5. Chemical energetics

Starter Quiz · 课前小测

A-Level Chemistry Name: _____ Score: _____

1. In an exothermic reaction:
   - ☐ heat is given out, the products are lower in energy, and ΔH is negative
   - ☐ heat is taken in and ΔH is positive
   - ☐ the products are higher in energy
   - ☐ no energy changes
2. Which statement is correct?
   - ☐ breaking bonds takes energy in (endothermic); making bonds gives energy out (exothermic)
   - ☐ breaking bonds gives energy out
   - ☐ making bonds takes energy in
   - ☐ neither breaking nor making changes energy
3. Hess's law states that the total enthalpy change for a reaction:
   - ☐ is the same no matter which route is taken from reactants to products
   - ☐ depends on the route taken
   - ☐ is always zero
   - ☐ is always positive
4. The activation energy is:
   - ☐ the least energy the particles need before they can react
   - ☐ the energy given out by the reaction
   - ☐ the difference between products and reactants
   - ☐ always zero
5. Using bond energies, ΔH of reaction equals:
   - ☐ sum of bonds broken − sum of bonds made
   - ☐ sum of bonds made − sum of bonds broken
   - ☐ bonds broken × bonds made
   - ☐ bonds made ÷ bonds broken
6. Hess's law works because energy is conserved.

   ☐ True ☐ False

7. A reaction that releases heat to the surroundings has a negative value of _____.

   _____
8. Breaking bonds is endothermic and making bonds is exothermic.

   ☐ True ☐ False
9. The law stating that enthalpy change is independent of the route taken is _____ law.

   _____
10. In an energy cycle, the direct route and the indirect route:
    - ☐ have the same total enthalpy change
    - ☐ have different enthalpy changes
    - ☐ cannot be compared
    - ☐ are always endothermic

A-Level Chemistry

1. **heat is given out, the products are lower in energy, and ΔH is negative**

   Exothermic reactions release heat; products sit below reactants, so ΔH is negative.

2. **breaking bonds takes energy in (endothermic); making bonds gives energy out (exothermic)**

   Energy is needed to break bonds and released when bonds form; ΔH is the difference.

3. **is the same no matter which route is taken from reactants to products**

   Because energy is conserved, the overall ΔH depends only on the start and end states, not the path.

4. **the least energy the particles need before they can react**

   Activation energy is the height of the "hill" — the minimum energy needed to start the reaction.

5. **sum of bonds broken − sum of bonds made**

   $\Delta H = \Sigma(\text{bonds broken}) - \Sigma(\text{bonds made})$; energy in to break minus energy out to make.

6. **True**

   Conservation of energy means the total enthalpy change is fixed by the start and end states alone.

7. **ΔH**

   Exothermic reactions have $\Delta H < 0$.

8. **True**

   ΔH = bonds broken − bonds made.

9. **Hess's**

   Enthalpy is a state function.

10. **have the same total enthalpy change**

    Both routes start and end at the same states, so their total ΔH must be equal (e.g. $\Delta Hr = \Delta H_1 + \Delta H_2$).