

The University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2013
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) Explain the terms C_p and C_v . (3+5+5=13)
Establish the relation between C_p and C_v .
Three moles of an ideal gas ($C_v = 5 \text{ cal deg}^{-1} \cdot \text{mol}^{-1}$) at 10.0 atm and 0°C are converted to 2.0 atm at 50°C . Find ΔE and ΔH for the change. ($R = 2 \text{ cal} \cdot \text{mol}^{-1} \cdot \text{deg}^{-1}$)
- b) What is meant by "bond energy"? (4+4+4=12)
Explain "thermo chemical equation" with suitable examples.
Given that energies for H-H, O=O and O-H bonds are 104, 118 and $111 \text{ kcal mol}^{-1}$, respectively. Calculate the heat of reaction of the following reaction:
 $\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$
2. a) What is reaction rate? (3+3+7=13)
How particle size of a solid reactant effects the reaction rate?
Discuss instantaneous, average and initial rates.
- b) Differentiate between 'order' and 'molecularity'. (5+4+3=12)
Why high molecularity is rate?
How molecularity of the complex reaction: $2 \text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$ can be determined?
3. a) Discuss that 'chemical equilibrium' is a state of a reversible system. (7+6=13)
Derive mathematically the "law of mass action".
- b) What are K_p , K_c and K_x ? How are they related? (3+5+4=12)
At 100°C , PCl_5 dissociates to 35%. If total pressure is 1.5 atm, find K_p and K_c .
4. Write note on: (12½ x 2 = 25)
a) Bomb calorimeter
b) Half-lives of reactions

Section-B

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

5. a) What is D_2O ? (2+5+6=13)

Compare the physical properties of D_2O and H_2O .

Draw the associated structure, Lewis structure and tetrahedral geometry of H_2O molecule.

- b) Explain the chemical value of the solvent property of water : (6+6=12)
i) For the reaction with $NaCl(s)$ and $NaCl(aq)$
ii) For the dissolution of $C_{12}H_{22}O_{11}$ and AgF
6. a) Sketch a physical view for a heterogeneous solution of a solid in solid. (2+6+5=13)
Distinguish between the physical solution, chemical solution and suspension.
Discuss the effect of external stresses on the dynamic equilibrium of a saturated solution.
- b) What meant by super-saturation ? (2+4+6=12)
How it can be obtained for a solid in water ?
Explain the effects of temperature and pressure on the solubility of a solid in liquid.
7. a) Draw and explain a 'colloidal system'. (3+10=13)
How lyophobic colloids can be prepared by the 'colloidal mill' and 'peptization' methods?
- b) Discuss the following properties of the colloids: (6+6=12)
i) Tyndall effect
ii) Brownian movement
8. a) Write note on : (12½ x 2 = 25)
i) Softening of water
ii) Formation of charged colloids
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