Electrochemical Potentials

At KS3, you will have learnt a reactivity series, defined as "being more reactive" at the top of the series. The **more reactive metals have a tendency to lose electrons and form positive ions**. The reactivity series is useful for predicting the behaviour of metals.

KS3 level ⟶ GCSE level

More "reactive"

Reactivity
potassium
sodium
lithium
calcium
magnesium
aluminium
zinc
iron
copper
silver
gold

Less "reactive"

Easier to remove electrons

	Reaction
P	potassium cation + electron → potassium
S	sodium cation + electron → sodium
L	lithium cation + electron → lithium
C	calcium cation + electrons → calcium
M	magnesium cation + electrons → magnesi
A	aluminium cation + electrons → aluminium
Z	zinc cation + electrons → zinc
I	iron cation + electrons → iron
H	proton + electron → hydrogen
C	copper cation + electrons → copper
S	silver cation + electron → silver
G	gold cation + electron → gold

Violent reactions with water

Reactions with acid

Slow reactions with strong acids

Not very reactive

Harder to remove electrons

Mnemonics like "**P**lease **S**top **C**alling **M**e **A** **Z**ebra, **I** like **H**er **C**alling (me a) **S**mart **G**oat."

ELECTROCHEMICAL CIRCUS

INSPIRATION THROUGH FASCINATION

Electrochemical Potentials

Can't remember which end of the table is keen to get rid of electrons and which end is keen to attain electrons, compared to hydrogen?

It's hard to remember that the more negative number is the reaction that is going to GIVE UP electrons (be oxidised) and the more positive number is the one which will accept electrons (be reduced). Here's a way to think about it.

Reaction
potassium cation + electron → potassium
sodium cation + electron → sodium
lithium cation + electron → lithium
calcium cation + electrons → calcium
magnesium cation + electrons → magnesium
aluminium cation + electrons → aluminium
zinc cation + electrons → zinc
iron cation + electrons → iron
proton + electron → hydrogen
copper cation + electrons → copper
silver cation + electron → silver

Bromine + electron → bromide
Chlorine + electron →chloride
Gold cation + electron → gold
Fluorine + electron →fluoride

You know that Group I of the periodic table (like sodium) have a weakly bound outer electron. These elements "want" to get rid of that electron to have a full outer shell.

So you already know these atoms will be more likely to lose electrons. So negative numbers correspond to "wanting" to get rid of electrons.

At the very bottom of some of these tables, you will find the Group VII non-metals, mixed up with some of the transition metals. You already know that chlorine and fluorine "want" one more electron to fill their outer shells.
These atoms "want" to gain electrons. So you know a positive number corresponds to "wanting" electrons.

ELECTROCHEMICAL CIRCUS
INSPIRATION THROUGH FASCINATION