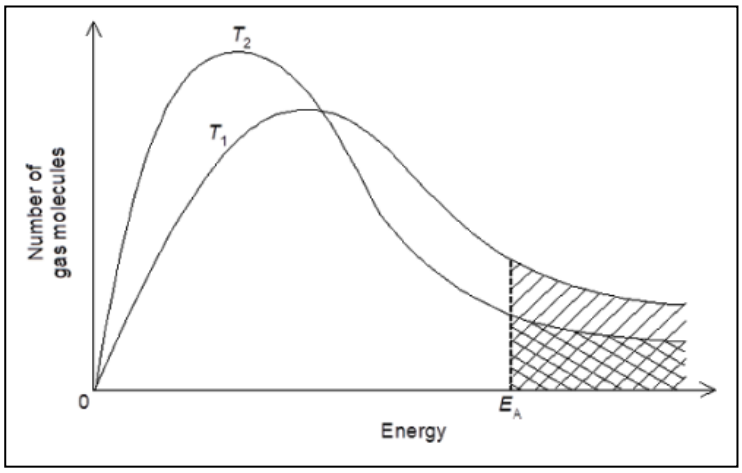
Friday Worksheet **Name: …….**

Chemical equilibrium worksheet 7

1) Consider the energy distribution graphs shown on the right. With reference to these graphs and the Particle theory, answer the following questions.



a) Explain why an increase in temperature increases the rate of a reaction.

More particles have the necessary activation energy to undergo fruitful collisions

b) Is the statement "All molecules have an increased kinetic energy at higher temperatures" true or false? Explain.No, not all particles have more kinetic energy at higher temperatures. This is shown by the energy distribution graph above. What they do have, however, is a greater average kinetic energy at higher temperatures.

c) Which of the following increase with higher temperature? Explain

i. Activation energy.

ii. Average kinetic energy of particles.

iii. Frequency of collisions.

Both ii. and iii. Since the average kinetic energy increases the number of collisions, be they fruitful or not will, also increase.

2) Consider the reaction below.

$2H_2(g) + O_2(g) \Rightarrow 2H_2O(g)$ $\Delta H = ?$

3.50 grams of hydrogen gas and 40.0 grams of oxygen gas were mixed and ignited. The energy released was captured and used to heat 2.300 kilograms of water at 25.0°C to a final temperature of 69.1°C.

a) Assuming no energy is lost, calculate the ΔH of the reaction above.

Step 1 Find the mol of H_2 and O_2

⇨ Mol of H_2 = 3.50 / 2.00 =1.75, mol of O_2 = 40.0 /32.0 = 1.25

Step 2 Find the limiting reactant. In this case it is hydrogen.

Step 3 Find the total Energy released

⇨ E = 4.18 j/g/C X 2,300 X (69.1 -25.0) = 424 kJ

Step 4 Find the energy per mol of hydrogen

=> 424/1.75 = 242 kJ/mol

Step 5 Find the ΔH

=> Since two mol of H_2 react in the equation the we must multiply 242 kJ/mol by 2

=> ΔH = -484 kJ/mol (Remember it is per mol of the equation)

b) Given the following bond energies **H-H**, 436kJ/mol. **O=O**, 499 kJ/mol and O-H, 463 kJ/mol, draw an energy profile diagram on the set of axes on the right.

Clearly label the following.

- activation energy

Since according to the equation there are two H-H and one O=O bond to break the activation energy must

= 2 X 436 + 499 = 1371 kj/mol

- ΔH = -484 kJ/mol

- activation energy of the backward reaction.

$2H_2O(g) \Rightarrow 2H_2(g) + O_2(g)$