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

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**Name of the Student**:_____
**Max. Marks : 25 Marks** **Time : 25 Minutes**

Mark Schemes

Q1.

(a)

| 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**<br>**5-6 marks** | All stages are covered and the description of each stage is generally correct and virtually complete. Answer is communicated coherently and shows a logical progression from stage 1 to stage 2 and stage 3. |
| **Level 2**<br>**3-4 marks** | All stages are covered but the description of each stage may be incomplete or may contain inaccuracies **OR** two stages are covered and the explanations are generally correct and virtually complete. Answer is mainly coherent and shows progression from stage 1 to stage 2 and/or stage 3. |
| **Level 1**<br>**1-2 marks** | Two stages are covered but the description 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. Answer includes isolated statements and these are presented in a logical order. |
| **Level 0** | **0 marks** Insufficient correct chemistry to gain a mark. |

Stage 1
1a Heterogeneous means in a different phase/state from reactants
1b Catalyst speeds up reaction and is left unchanged **OR** lowers the activation energy for the reaction

Stage 2
2a Hydrogen and nitrogen/reactants adsorb onto the surface/ active sites of the iron
2b Bonds weaken/reaction takes place
2c Products desorb/leave from the surface (of the iron)

Stage 3
3a Large surface area (of iron) by using powder or small pellets or support medium/mesh
3b Catalyst poisoned / sulfur poisons or binds to the catalyst
3c Active sites blocked

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Ignore references to temperature and pressure

**6**

(b) Two negative ions repel

**1**

So activation energy is high

**1**

$2\ Fe^{2+} + S_2O_8^{2-} \rightarrow 2\ SO_4^{2-} + 2\ Fe^{3+}$

**1**

$2\ Fe^{3+} + 2\ I^- \rightarrow 2\ Fe^{2+} + I_2$

*Ignore any state symbols given*
*Allow multiples for both equations*
*Allow equations in either order*

**1**

(c) (Zn ions) have only one oxidation state
Or
$Zn^{2+}$ is the only ion

*Allow doesn't have variable oxidation state*
*Allow cannot be oxidised to $Zn^{3+}$*
*Ignore has a full d shell*

**1**

(d) M1 Amount of Fe = 0.998 ÷ 55.8 = 0.0179 mol

**1**

M2 Amount of HCl = 0.0300 mol

**1**

M3 HCl is the limiting reagent

**1**

M4 Amount of $H_2$ produced = 0.0150 mol

*M4 = M2÷2*

**1**

M5 T = 303 K P = 100 000 Pa

**1**

M6 $V \left(= \frac{0.0150 \times 8.31 \times 303}{100\ 000}\right) = 3.78 \times 10^{-4}\ (m^3)$

*M6* $V \left(= \frac{M4 \times 8.31 \times 303}{100\ 000}\right) (m^3)$

**1**

(e) $FeCO_3$ or iron(II) carbonate

**1**

Green

*Allow white*

**1**

(f) $Fe(H_2O)_3(OH)_3$

*Ignore square brackets if added*

**1**

brown

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1

$2\ [Fe(H_2O)_6]^{3+} + 3\ CO_3^{2-} \rightarrow 2\ Fe(H_2O)_3(OH)_3 + 3\ H_2O + 3\ CO_2$

*Accept multiples*

1

(g) M1 $Fe^{3+}$ is smaller (than $Fe^{2+}$) **OR** $Fe^{3+}$ has a greater charge **OR** $Fe^{3+}$ has a greater charge density **OR** $Fe^{3+}$ has a greater charge to size ratio

*Penalise $Fe(H_2O)_6^{3+}$ ions once in M1 or M2*

1

M2 $Fe^{3+}$ ions are more polarising **OR** $Fe^{3+}$ ions polarise water molecules more

1

M3 So more O-H bonds (in the water ligands) break **OR** more $H^+$ ions released **OR** weaken O-H bonds in ligands more (in the $Fe^{3+}$ solution)

*Do not allow $Fe^{3+}$ releases $3H^+$ ions*

1

**[25]**

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