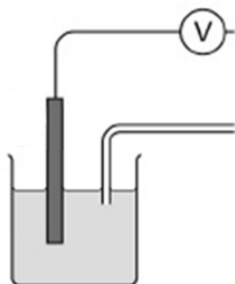


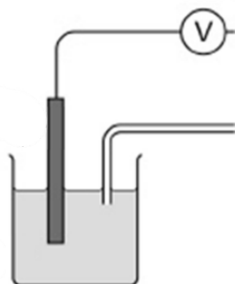
1 LABELLED DIAGRAMS

Annotate the diagrams below with the key requirements for each type of half-cell when drawing labelled diagrams:

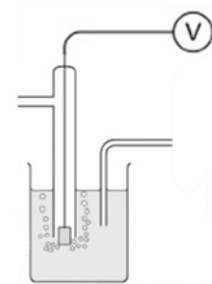
Metal and Metal Ions



Two ions in solution



Hydrogen Electrode



Complete the table below to summarise what should be used for each type of half-cell:

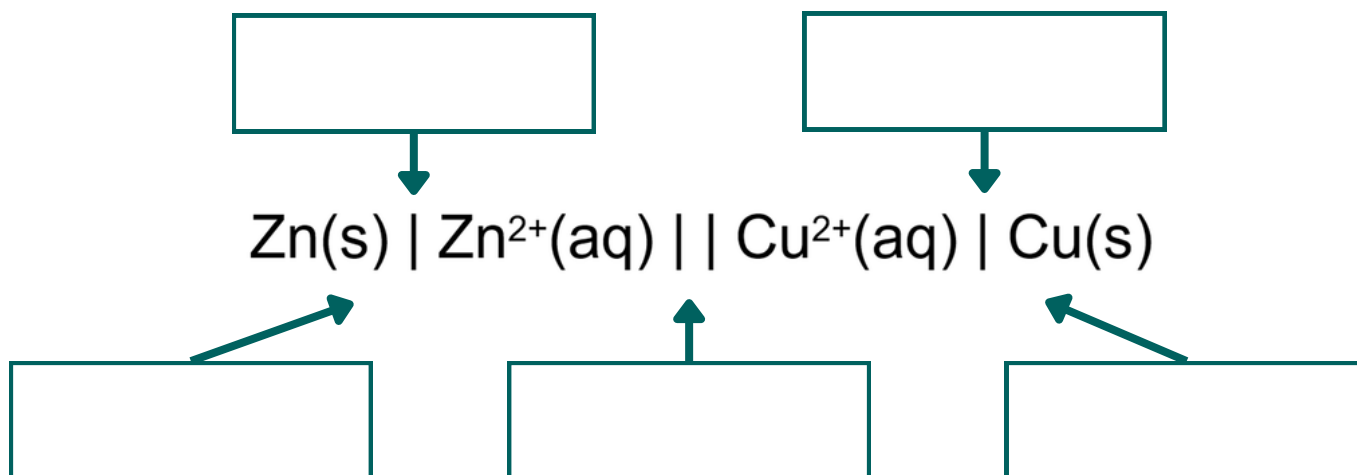
Type of Half-Cell	Electrode Used	Solution(s) Needed	Concentration Needed?
Metal in solution (e.g. $\text{Zn}_{(s)} / \text{Zn}^{2+}_{(aq)}$)			
Two ions of the same element in solution (e.g. $\text{Fe}^{3+} / \text{Fe}^{2+}$)			
Standard Hydrogen Electrode			

Draw a clearly labelled diagram to show the components and reagents, including their concentrations, in a Fe(III)/Fe(II) electrode used to determine the standard electrode potential of that half-cell:



2 CONVENTIONAL REPRESENTATIONS

Label the conventional representation of a zinc-copper cell:



Fill in the meaning of each symbol or separator used:

Symbol / Separator	Meaning
,	

3 CONSTRUCTING CONVENTIONAL REPRESENTATIONS

Complete the steps for constructing a conventional representation:

1. Identify which half-cell is being _____ and which is being _____.
2. Write the correct half-equations for each half-cell.
3. The oxidation half-cell goes on the _____.
4. Write the _____ species first, followed by the product.
5. Use a comma to separate species in the same _____ and use a single vertical line to separate species in different _____.
6. Check to see if there is a conducting metal, if not add a platinum electrode separated by a _____ vertical line. The platinum electrode must always go on the _____ of the cell representation.
7. Use double vertical lines to represent the _____.
8. The reduction half-cell then goes on the _____.



