define Molarity (M) and Normality (N) with example. 2+2+5

   b) What is critical solution temperature (CST)? Draw and explain the CST diagram for the Phenol-water system. What is the application of this diagram? 2+6

   c) 20gm NaCl is dissolved in 100ml water. Find out the molarity(M) and molality(m) of the solution. The density of the solution = 1.06gm/cc. 8

3. a) Write Henry's law and show the effect of temperature and pressure on the dissolution of gases in liquid. 8

   b) Show through mathematical derivation that the solubility of solids in liquids is generally endothermic in nature and that the curve of solubility against temperature is exponential. 8

   c) Define osmosis, osmotic pressure and reverse osmosis. Mention their uses. State Vant Hoff laws of osmotic pressure and deduce an equation to establish the relationship between molecular weight of a solute and osmotic pressure. 9

4. a) Define energy of activation (Ea) and show its application through diagram. 6

   b) The relationship between temperature and the rate constant (k) is exponential. Prove this statement through derivation of an equation. Give application of this equation. 12

   c) Define vapour pressure above a liquid and also the boiling point of a liquid. What is the characteristic of an ideal solution? State Raoult's law. 7

B.Sc. Engg. / HD CSE 2nd Semester 25 August 2017 (Morning)

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DURATION: 1 Hour 30 Minutes FULL MARKS:75

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1. a) Explain the terms Order, Molecularity, Rate and Rate constant of a reaction with examples. 8
   b) Derive the integrated kinetic equation for a first order reaction A ⟶ P and prove that a first order reaction is never complete. 8+3
   c) The half-life period for a first order reaction is 69.3min at 27°C and 34.7min at 37°C. Find out the energy of activation (Ea) of the reaction. 6

2. a) What do you understand by 'equilibrium constant'? Derive relationship between Kp and Kc for a gaseous reaction at equilibrium. 10
   b) Show how the change of pressure and temperature affect a gaseous reaction according to LeChatelier principle with examples. 8
   c) At 60°C and total pressure of 1atm 1 mole $N_2O_4(g)$ is dissociated 50% into two moles $NO_2(g)$. Calculate the value of Kp and Kc for the reaction. 7

3. Write short notes on the followings: 5×5
   a) Effect of temperature on dissolution of gases in liquid.
   b) Activation Energy.
   c) Molarity (M) and Normality (N).
   d) Critical solution temperature (CST).
   e) Henry's law and it's application.

4. a) What are Colligative properties? Why are they so called? What is an ideal solution? 6
   b) Derive a relationship between lowering of vapour pressure of solvent and molecular weight of the dissolved non-electrolyte solute in the solvent 12
   c) The vapour pressure of ether at 25°C is 445mm of Hg. When 6.5gm of a solute "X" is dissolved in 50gm ether (MW=74), the vapour pressure of the solution becomes 410mm of Hg. What is the molecular weight (MW) of "X"? 7

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DURATION: 1 Hour 30 Minutes **FULL MARKS: 75**

Chem 4241: Chemistry

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Figures in the right margin indicate marks.

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a) Define and classify solutions. Name the units of concentration and define Molarity(M) and Normality(N) with examples. 2+2+5

b) What is critical solution temperature (CST)? Draw and explain the CST diagram for the phenol-water system. 3+7

c) 20gm of NaCl (MW=58.5) is dissolved in 100mL of water. Find the molarity(M) and molality(m) of the solution. The density of the solution is equal to 1.06gm/mL 6

a) What are the fundamental particles of an atom? Describe them in brief. 6

b) Discuss Bohr's theory of hydrogen atom. Derive an equation to find out the radius of orbits in a hydrogen atom. 4+8

c) Derive De Broglie's equation and explain the dual nature of electrons. 7

3. Write short notes on the followings: 5×5

a) Effect of temperature on dissolution of gases in liquid.

b) Quantum Number.

c) AUFBAU principle.

d) Rate Constant and Order of a reaction.

e) Sommerfeld's modification.

4. a) Derive a relationship between elevation of boiling point solvent and molecular weight of the dissolved non-electrolyte solute in the solvent 12

b) Explain why the boiling point of a liquid rises when a non-electrolyte solute is dissolved in it and the dissolution of solids in liquids is usually endothermic. 6

c) The vapour pressure of ether at 250C is 445mm of Hg. When 6.5gm of a solute "X" is dissolved in 50gm ether (MW=74) , the vapour pressure of the solution becomes 410mm of Hg. What is the molecular weight(MW) of "X" ? 7