Unit 3: Chemical Reactions

What is a chemical change?

- An event that creates a new substance from the rearrangement of particles of a previous substance.

What are some clues that a chemical change has occurred?

- Light, heat, energy
- Colour change
- A solid appearing after 2 liquids have combined (precipitate)
- A gas is produced, bubbles, odour
- The "reaction" is very difficult to reverse

Theories about chemical reactions

Kinetic Molecular Theory (Particle Theory)

1. Molecules of gas (Particles) are in constant random motion.
   a. Solids – vibrational
   b. Liquids – rotational
   c. Gases – translational

2. A gas particles travels in continuous straight-line motion until they collide with another gas particle or with the wall of the container.

3. Collisions between molecules are perfectly elastic and molecules bounce back after collision. (that is, no energy is gained or lost during the collision).

4. There are no attractive or repulsive forces between the molecules.

5. The average kinetic energy (speed of molecules) of a collection of gas particles is dependent only upon the temperature of the gas.

Collision Theory

- Collision theory says that a chemical reaction can only occur between particles when they collide (hit each other).
- Particles may be atoms, ions or molecules.
- There is a minimum amount of energy which colliding particles need in order to react with each other.
- If the colliding particles have less than this minimum energy then they just bounce off each other and no reaction occurs.
- This minimum energy is called the activation energy.
- The faster the particles are going, the more energy they have.

- Fast moving particles are more likely to react when they collide.

- If you increase the number of collisions the better chance the reaction will occur

Changing the Rate of a Reaction.

- There are 5 ways to increase the rate of a chemical reaction

The rate of a chemical reaction may be increased by

1. Raising the temperature. (make particles move more quickly)
2. Increasing the concentration (in solution).
3. Increasing the pressure (in gases).
4. Increasing the surface area of a solid.
5. Use a catalyst.

- The opposite of 1, 2, 3 and 4 will decrease the rate of a reaction.

- A catalyst (strictly speaking) will change the rate of a reaction by lowering the activation energy.

- A catalyst can make a reaction go faster or slower. In practice a catalyst is mainly used to make a reaction go faster.

- A catalyst is never used up in a chemical reaction