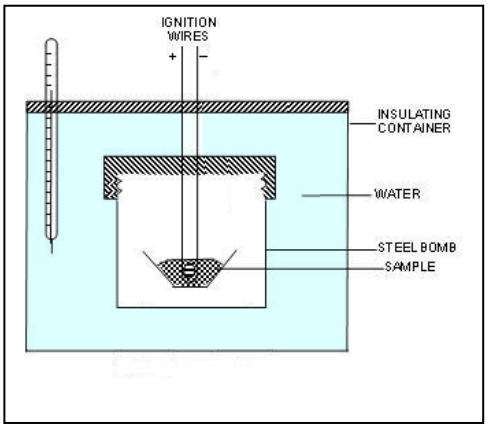
Friday Worksheet **Name: …….**

Enthalpy worksheet 6

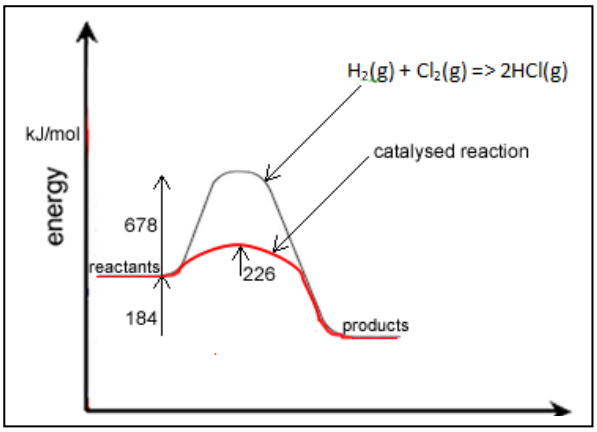
1) Students were investigating energy transformations in redox reactions. This involved adding a known mass of chlorine gas to excess hydrogen gas in a bomb calorimeter and then measuring the temperature change of 150.0 mL of water.



Mass of chlorine gas used	7.10g
Initial temperature of the water	20.0 °C
Temperature of the water after the reaction's completion	49.4 °C

(a) Using the information above and assuming no energy loss from the system, calculate the ΔH of the equation below.

$H_2(g) + Cl_2(g) \Rightarrow 2HCl(g)$ ΔH = ? kJ/mol



Energy = 4.18 J/g/°C X mass X ΔT
=> Energy = 4.18 J/g/°C X 150.0 X (49.4 – 20.0)
=> Energy = 18.43kJ
Mol of Cl_2 = 7.10 / 71.0 = 0.100 mol
=> Energy (kJ/mol) = 18.43 / 0.100 = 184.3 kJ/mol
=> ΔH = -184 kJ/mol

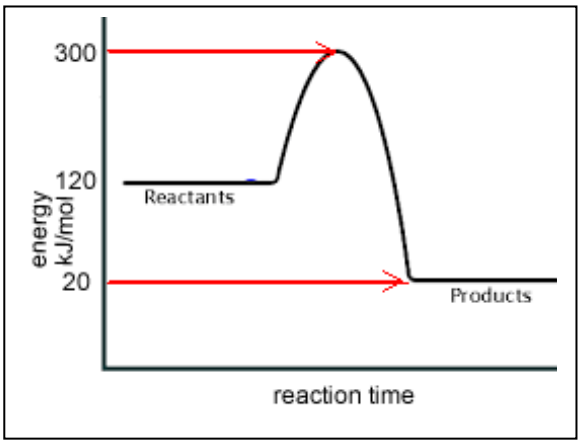
b) Given that the energies needed to break the bonds of H-H is 436 kJ/mol and Cl-Cl is 242 kJ/mol draw an energy profile for the reaction.

c) On the same set of axes draw the energy profile when a catalyst is used that lowers the activation energy by two thirds.

d) What is the activation energy for the catalysed reaction $2HCl(g) \Rightarrow H_2(g) + Cl_2(g)$
410 kJ/mol

e) Consider the energy profile shown on the right. It represents the reaction given by the equation below.

2a(aq) + B(aq) => 2AB (aq)



i. What is the energy given out during bond formation

280 kJ/mol

ii. What is the energy absorbed during bond breaking

180 kJ/mol

iii. What is the ΔH of the reaction.

- 100 kJ/mol

iv. On the same set of axes draw the energy profile of the reaction given by the equation a(aq) + ½ B(aq) => AB (aq)