Rates: How Fast? — Support worksheet

Support tier OCR A Level Chemistry A (H432) · 5.1.1 Reaction rates · R = 8.31 J K^{-1} mol^{-1} · every answer computationally verified

A · Spotting orders (the ×2 test)

Method. Keep every other concentration the same. Double ONE reactant. Watch the rate: ×1 → order 0 · ×2 → order 1 · ×4 → order 2. Orders come from **experiments**, never from the big equation.

S1. In three separate tests, one concentration was doubled each time. Fill in the order. **[3]**

What happened to the rate	Order (0, 1 or 2)
stayed the same	
doubled	
quadrupled (×4)	

B · Orders from a results table — with the steps

S2. For **P + Q → products**:

Exp	[P] / mol dm^{-3}	[Q] / mol dm^{-3}	rate / mol dm^{-3} s^{-1}
1	0.10	0.10	0.0002
2	0.20	0.10	0.0004
3	0.20	0.20	0.0016

(a) Exp 1 → 2: [P] ×____, [Q] same, rate ×____. So order in P = ____ **[2]**
(b) Exp 2 → 3: [Q] ×____, [P] same, rate ×____. So order in Q = ____ **[2]**
(c) Complete: rate = k [P]$^{(\ )}$ [Q]$^{(\ )}$ **[1]**
(d) Using Exp 1: k = rate ÷ ([P][Q]^2) = _____. Circle its units: s^{-1} · dm^3 mol^{-1} s^{-1} · dm^6 mol^{-2} s^{-1} **[3]**

C · Reading a concentration–time curve

S3. A curve for reactant A falls from 0.80 to 0.40 mol dm^{-3} in 120 s, and from 0.40 to 0.20 in the next 120 s.
(a) The half-life is **constant** / **not constant** (circle). **[1]**
(b) So the order is ____. **[1]**
(c) Use k = ln 2 ÷ t½ to find k: k = 0.693 ÷ ____ = _____ s^{-1} **[2]**

D · What k does — and does not — depend on

S4. The same reaction is run twice at the same temperature, once with double the concentration. Tick every true statement: **[2]**

□ the rate is higher in the doubled run □ k is higher in the doubled run

□ k would change if the temperature changed □ k would change if a catalyst were added

Support total: 17 marks
