

# SUBJECT:

## UNIT:



Lesson 1: What is the test for hydrogen gas?

Lesson 2: What is an electrode made from?

Lesson 3: How is aluminium extracted?

Lesson 4: What happens to electrons during oxidation?

Lesson 5: What is produced when a metal reacts with acid?

Lesson 6: Describe the pH scale

Lesson 7: What happens during neutralisation?

Lesson 8: How is copper sulfate made?

Lesson 9: How can a titration be used to find concentration

Lesson 10: What is the difference between a strong and weak acid?

Lesson 11: What is produced at the electrodes during electrolysis of sodium chloride solution?

Lesson 12: What is a half equation?

Lesson 13: Draw the reaction profile of an endothermic reaction

Lesson 14: How do you calculate energy change?

Lesson 15: What is a fuel cell?



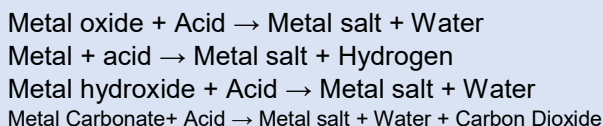
### Reactivity series

The reactivity series is a league table for metals. The more reactive metals are near the top of the table with the least reactive near the bottom. In chemical reactions, a more reactive metal will displace a less reactive metal.

	potassium
	sodium
	calcium
	magnesium
	aluminium
carbon →	zinc
	iron
	tin
	lead
Hydrogen →	copper
	silver
	gold
	platinum

### Reactions of acids

The main general formulas for acid reactions are...



### Naming salts

The first part comes from the metal in the carbonate, oxide or hydroxide. The other part comes from the acid.

Acid Used	Salt formed
Hydrochloric Acid HCl	Metal Chloride XCl
Sulfuric Acid H <sub>2</sub> SO <sub>4</sub>	Metal Sulfate XSO <sub>4</sub>
Nitric Acid HNO <sub>3</sub>	Metal Nitrate XNO <sub>3</sub>

### Redox reactions

When metals react with acids they undergo a redox reaction. A redox reaction occurs when both oxidation and reduction take place at the same time.

Oxidation is loss of electrons. OIL  
 $\text{Ca} \rightarrow \text{Ca}^{2+} + 2\text{e}^-$

Reduction is gain of electrons. RIG  
 $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$

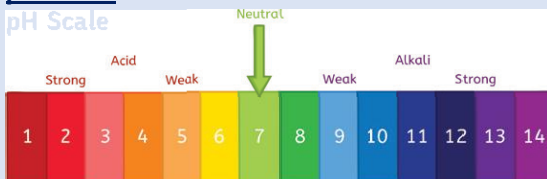
### Electrolysis of aqueous solutions

Gases may be given off or metals deposited at the electrodes. This is dependent of the reactivity of the elements. Is the metal is more reactive than hydrogen in the reactivity series, then hydrogen will be produced at the negative cathode., At the positive anode, negatively charged ions lose electrons. This is called oxidation and you say that the ions have been oxidised.

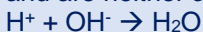
### Reactions of metals with acid

Metals, when they react with acid produce hydrogen gas.

### pH scale



In aqueous solutions, acids produce H<sup>+</sup> ions and alkalis produce OH<sup>-</sup> ions. Neutral solutions are pH7 and are neither acids or alkalis.



### Using electrolysis to extract metals

Metals are extracted by electrolysis if the metal in question reacts with carbon or if it is too reactive to be extracted by reduction with carbon. Aluminium is manufactured by the process of electrolysis. Aluminium oxide has a high melting point and melting it requires a large amount of energy (increasing the cost) There fore molten cryolite is added to aluminium oxide to lower the melting point and thus reduce the cost.

### Ambitious Vocabulary

Acid, base, Redox, electrolysis

### Making soluble salts

Pour 40 cm<sup>3</sup> of 1.0M sulphuric acid into 100 cm<sup>3</sup> beaker

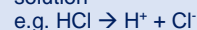
Add the Copper oxide to excess one spatula at a time, stirring using the glass rod as you add it.

Filter the solution into a conical flask and then pour some of the solution into the evaporating dish.

Make a water bath using a beaker. Place the evaporating dish on top of it and then heat until about half the solution has evaporated. Allow to cool then transfer the solution to a labelled Petri dish and leave in a warm place to finish crystallising.

### Strong and Weak acids

A strong acid completely dissociates in a solution



Hydrochloric acid is able to completely dissociate in solution to form hydrogen and chloride ions.

Weak acids in comparison only partially dissociate. For example acetic acid partially dissociates to form a hydrogen and acetate ion.



### The process of electrolysis

Electrolysis is the splitting up of an ionic substance using electricity. Two electrodes are required to be placed in the electrolyte. The electrodes are conducting rods. One of the rods is connected to the positive terminal and the other to the negative terminal. The electrodes are inert (this means they do not react in the reaction) and are often made from graphite or platinum.

During the process of electrolysis, opposites attract. The positively charged ions will be attracted toward the negative electrodes, the charges are lost and they become elements. The positive electrode is called the anode.

The negative electrode is called the cathode.

