Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Kinetics

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Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) $S_2O_3^{2-} + 2\ H^+ \rightarrow SO_2 + S + H_2O$

Allow $S_2O_3^{2-} + 2H_3O+ \rightarrow SO_2 + S + 3H_2O$
Allow $½S_2O_3^{2-} + H^+ \rightarrow ½SO_2 + ½S + ½H_2O$
Allow $½S_2O_3^{2-} + H_3O + \rightarrow ½SO_2 + ½S + 1½H_2O$
Ignore state symbols
NOT multiples
NOT if any spectator ions included (unless crossed out)

1

(b) **M1** acid(ic) / acidity / produces H^+

M1 *Allow low(ers) pH*
Ignore toxic / soluble
Ignore sulfurous / sulfuric / H_2SO_4
Ignore rain
Ignore proton donor (unless qualified, e.g. reacts with water to form a proton donor)
NOT any other named acid

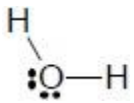
1

M2 $SO_2 + H_2O \rightarrow H_2SO_3 / H^+ + HSO_3^-$

M2 *Allow* $SO_2 + H_2O \rightarrow 2\ H^+ + SO_3^{2-}$
Allow $SO_2 + 2\ H_2O \rightarrow H_3O^+ + HSO_3^-$
Allow $SO_2 + 3\ H_2O \rightarrow 2\ H_3O^+ + SO_3^{2-}$
Allow multiples
Ignore state symbols

1

(c) **M1**



M1 *bent shape and 2 lone pairs on O*
Allow any suitable representation of lone pairs (e.g. dots, crosses, lobes with/without dots/crosses)

1

M2 104½°

M2 *Allow 104-105°*

1

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M3 lone pairs repel more (strongly) than bond(ing) pairs

M3 *Allow non-bonding pair for lone pair*

Allow covalent bond for bond(ing) pair

Allow shared pair for bond(ing) pair

Allow OH bond for bond(ing) pair

Allow bond for bond(ing) pair

NOT OH or O-H without the word bond for bond(ing) pair

1

M4 so bond angle reduced from/less than 109½° / tetrahedral

M4 *Allow bond angle reduced from 120° if bent with one lone pair in* ***M1***

Allow reduced from 109°

Allow reduced by 2.5° per lone pair or 5° if ***M2*** *correct*

1

(d)

This question is marked using levels of response. Refer to the Mark Scheme Instructions for examiners for guidance on how to mark this question	
Level 3 **5-6 marks**	**All stages are covered and the explanation of each stage is correct and virtually complete.** (6 v 5) Answer is well structured, with no repetition or irrelevant points. Accurate and clear expression of ideas with no errors in use of technical terms.
Level 2 **3-4 marks**	**All stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies OR two stages covered and the explanations are generally correct and virtually complete** (4 v 3) Answer has some structure. 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 the explanation of each stage may be incomplete or may contain inaccuracies OR only one stage is covered but the explanation is generally correct and virtually complete** (2 v 1) Answer includes statements which are presented in a logical order and/or linked.
0 marks	Insufficient correct Chemistry to warrant a mark

Indicative Chemistry content

Stage 1 Method
(1a) Idea of using disappearing cross or colorimetry
(1b) Puts acid or thiosulfate into container on/with cross or in colorimeter
(1c) Add second reactant and start timing

Stage 2 Measurements
(2a) Repeat at different temperatures (if number of temperatures stated, must be more than two)

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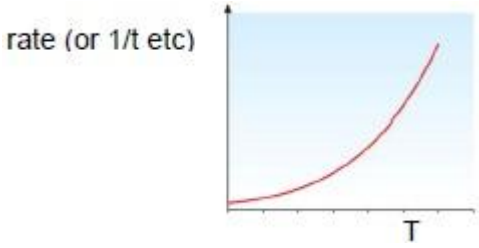
(2b) Record time, t, for cross to disappear / defined reading on colorimeter
(2c) Idea of ensuring other variables (cross, volumes, concentrations) kept constant (apart from T)

Stage 3 Use of Results
(3a) 1/t (or 1000/time, etc) is a measure of rate
(3b) plot of rate (or 1/t etc) (y-axis) against T (x-axis) (can come from labelled axes on sketch) (IGNORE T against rate)
(3c) sketch of plot as shown (Allow 3c if axes not labelled but NOT if incorrectly labelled)



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Q2.

(a) **M1** provides a different route / mechanism / pathway

Ignore reference to (frequency of) collisions, surface area or active sites

1

M2 with lower activation energy

Penalise reference to increasing energy of particles (CE = 0)

*Allow E_a / E_{act} or definition of activation energy in **M2***

1

(b) **M1** line 2 = steeper than original and finishes at same height

1

M2 line 3 = less steep than original and finishes at half the height

If two correct lines are drawn but neither labelled, then allow 1 mark.

If two correct lines are drawn and only one is labelled, then allow 2 marks.

If only one correct line is drawn and neither are labelled, then 0 marks.

If two correct lines are drawn but line 2 is labelled 1 and line 3 is labelled 2, then allow 1 mark

Allow some unevenness in drawing of lines in terms of height it levels off at, with up to a quarter of a box of unevenness

At the start, lines must separate from the original before the first vertical line.

In terms of the origin, lines must start within one half of a square of the origin.

For each line ignore the time at which the line becomes horizontal – it is the fact it is more or less steep than the original line that matters (along with the height at which it finishes)

1

(c) **M1** more particles/molecules/reactants/H_2O_2/moles in given/same volume/space OR particles/molecules/reactants/H_2O_2/moles closer together

Penalise reference to changing the activation energy (CE = 0)

*For **M1** do not allow area*

1

M2 successful collisions are more frequent

*For **M2***

successful collisions – allow reference to collisions with sufficient energy or collisions with the activation energy or effective collisions

more frequent – allow reference to per unit time, per second (but ignore reference to rate of collisions, ignore chance of collisions, ignore likelihood of collisions)

1

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