

Solutions

Each answer shows the steps, then the **result**.

2.1

- it speeds up the reaction; it is not used up / is regenerated

2.2

- homogeneous — in the same physical state as the reactants; heterogeneous — in a different state

3.1 B

- A catalyst provides a route with lower activation energy

3.2 C

- The enthalpy change is unchanged by a catalyst

3.3

(a)

- the catalyst lowers the activation energy; so a larger fraction of molecules now exceed E_A and can react — more effective collisions per second

(b)

- reactants higher than products (exothermic); two activation-energy humps, the catalysed one lower; same ΔH marked between reactants and products

3.4

- heterogeneous; the iron is a solid while the reactants (N_2 and H_2) are gases — a different physical state