

Solutions

2.1 Surface area of a solid; concentration of solution; pressure of gas; temperature; (catalyst).

2.2 More particles of reactant in the same volume → more frequent collisions per second, so more successful collisions per second.

2.3 Temperature.

2.4 A substance that increases the rate of a reaction but is chemically unchanged at the end.

2.5 (C) The forward and reverse reactions occur at the same rate; the concentrations of reactants and products remain constant.

3.1 Temperature raises the energy of particles, so a greater fraction of collisions exceeds the activation energy; a catalyst provides an alternative pathway of lower activation energy without changing the particles' energy – and unlike temperature it does not shift an equilibrium position.

3.2 Doubled concentration: faster rate – twice as many acid particles in the same volume, so more frequent collisions. Crushed chips: faster rate – a larger exposed surface area, so more collisions at the solid surface per second.

3.3 (C) (a) Pressure up shifts equilibrium to the right – 3 moles of gas on the left, 2 on the right – so the SO_3 yield rises. (b) Temperature up shifts equilibrium in the endothermic direction – to the left – so the SO_3 yield falls.