

# Edexcel IAL Chemistry

## A-Level

### Topic 16 - Redox Equilibria

#### Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



# What is an oxidation number?



# What is an oxidation number?

A number that represents the number of electrons lost or gained by an atom of an element in a compound.



# What is oxidation?



# What is oxidation?

Oxidation is the loss of electrons, leading to an increase in the oxidation number value.



# What is reduction?



# What is reduction?

Reduction is the gain of electrons,  
leading to a decrease in the oxidation  
number value.



# What is standard electrode potential?





# What is standard electrode potential?

Standard electrode potential is the potential across the electrodes when a redox system is connected to a hydrogen half-cell under standard conditions.



What conditions are required for measuring the standard electrode potential?



What conditions are required for measuring the standard electrode potential?

- 298 K temperature
- 100 kPa pressure
- 1.00 mol dm<sup>-3</sup> concentration of ions



Why is a hydrogen half-cell needed as a reference?



# Why is a hydrogen half-cell needed as a reference?

The hydrogen half cell is used to allow for easy comparison between the electrode potential of different elements. The standard electrode potential for hydrogen is assumed to be zero volts at any temperature.

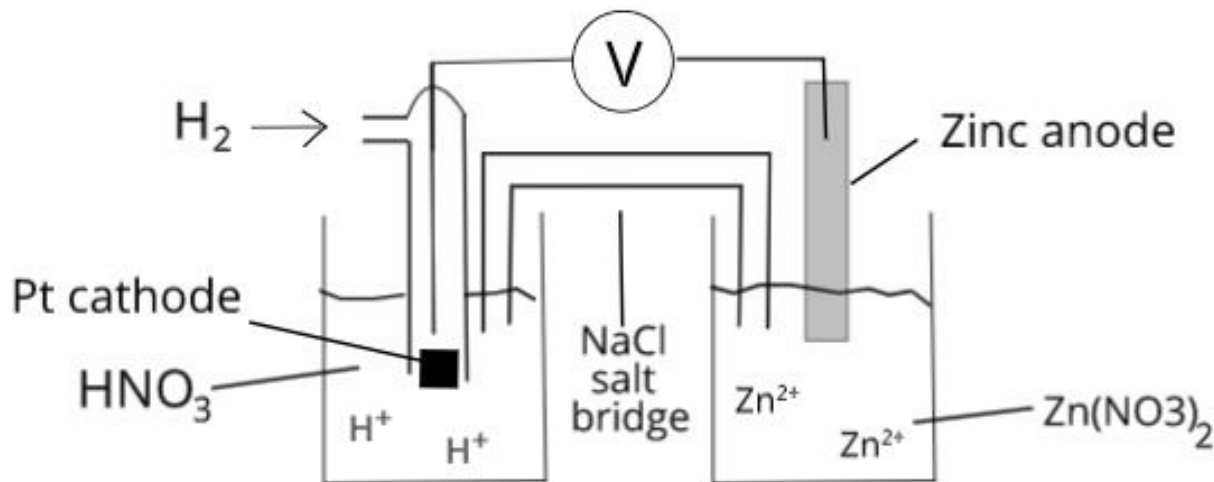


What is the experimental setup to calculate the standard electrode potential for zinc?



# What is the experimental setup to calculate the standard electrode potential for zinc?

The hydrogen standard cell is always placed on the left.



Why must metal electrodes be cleaned with sandpaper before creating an electrochemical cell?





Why must metal electrodes be cleaned with sandpaper before creating an electrochemical cell?

To remove any metal oxide that has formed on the surface and improve electrical conductivity.



Describe the movement of electrons in  
an electrochemical cell



Describe the movement of electrons in an electrochemical cell

Electrons flow through the wire from the positive electrode to the negative electrode.



# Why is a salt bridge used in an electrochemical cell?



# Why is a salt bridge used in an electrochemical cell?

To maintain the charge balance and complete the circuit.

This is because negative electrons are moving from one half cell to another. Without the salt bridge, positive charge would build up in the half cell containing the anode and negative charge would build up in the half cell containing the cathode. This would cause the reaction to stop.



