IB Chemistry HL Notes

Energetics

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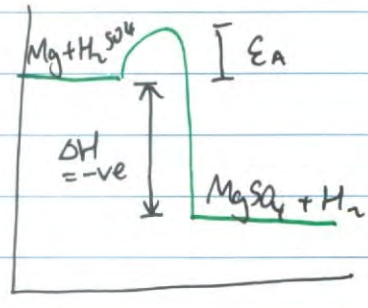
ENERGETICS

- The study of the changes of energy in a chemical system
- If a chemical system undergoes a chemical reaction, there is a chemical energy change.
- Sometimes physical change also induces energy change.
- Molecules in a system have:
  - kinetic energy : movement of intermolecular.
  - potential energy :

1. $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2 \quad \Delta H = -ve$

Exothermic reaction ; bonds made > bonds broken



2. $2Cl_2 + O_2 \rightarrow 2Cl_2O$

a) Chlorine ~~double~~ single bond $Cl-Cl$ broken : absorb E.
Oxygen double bond $O=O$ broken : absorb E.

b) 2 x $Cl-O$ made : evolves E.

c) Energy change when the reactants are converted to the products.

e) Endothermic

5.2 Calculation of Enthalpy Change

$Q = mc\Delta T$ $\quad Q = g \cdot Jg^{-1}K^{-1} \cdot K$

$= J = \frac{kJ}{10^{-3}}$

Q = heat energy

m = mass (g)

c = specific heat capacity $Jg^{-1}K^{-1}$

T = temp.

$50.0g\ H_2O$ from $20°C$ to $60°C$ $\quad (c_{H_2O} = 4.18\ Jg^{-1}K^{-1})$

so $Q = 50 \times 4.18 \times (60-20)$

$= 8360\ J$

$= 8.36\ kJ$ //

In calorimetry: Heat absorbed $= (mc\Delta T)_{liquid} + (mc\Delta T)_{calorimeter}$.

Note: major error in thermochemistry experiments is loss of heat to the surroundings. Improvement: minimize by increasing insulation: fitting insulated lid.

Exercise 5.2

1. $Q = 10 \cdot 440 \cdot 20 = 88000\ J = 88\ kJ$
2. ~~$Q = 50 \cdot 800 \cdot \Delta T$ $\quad 800 = 50 \cdot 0.4 \cdot \Delta T$ $\quad so\ \Delta T = \frac{8000}{2000} = \frac{8}{20} = \frac{4}{100} = 0.04$~~
2. $800 = 50 \cdot 0.4 \cdot \Delta T$ $\quad so\ \Delta T = 40°C$
3. $2C_2H_5OH + O_2 \rightarrow 4CH_4 + 3H_2O$