Pwani University College

A Constituent College of Kenyatta University

UNIVERSITY EXAMINATIONS 2010/2011 ACADEMIC YEAR

LEVEL II SESSION II EXAMINATIONS FOR THEDEGREE OF BACHELOR OF EDUCATION SCIENCE,

SCH 201: CHEMICAL THERMODYNAMICS

END SESION II TIME: 3HRS

DAY/TIME: TUESDAY 7.00AM – 10.00AM DATE: 02.08.10 (TF1)

PART A: ANSWER ALL THE QUESTION

Constants: R = 8.315 J/K mole^{-1}, h = 6.626 x 10^{-34}Js, K_B = 1.381 x 10^{-23}J K^{-1}

1. (a) State the first law of thermodynamics and derive an equation summarises it and leading to the enthalpy equation (4marks)

(b) Differentiate between the second law and third law of thermodynamics (6 marks)

2. Show using equations the difference between enthalpy at constant pressure and the enthalpy at constant volume for one mole of an ideal gas (4marks)

3. The volume of a sample of an ideal monoatomic gas at 0^{o}C is 54.83L. To what volume must the gas be compressed adiabatically so to attain a temp of 30 ^{o}C? (4marks)

5. The enthalpy of fusion of monoclinic sulphur is 1.26 KJ/mole. Determine the entropy change when two moles of monoclinic sulphur melts at 392K (2 marks)

6. A heat engine operated with mercury vapour between 350^{o}C and 50^{o}C, what is the amount of heat that must be withdrawn from the reservoir to produce 500J of work? (4 marks)

8. Differentiate between Helmholtz Free Energy and the Gibbs free energy (4 marks)

9. Calculate the change in free energy when 11.21 dm^3 of a perfect gas at 0^oC and 1 atm pressure expands isothermally until its pressure is 0.5atm (4 marks)

10. State five applications of Hess's Law (5 marks)

11. Calculate the change in Gibbs function when dinitrogen tetra oxide gas forms nitrogen dioxide gas at STP. The change in entropy is 175.8 $Jk^{-1}mole^{-1}$ and change in enthalpy is 57.2 KJ $mole^{-1}$ (3 marks)

PART B: Answer any **TWO** questions

1. (a) Differentiate between energy, work and heat (6 marks)

(b) State the difference between heat capacity and specific heat capacity (4 marks)

(c) Derive the formula for heat capacities from the kinetic molecular theory (5 marks)

2. (a) Define Entropy (4 marks)

(b) Differentiate between a system and a surrounding (4 marks)

(c) 10 g of ice at 273 K is added to 20 g of water at 363 K in an insulated flask. The heat of fusion of ice is 6000J/mole and the specific heat capacity of water is 4.2J/k.g. Determine the entropy change per mole (4 marks)

(d) Calculate the entropy change per mole when helium at 1atm pressure and 27 ^oC is heated to 250 ^oC (3 marks)

3. (a) 4. Define the Hess's law (4 marks)

(b) Determine the enthalpy of formation of liquid ethanol at 398K from its elements given that the molar enthalpies of combustion of liquid of liquid ethanol, crystalline carbon and hydrogen gas are -393.13 and -285.5 KJ respectively at 298K. (6 marks)

(c) State five different types of heat of reactions (5 marks)