GCSE and IGCSE Chemistry: Rates of Reaction Worksheet - Mark Scheme

Year 10-11 · GCSE (AQA 4.6) and Cambridge IGCSE 0620 topic 6 · Exam-style questions

Section A: Collision theory [14 marks]

1(a)	collide; activation energy	**2**
1(b)	temperature	**1**
1(c)	catalyst	**1**
2	More particles in the same volume (1) so more frequent collisions (1) so more successful collisions per second (1).	**3**
3	Powder has a larger surface area (1) so more particles exposed to the acid (1) giving more frequent collisions (1).	**3**
4	Particles have more kinetic energy and move faster (1) so collide more often (1). A greater proportion of collisions have energy greater than the activation energy (2).	**4**

Section B: Measuring rate [12 marks]

5	Measure volume of hydrogen with a gas syringe or upturned measuring cylinder; time for a cross to disappear; measure mass loss on a balance. Guidance: 1 mark each.	**3**
6(a)	Curve starting at origin (1), steepest at the start (1), then levelling off (1).	**3**
6(b)	Reactant particles are used up (1) so concentration decreases and there are fewer collisions (1).	**2**
6(c)	Steeper at the start (1); same final volume as the same mass of magnesium is used (1).	**2**
6(d)	60 ÷ 40 (1) = 1.5 cm^3/s (1)	**2**

Section C: Catalysts, energy and reversible reactions [13 marks]

7	It provides an alternative pathway (1) with a lower activation energy (1).	**2**
8	Any two: reduces energy costs / allows lower temperature; speeds up the reaction so more product in less time; can be reused.	**2**
9	Products lower than reactants (1); catalysed curve has a lower peak (1); activation energy arrow shown from reactants to the peak (1).	**3**
10	Moves to the right / more ammonia (1). There are fewer gas molecules on the right (2 compared with 4) (1) so the system opposes the increase in pressure (1). Guidance: Higher tier / Extended.	**3**
11	Lower temperature gives a higher yield (exothermic forward reaction) but the rate is too slow (1). Higher temperature gives a faster rate but a lower yield (1). 450 °C is a compromise between yield and rate (1). Guidance: Higher tier / Extended.	**3**

Total: 39 marks. Accept any scientifically correct alternative wording.