

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Mark Schemes

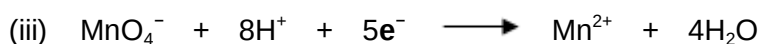
Q1.

*Ignore state symbols**Credit loss of electrons from LHS**Credit multiples**Do not penalise absence of charge on electron*

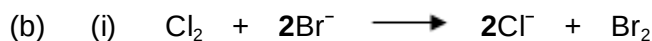
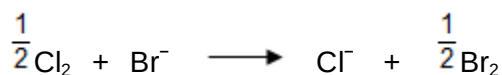
1

*Allow Mn^{+7} and 7+*

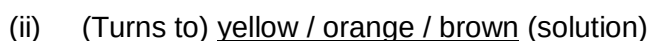
1

*Ignore state symbols**Credit loss of electrons from RHS**Credit multiples**Do not penalise absence of charge on electron*

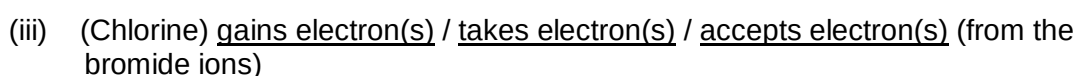
1

**OR***One of these two equations only**Ignore state symbols*

1

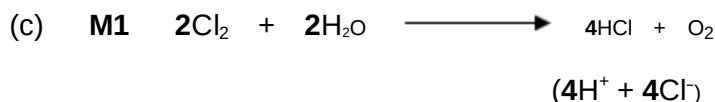
*Penalise "red / reddish" as the only colour**Accept "red-brown" and "red-orange"**Ignore "liquid"**Penalise reference to a product that is a gas or a precipitate*

1

**OR**

Penalise "electron pair acceptor"
Not simply "causes loss of electrons"

1



M2 Oxidation state **-1**

Ignore state symbols

Credit multiples

M2 consequential on HCl or Cl^- which **must** be the only chlorine-containing product in the (un)balanced equation.

For **M2** allow Cl^{-1} or Cl^{1-} but **not** Cl^-

2

(d) **M1** The relative size (of the molecules / atoms)

Chlorine is smaller than bromine **OR** has fewer electrons / electron shells

For **M1** ignore whether it refers to molecules or atoms.

OR It is smaller / It has a smaller atomic radius / it is a smaller molecule / atom (or converse)

CE=0 for the clip for reference to (halide) ions or incorrect statements about relative size

Ignore molecular mass and M_r

M2 How size of the intermolecular force affects energy needed

Ignore shielding

The forces between chlorine / Cl_2 molecules are weaker (than the forces between bromine / Br_2 molecules)

(or converse for bromine)

OR chlorine / Cl_2 has weaker / fewer / less (VdW) intermolecular forces / forces between molecules

(or converse for bromine)

QoL in M2 for clear reference to the difference in size of the force between molecules. Reference to Van der Waals forces alone is not enough.

Penalise **M2** if (covalent) bonds are broken

2

[10]

Q2.

(a) **M1** acidified potassium dichromate or $\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$

OR $\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}^+$ **OR** acidified $\text{K}_2\text{Cr}_2\text{O}_7$

M2 (orange to) green solution **OR** goes green

M3 (solution) remains orange or no reaction or no (observed) change

*If no reagent or incorrect reagent in **M1**, **CE = 0** and no marks for **M1**, **M2** or **M3***

*If incomplete / inaccurate attempt at reagent e.g. "dichromate" or "dichromate(IV)" or incorrect formula or no acid, **penalise M1 only and mark on***

*For **M2** ignore dichromate described as "yellow" or "red"*

*For **M3** ignore "nothing (happens)" or "no observation"*

Alternative using $\text{KMnO}_4 / \text{H}_2\text{SO}_4$

M1 acidified potassium manganate(VII) / potassium permanganate or $\text{KMnO}_4 / \text{H}_2\text{SO}_4$

OR $\text{KMnO}_4 / \text{H}^+$ **OR** acidified KMnO_4

M2 colourless solution **OR** goes colourless

M3 (solution) remains purple or no reaction or no (observed) change

*For **M1***

*If incomplete / inaccurate attempt at reagent e.g. "manganate" or "manganate(IV)" or incorrect formula or no acid, **penalise M1 only and mark on***

*Credit alkaline KMnO_4 for possible full marks but **M2** gives brown precipitate or solution goes green*