# Why must an inert salt be used in the salt bridge?



Why must an inert salt be used in the salt bridge?

The salt must be inert so it doesn't react with the solutions and alter their concentrations. If a reactive salt was used, the cell potential would change.



# What moves across the salt bridge?





# What moves across the salt bridge?

Ions.



What must the cell potential value be, for a process to be feasible?



What must the cell potential value be, for a process to be feasible?

Cell potential must be greater than 0.



# How can cell potential be calculated?



# How can cell potential be calculated?

$$E^{\theta}_{\text{cell}} =$$

$$E^{\theta}(\text{positive terminal}) - E^{\theta}(\text{negative terminal})$$



Why might theoretical cell potential values be different to values obtained experimentally?



Why might theoretical cell potential values be different to values obtained experimentally?

Conditions may be non-standard

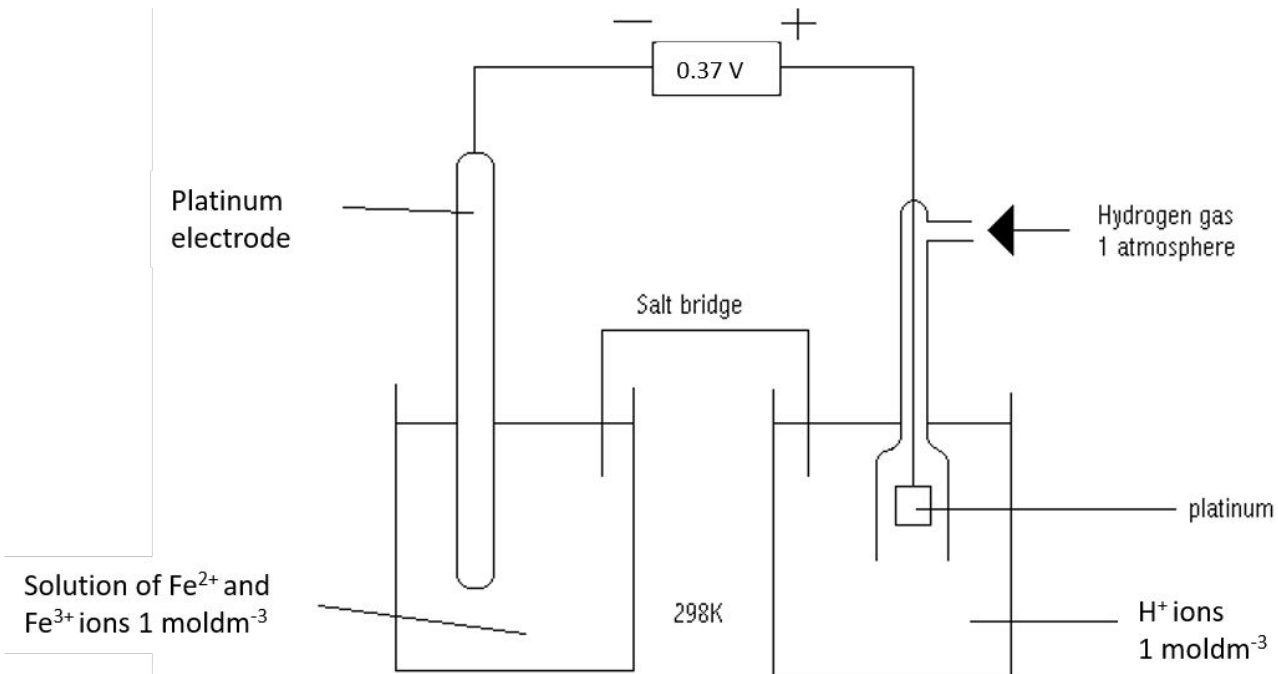


Draw a diagram showing a standard  
 $\text{Fe}^{2+}/\text{Fe}^{3+}$  cell





# Draw a diagram showing a standard $\text{Fe}^{2+}/\text{Fe}^{3+}$ cell



A cell is made up of the following half cells:



