AQA A-Level Chemistry

Kinetics mark scheme · goes with “Kinetics” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Kinetics · 18 questions

Q1 · June 2023 · AS Paper 2 · Q19 · [1 mark]

Answer: **C**

line C

Q2 · June 2023 · Paper 2 · Q1 · [7 marks]

(a) Reduces loss of liquid droplets

Allow description of reduction of loss of liquid

[1 mark]

(b) M1 Tangent drawn at 2 mins

M2 Gradient of tangent = (0.50 +/- 0.05)

Conseq to their M1

M3 g min^{-1}

If convert mins to sec M2 = 7.80 x 10^{-3} (7.0 x 10^{-3} to 8.6 x 10^{-3}) and award M3 conseq

If M1 not awarded then allow average rate calculated M2 = 1.05

If M1 not awarded then allow average rate and if 120 sec used for time allow M2 =0.0175 and can score M3 for g s^{-1}

Penalise g/min

[3 marks]

(c) M1 Curve steeper at first & flattens at same point on y axis

M2 Cl is an electron withdrawing group or negative inductive effect

M3 Weakens the O-H bond / increase polarity of O-H bond

Allow opposite argument

M2 CH_3 electron donating or positive inductive effect

M3 Makes O-H bond stronger / decrease polarity of O-H bond

Also allow answers that discuss the carboxylate ion

M2 Cl Electron withdrawing group

M3 makes $RCOO^-$ less negative / delocalises the negative charge more / more stable ion (so $RCOO^-$ less likely to accept H^+)

[3 marks]

Q3 · June 2025 · AS Paper 2 · Q19 · [1 mark]

Answer: **B**

Q4 · June 2025 · AS Paper 2 · Q2 · [8 marks]

02.1

M1 provides alternative route/mechanism/pathway

M2 with lower activation energy

[2 marks]

02.2

M1 particles/molecules/reactants move faster / have greater (kinetic) energy

M2 more particles/molecules have (energy greater than/equal to) the activation energy

M3 successful collisions are more frequent

Ignore atoms

Ignore vibrations

Allow per unit time for frequency

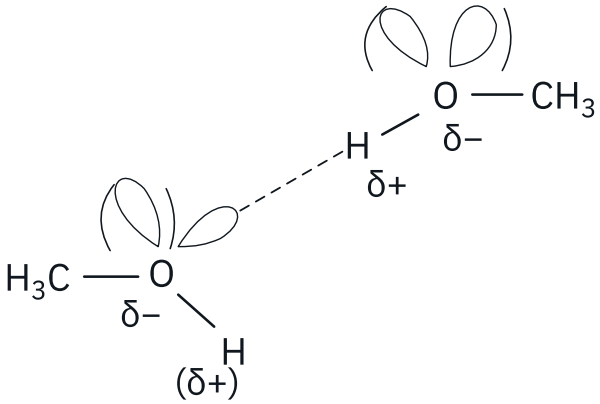
[3 marks]

02.3

M1 lone pairs and partial charges (O δ−, H δ+, :O δ−) on atoms involved in the hydrogen bond of one methanol molecule to a second methanol molecule

M2 dotted line between lone pair on O to correct H

M3 linear O–H· · · · ·O



Accept two dots or two crosses for lone pair

Ignore partial charges on atoms in CH_3 group

For incorrect compounds that do have hydrogen bonding (e.g. ethanol, water), M2/3 could score for a correct hydrogen bond

[3 marks]

Q5 · June 2025 · AS Paper 2 · Q20 · [1 mark]

Answer: **C**

Q6 · June 2025 · Paper 3 · Q9 · [1 mark]

Answer: **C**

The rate of the reverse reaction increases.

Q7 · June 2022 · AS Paper 2 · Q14 · [1 mark]

Answer: **B**

At a fixed temperature their average kinetic energy is constant

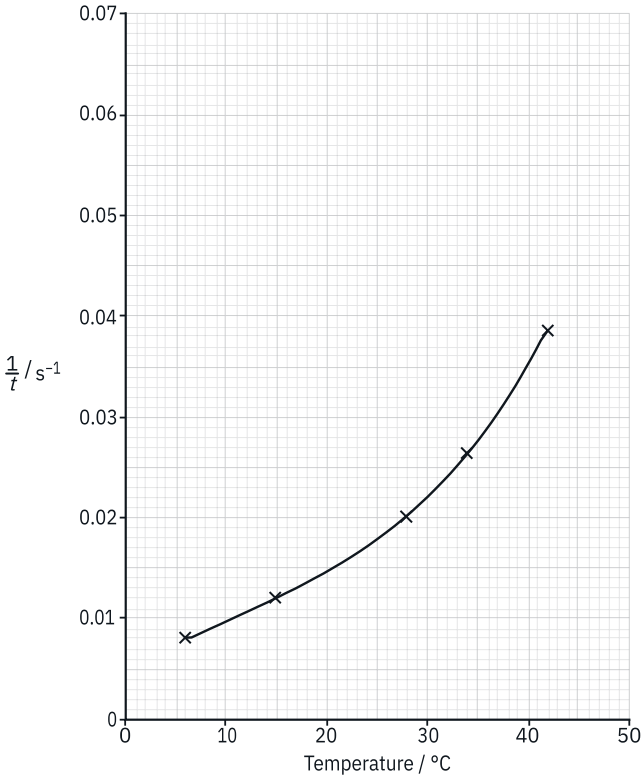
Q8 · June 2024 · AS Paper 2 · Q6 · [7 marks]

