

Solutions

2.1 Endothermic – the surroundings cool.

2.2 Activation energy.

2.3 Hand warmer / self-heating can.

3.1 Products drawn above reactants; a curved line from reactants over a hump; activation energy arrow from reactant level to the peak; overall energy change arrow from reactant level up to product level.

3.2 Overall change = $1000 - 850 = +150$ kJ/mol; positive – energy taken in; endothermic reaction.

3.3 Hand warmers use an exothermic reaction – oxidation of iron – releasing energy that warms the hands; limited because they eventually run out of reactants/oxygen and cannot be reused if disposable. Injury packs use an endothermic reaction – ammonium nitrate dissolving takes in energy, cooling the injury; limited because the cooling is temporary until the reaction finishes; reusable gel packs reverse the process by re-crystallising in hot water.