Friday Worksheet   **Name: ……………….**

Heat of reaction worksheet 5

1) The decomposition of hydrogen peroxide is represented by the following equation.
$2H_2O_2(aq) => 2H_2O(l) + O_2(g)$ $\Delta H = -196.1$ kJ mol^{-1}
a. The activation energy for the reaction is 75 kJ/mol in the absence of a catalyst. Catalase, which is an enzyme found in the liver, lowers the activation energy to 8 kJ/mol, which significantly increases the rate at which hydrogen peroxide is broken down at body temperature. On the grid provided below, draw a labelled energy profile diagram for the uncatalysed and catalysed reactions
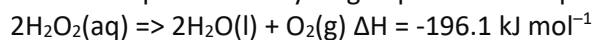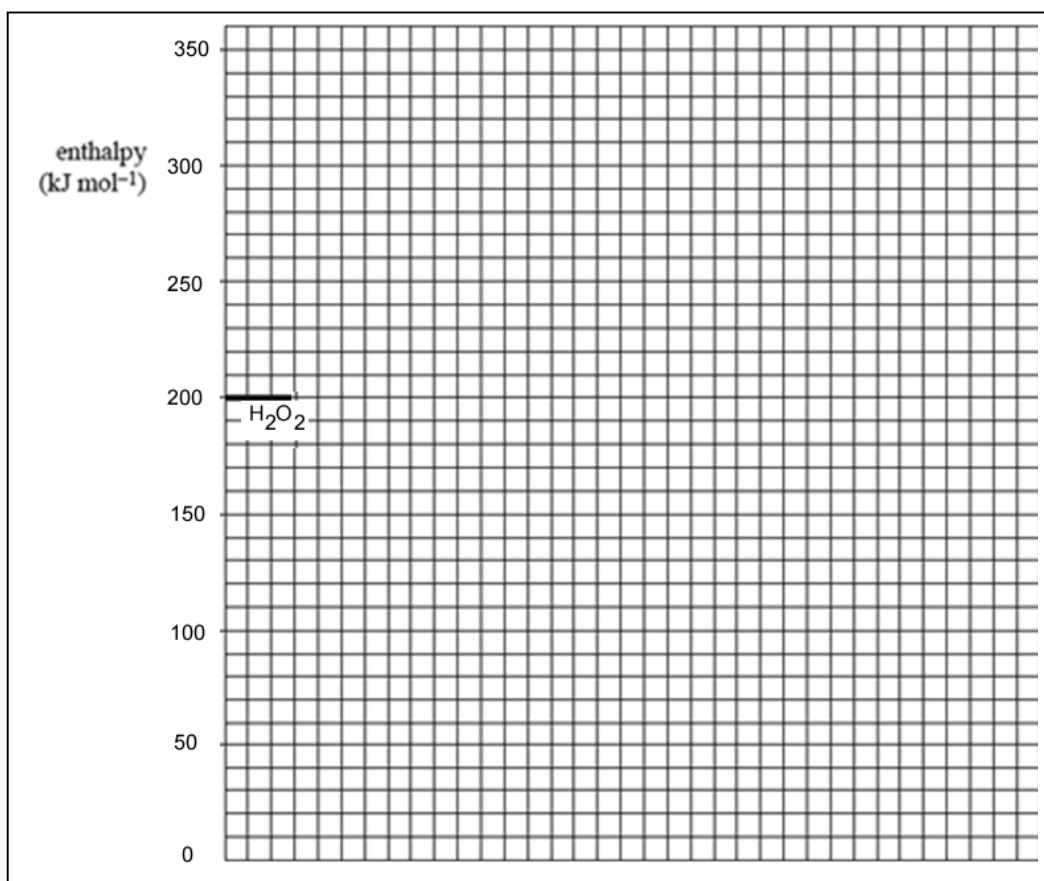
b. When a platinum metal catalyst is used the activation energy drops to about 49 kJ/mol. Explain, using your knowledge of the relationship between kinetic energy and temperature, whether the reaction rate using the platinum catalyst will be greater than the enzyme catalysed reaction.

c. The following two statements, represent changes to a gaseous system associated with an increase in temperature.

i. At a higher temperature, particles move faster and the reactant particles collide more frequently.

ii. At a higher temperature, more particles have energy greater than the activation energy.

Which alternative below best explains why the observed reaction rate is greater at higher temperatures? Explain

    1) i only

    2) i and ii equally.

    3) ii only

    4) i and to a lesser extent ii.

2) Consider the following two reactions

    i. $N_2(g) + 2O_2(g) => 2NO_2(g)$ $\Delta H = +68$ kJ mol^{-1}

    ii. $N_2(g) + 2O_2(g) => N_2O_4(g)$ $\Delta H = +10$ kJ mol^{-1}

If the activation energy for the following reaction ½ $N_2O_4(g) => NO_2$ (g) is 53.7 kJ/mol
What is the activation energy for the reverse reaction?