

LESSON NOTES

WEEK 7

Year/Level: 13A/B

Subject: Chemistry

Strand 3	Reactions
Sub Strand 3.1	Electrochemistry
Content Learning Outcome	<ul style="list-style-type: none"> Identify the components of an electrolytic cell and describe its purpose Identify the components of a galvanic cell and describe its purpose

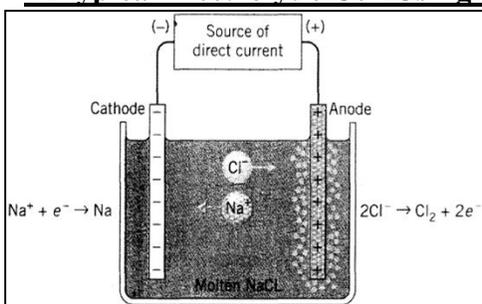
Electrochemistry

Study of processes in which redox reactions are brought about by electricity or used to produce electricity.

1. **Electrolytic Cell (electrolysis)**

- ✓ One in which redox reaction is brought about with the use of an external source of electricity where inert electrodes are used. (**inert means non-reactive**)

A Typical Electrolytic Cell Using Molten Sodium Chloride



Reaction at anode	$2\text{Cl}^- \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$	Oxidation	(Positive)
Reaction at cathode	$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}(\ell)$	Reduction	(Negative)

Anode (+)

- ✓ **Oxidation occurs** - Electrons are pulled from negatively charged chloride ions.

Cathode (-)

- ✓ **Reduction occurs** - Electrons are picked up by the positively charged sodium ions.

2. **Galvanic Cell(Voltaic Cell)**

- ✓ Electrochemical cells that produce electricity from redox reactions. (here energy is produced compared to electrolytic cell)
- ✓ Consists of **two different compartments called half cells** connected using a **salt bridge** and the wire.

Salt bridge

- ✓ Conducting medium that allows **ions** to pass from one half cell to other to keep the half cell electrically neutral.

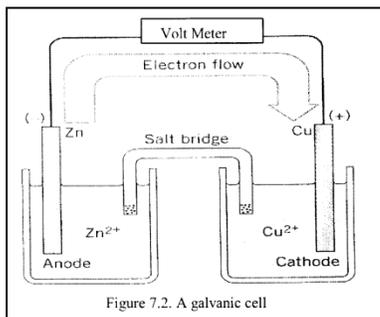
(E.g. platinum wire or **U- tube filled with KI or KNO₃ or KCl** can be used and fitted with porous plugs at either end.)

Anode (-)

- ✓ Oxidation occurs - The ion species or atoms that the electrode is composed of lose electrons which pass through the wire to the cathode.

Cathode (+)

- ✓ Reduction occurs - Electrons from the anode are received by the cathode and passed onto the cations.



Reaction at anode	$Zn(s) \rightarrow Zn^{2+}(aq) + e^{-}$	Oxidation	(Negative)
Reaction at cathode	$Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$	Reduction	(Positive)

Students let us closely look at galvanic cell and break it down:

- ✓ Zinc strip is immersed in Zn^{2+} solution on the left and on the right, a copper strip is immersed into a Cu^{2+} solution connected **using a salt bridge and a wire** which can conduct electricity.
- ✓ At the anode Zn atoms are oxidized to Zn ions. Electrons are left behind and give the anode a **negative charge** (electrons are negatively charged remember?)
- ✓ At the cathode copper ions **uses the electrons** to produce copper metal. The cathode gains a positive charge. (e^{-} are used that's why only positive charge)
- ✓ The oxidation of Zn to Zn^{2+} ions at anode and the reduction of Cu ions to Cu metal at the anode cause the passage of the current.

Exercise 1: Multiple Choice Questions

1. When the salt bridge is removed from a cell, its voltage

A will increase B will decrease to half C will decrease to zero D will not change

2. How is the component of electrolytic cell different from galvanic cell? (discuss 3 points)

The End