3

(b) **M1** (Shake with) Br_2 **OR** bromine (water) **OR** bromine (in CCl_4 / organic solvent)

M2 (stays) orange / red / yellow / brown / the same

OR no reaction **OR** no (observed) change

M3 decolourised / goes colourless / loses its colour / orange to colourless

*If no reagent or incorrect reagent in **M1**, **CE = 0** and no marks for **M1**, **M2** or **M3***

*If incomplete / inaccurate attempt at reagent (e.g. Br), **penalise M1 only and mark on***

*No credit for combustion observations; **CE = 0***

*For **M2** in every case*

Ignore "nothing (happens)"

Ignore "no observation"

Ignore "clear"

OR as alternatives

Use KMnO_4 / H_2SO_4

M1 acidified potassium manganate(VII) / potassium permanganate **OR**
 KMnO_4 / H_2SO_4

OR KMnO_4 / H^+ **OR** acidified KMnO_4

M2 (stays) purple or no reaction or no (observed) change

M3 decolourised / goes colourless / loses its colour

Use iodine

M1 iodine or I_2 / KI or iodine solution

M2 no change

M3 decolourised / goes colourless / loses its colour

Use concentrated sulfuric acid

M1 concentrated H_2SO_4

M2 no change

M3 brown

For M1, it must be a whole reagent and / or correct formula

For M1 penalise incorrect attempt at correct formula, but mark M2 and M3

With potassium manganate(VII)

If incomplete / inaccurate attempt at reagent e.g. "manganate" or "manganate(IV)" or incorrect formula or no acid, penalise M1 only and mark on

Credit alkaline / neutral KMnO_4 for possible full marks but M3 gives brown precipitate or solution goes green

Apply similar guidance for errors in the formula of iodine or concentrated sulfuric acid reagent as those used for other reagents.

3

(c) **M1** Any soluble chloride including hydrochloric acid (ignore concentration)

M2 white precipitate or white solid / white suspension

M3 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

OR as an alternative

M1 Any soluble iodide including HI

M2 yellow precipitate or yellow solid / yellow suspension

M3 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

OR as an alternative

M1 Any soluble bromide including HBr

M2 cream precipitate or cream solid / cream suspension

M3 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

OR as an alternative

M1 NaOH or KOH or any soluble carbonate

M2 brown precipitate or brown solid / brown suspension with NaOH / KOH
(white precipitate / solid / suspension with carbonate)

M3 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

*If no reagent or incorrect reagent or insoluble chloride in **M1**, **CE = 0** and no marks for **M1**, **M2** or **M3***

Allow chlorine water

*If incomplete reagent (e.g. chloride ions) or inaccurate attempt at formula of chosen chloride, or chlorine, **penalise M1 only and mark on***

*For **M2** require the word “white” and some reference to a solid. Ignore “cloudy solution” OR “suspension” (similarly for the alternatives)*

*For **M3***

Ignore “nothing (happens)”

Ignore “no observation”

Ignore “clear” on its own

Ignore “dissolves”

3

(d) **M1** Any soluble sulfate including (dilute or aqueous) sulfuric acid

M2 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

M3 white precipitate or white solid / white suspension

*If no reagent or incorrect reagent or insoluble sulfate in **M1**, **CE = 0** and no marks for **M1**, **M2** or **M3***

Accept MgSO_4 and CaSO_4 but not barium, lead or silver sulfates

*If concentrated sulfuric acid or incomplete reagent (e.g. sulfate ions) or inaccurate attempt at formula of chosen sulfate, **penalise M1 only and mark on***

*For **M3** (or **M2** in the alternative) require the word “white” and some reference to a solid.*

Ignore “cloudy solution” OR “suspension”

*For **M2** (or **M3** in the alternative)*

Ignore “nothing (happens)”

Ignore “no observation”

Ignore “clear” on its own

Ignore “dissolves”

OR as an alternative

M1 NaOH or KOH

M2 white precipitate or white solid / white suspension

M3 remains colourless or no reaction or no (observed) change or no precipitate or clear solution or it remains clear

*If incomplete reagent (e.g. hydroxide ions) or inaccurate attempt at formula of chosen hydroxide, **penalise M1 only and mark on***

*If **M1** uses NH_3 (dilute or concentrated) **penalise M1 only and mark on***

3

[12]