Reaction Rates & Collision Theory

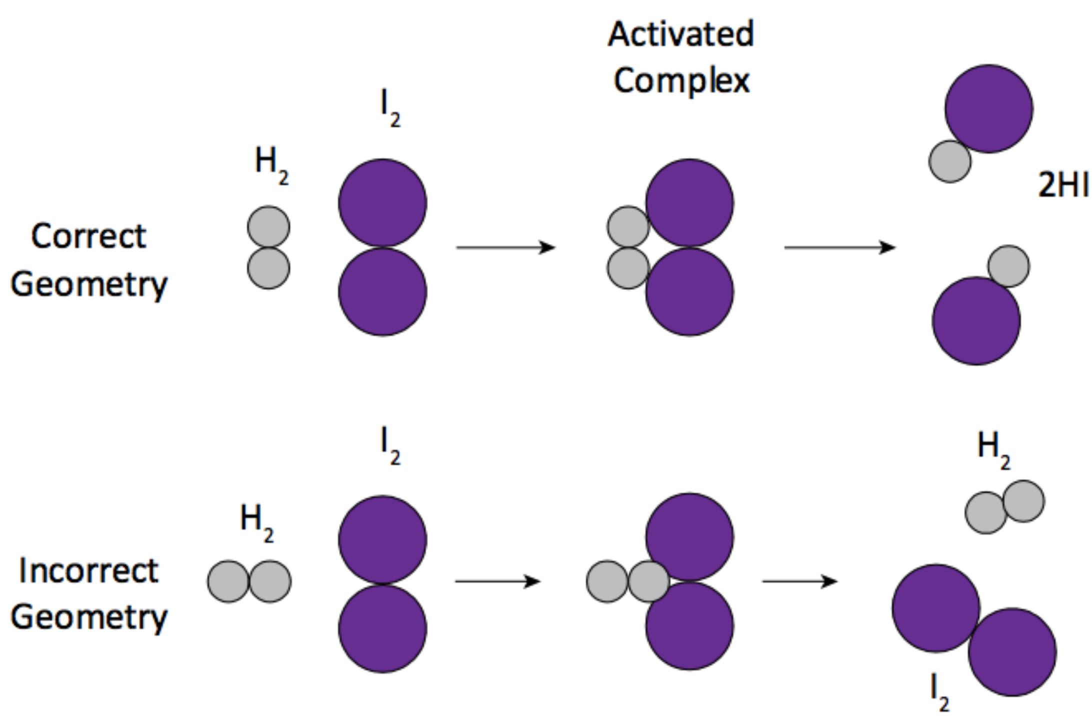
1. collision theory (KMT) = reactions depend on collisions between reactant molecules . . . however . . .

> not all collisions lead to a reaction
> effectiveness of collision determined by:

a) orientation / geometry

« colliding reactant molecules must be oriented in a favourable position to allow bonds to break and atoms to rearrange

Consider the reaction: $H_2 + I_2 \rightarrow 2HI$



b) Activation Energy

- for a reaction to occur, molecules need to collide with sufficient energy to break bonds so that atoms can rearrange and form new bonds
- **activation energy** = minimum amount of energy needed for a reaction to occur

2. Collision theory explains why increasing concentration and temperature increase reaction rate

a) **effect of increasing concentration**

- ↑ concentration of reactants (or partial pressure of gases) ↑ **frequency** of possible collisions and therefore ↑ the rate
- the % of collisions that are effective remains the same

b) effect of increasing temperature

- ↑ T ↑ **average kinetic energy** of the molecules
- 2 effects:
  - > molecules collide more often
  - > molecules collide with more energy
- ↑ T ↑ the % of effective collisions
- ↑ in rate primarily due to in ↑ E of collisions