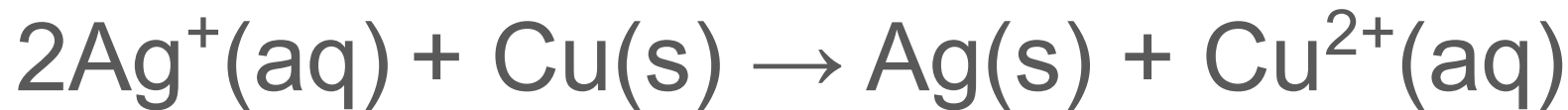
Write the overall cell equation and  
calculate the standard cell potential



A cell is made up of the following half cells:



Write the overall cell equation and calculate the standard cell potential



$$E^\theta_{\text{cell}} = +0.80 - (+0.34) = 0.46\text{V}$$



In an electrochemical cell, is the more negative half cell oxidised or reduced?



In an electrochemical cell, is the more negative half cell oxidised or reduced?

Oxidised



What is the relationship between  $E_{\text{cell}}^{\ominus}$   
and  $\ln K$ ?



What is the relationship between  $E_{\text{cell}}^{\ominus}$  and  $\ln K$ ?

$E_{\text{cell}}^{\ominus}$  is directly proportional to  $\ln K$  where  $K$  is the equilibrium constant of the reaction.



What is the relationship between  $E_{\text{cell}}^{\ominus}$  and the entropy change of the reaction?





What is the relationship between  $E_{\text{cell}}^{\ominus}$  and the entropy change of the reaction?

$E_{\text{cell}}^{\ominus}$  is directly proportional to the entropy change of the reaction.



# What is uncertainty in measurement?



# What is uncertainty in measurement?

The range in which the true value being measured lies.



# What is a fuel cell?



# What is a fuel cell?

A cell that continually produces a voltage as long as it is supplied with oxygen and a fuel (like hydrogen).



What is the only product of a hydrogen-oxygen fuel cell?



What is the only product of a hydrogen-oxygen fuel cell?

Water.



# How does a hydrogen-oxygen fuel cell work?





# How does a hydrogen-oxygen fuel cell work?

Hydrogen and oxygen are pumped through porous electrodes. The electrolyte is often an acid such as phosphoric acid.

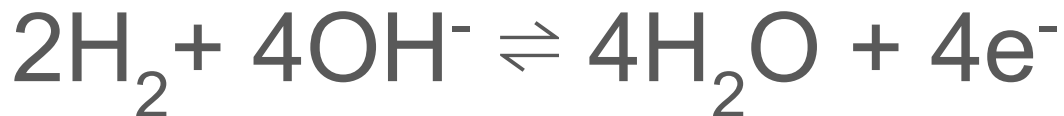
Hydrogen and oxygen react, producing electricity and water.



What are the two half equations taking place in a hydrogen-oxygen fuel cell?



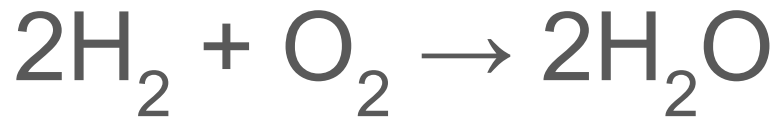
What are the two half equations taking place in a hydrogen-oxygen fuel cell?



Write an equation for the overall reaction  
that takes place in a hydrogen-oxygen  
fuel cell



Write an equation for the overall reaction that takes place in a hydrogen-oxygen fuel cell



# What are the advantages of fuel cells?



## What are the advantages of using fuel cells?

- No pollution produced - only product is water.
- Produce more energy than an alternative fuel like petrol.
- Continuous process as long as fuel is supplied.



# What are the disadvantages of fuel cells?





## What are the disadvantages of using fuel cells?

- The materials used to make them are expensive.
- High pressure tanks are required to store oxygen and fuels like hydrogen.
- Hydrogen is expensive and hard to store.
- Efficiency is affected by temperature.



Name another fuel which could be used  
in a fuel cell



Name another fuel which could be used in a fuel cell

- Methanol
- Any other hydrogen rich fuel