3 CONSTRUCTING CONVENTIONAL REPRESENTATIONS

Two half-cells $\text{Fe}^{2+}_{(\text{aq})} / \text{Fe}_{(\text{s})}$ and $\text{Zn}^{2+}_{(\text{aq})} / \text{Zn}_{(\text{s})}$ are connected.

1. Which half-cell is oxidised? Why?

2. Write the two half equations.

Oxidation: _____

Reduction: _____

3. Write the conventional representation.

Two half-cells $\text{Fe}^{3+}_{(\text{aq})} / \text{Fe}^{2+}_{(\text{aq})}$ and $\text{Ag}^{+}_{(\text{aq})} / \text{Ag}_{(\text{s})}$ are connected.

1. Which half-cell is oxidised? Why?

2. Write the two half equations.

Oxidation: _____

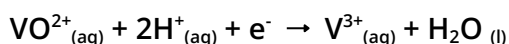
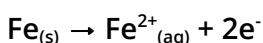
Reduction: _____

3. Write the conventional representation.

4 COMPLEX CELLS (ACIDIC AND ALKALINE)

Write the conventional representation including H^{+} ions.

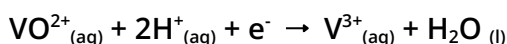
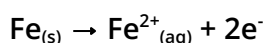
Half equations:



Conventional representation:

Write the conventional representation ignoring H^{+} ions.

Half equations:



Conventional representation:



EXAM TIP

AQA do not penalise you for not including H^{+} and OH^{-} ions when writing conventional representations.



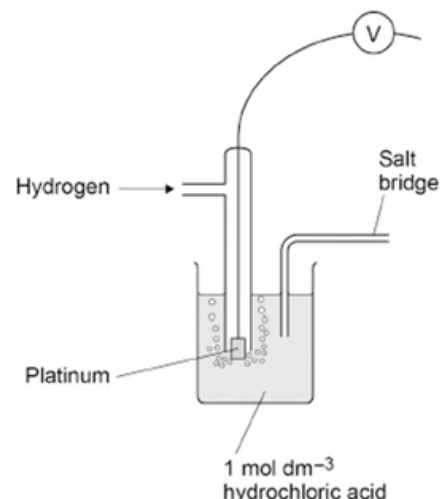
5 STANDARD HYDROGEN ELECTRODE

Complete the key rules to follow when writing conventional representations using the standard hydrogen electrode:

Key Rules:

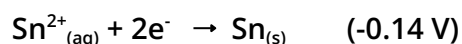
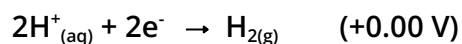
When measuring standard electrode potentials, the standard hydrogen electrode must:

- Always be placed on the _____.
- Always be shown as being _____.



Write the conventional representation for a cell used to determine the standard electrode potential of tin.

Half equations:



Conventional representation:

6 PRACTICE QUESTIONS

Using the table of standard electrode potentials opposite, draw conventional representations for the following cells:

1. A gold-zinc cell.

2. A zinc-iron cell.

3. A cell to measure the E^\ominus value for cobalt (Co^{2+}/Co).

4. An iron-oxygen cell.

5. A cobalt (Co^{2+}/Co) - cobalt($\text{Co}^{3+}/\text{Co}^{2+}$) cell.

Electrode half-reaction	E^\ominus/V
$\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Zn}(\text{s})$	-0.76
$\text{Co}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Co}(\text{s})$	-0.28
$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	0.00
$\text{Fe}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Fe}^{2+}(\text{aq})$	+0.77
$\frac{1}{2}\text{O}_2(\text{g}) + 2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2\text{O}(\text{l})$	+1.23
$\text{Au}^+(\text{aq}) + \text{e}^- \rightarrow \text{Au}(\text{s})$	+1.68
$\text{Co}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Co}^{2+}(\text{aq})$	+1.82