(a) Silver iodide or AgI

If name and formula given, both must be correct

[1 mark]

(b)



M1 All points plotted (within half a square)

M2 Best fit line - slight curve (for at least 6 to 42°C)

M2 Best-fit line should be no more than one square away from each point (but allowance made for incorrectly plotted points that mean the line may be further away from some points)

M3 Use $\frac{1}{\text{reading}}$ from extrapolated line (reading within half square)

$$\text{typical answer} = \frac{1}{0.054} = 18.5 \text{ s}$$

[3 marks]

(c) M1 Rate of reaction would be slower

Mark M1 and M2 independently (no ECF from M1 to M2)

M2 C-Br bond is stronger than C-I bond

M2 Ignore reference to bond polarity / electronegativities / bond length; allow C-Br bond has greater bond enthalpy/energy than C-I bond

M3 Line for 1-bromobutane will be below that for 1-iodobutane

M3 Ignore references to gradient, shallowness or distance between lines

M3 Allow ECF from faster in M1 to M3 with the line is above the original

[3 marks]

Q9 · June 2023 · Paper 3 · Q12 · [1 mark]

Answer: **C**

The proportion of successful collisions increases because the catalysed reaction has a lower activation energy.

Q10 · June 2023 · Paper 3 · Q25 · [1 mark]

Answer: **C**

They have no effect on the value of the equilibrium constant.

Q11 · June 2023 · Paper 3 · Q11 · [1 mark]

Answer: **D**

total number of particles present

Q12 · June 2024 · AS Paper 2 · Q10 · [1 mark]

Answer: **C**

The proportion of successful collisions increases because there is a decrease in the activation energy.

Q13 · June 2023 · AS Paper 2 · Q8 · [6 marks]

This question is marked using levels of response.

Level 3 5-6 marks	**All stages are covered and each stage is generally correct and virtually complete. (6 v 5) Answer is well structured, with no repetition or irrelevant points, and covers all aspects of the question. Accurate and clear expression of ideas with no errors in use of technical terms.**
Level 2 3-4 marks	**All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR two stages are covered and are generally correct and virtually complete**. (4 v 3) Answer has some structure and covers most aspects of the question. Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. If any, only minor errors in use of technical terms.
Level 1 1-2 marks	**Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR only one stage is covered but is generally correct and virtually complete**. (2 v 1) Answer includes statements which are presented in a logical order and / or linked.
Level 0 0 marks	Insufficient correct chemistry to gain a mark.

Stage 1 - Single distribution curve

1a suitable axis labels:

vertical: number/proportion/fraction of molecules/particles;

horizontal: (kinetic) energy

1b suitable shape (including on LHS must start reasonably close to 0,0 and RHS must not meet x-axis or rise upwards (on each curve drawn))

Stage 2 - Distribution curve at higher temperature

2a peak moves to the right and down

2b area under the curve (roughly) the same

2c lines cross once only

Stage 3 - Why a gas reacts faster at higher temperature

3a molecules have more energy

3b more molecules have the activation energy

3c higher proportion of collisions are successful / increases frequency of successful collisions

---

Q14 · June 2024 · Paper 3 · Q16 · [1 mark]

Answer: **C**

The proportion of successful collisions increases because there is a decrease in activation energy.

Q15 · June 2024 · Paper 3 · Q15 · [1 mark]

Answer: **A**

0.4

Q16 · June 2024 · Paper 3 · Q14 · [1 mark]

Answer: **C**

The total number of molecules in the reaction mixture

Q17 · November 2021 · AS Paper 2 · Q1 · [5 marks]

(a) Number of molecules (with a particular energy)

Ignore particles / atoms

Allow amount or fraction or proportion for number

[1 mark]

(b) There are no molecules with no energy

All molecules / particles have some energy

Allow particles / atoms

[1 mark]

(c) Most probable / common / modal energy

[1 mark]

(d) M1 Peak should be at same energy (i.e. in line with X)

M1 and M2 marked independently

[1 mark]

M2 Overall area should be half the original area; after diverging from the origin, the second line should not touch the first line

M2 area should be about half of the original

[1 mark]

Q18 · June 2022 · Paper 3 · Q9 · [1 mark]

Answer: **D**

There is an increase in the most probable energy of the molecules.

Source: AQA A-Level Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.

Stuck on any of these? One-to-one online A-Level chemistry tuition with Joe White, an experienced examiner: whiteboardchemistry.com/tuition