LIZARDI BHI 2008-09	**Topics:**	**Marks:**
Batxilergoko 2. maila	Thermochemistry Kinetics Equilibrium	
1. term exam		
2008 – XII - 16		
NAME:		

Exercise #1

When 22 grams of ethane are burned the energy released is 1100 kJ.

a) Determine
- the combustion enthalpy of ethane
- the formation enthalpy of ethane

b) Determine the formation enthalpy of ethene

c) Determine whether the hydrogenation process of ethene is endothermic or exothermic. The process is:

$$C_2H_4\ (g) + H_2\ (g) \rightarrow C_2H_6\ (g)$$

Atomic weights: H=1; C=12

Enthalpies of formation of carbon dioxide and water are -394 kJ/mol and –286 kJ/mol, respectively

The combustion enthalpy of ethene is –1386 kJ/mol

Exercise #2

Graphite (C) reacts with water vapor to yield carbon monoxide and hydrogen, both in gas phase. Write the corresponding chemical equation and determine:

a) ΔG^0 for this reaction at 25 ºC and whether the reaction is spontaneous or not.

b) Provided that ΔH and ΔS do not change with temperature, study the spontaneity for this reaction (the range of temperatures in which it is spontaneous, building a ΔG - T graphic)

c) If the activation energy is Ea=220 kJ/mol, draw the corresponding enthalpy diagram. What is the meaning of activation energy?

Data	C	H_2O	CO	H_2
ΔH_f^0 (kJ/mol)	0	-241.82	-110.52	0
S^0 (J/mol.K)	5.74	188.82	197.67	130.68

Exercise #3

A 10 L-vessel is charged 2.5 mol of PCl_5 and heated to 270 °C. Due to its dissociation, the pressure increases to 15.68 atm. The reaction is exothermic. Determine:

a) the value of Kc
b) the composition (# of moles) at equilibrium
c) apply Le Chatelier principle to establish a relationship between the changes in pressure and temperature and the shifting of the reaction.

$$PCl_5\ (g) \rightleftarrows PCl_3\ (g) + Cl_2\ (g)$$

Exercise #4

A 1.5 L-container is charged with 0.08 mol of dinitrogen tetroxide and heated to 35 °C. The reactant dissociates partially, according to this process:

$$N_2O_4\ (g) \rightleftarrows 2\ NO_2\ (g)$$

When equilibrium is reached the pressure is 2.27 atm. Determine:

a) the dissociation percent
b) Kp and Kc