



## 8G Metals and Their Uses

1. Metal Properties	
Physical Properties	The properties that describe a substance on its own. <i>(colour, strength, density, etc.)</i>
Chemical Properties	How a substance reacts with other substances.
Properties of Metals	High melting points, strong, flexible, malleable, shiny, good conductors.
Copper	Used in electrical circuits because it is a good conductor of electricity and unreactive. Used in water pipes because it is unreactive, non-poisonous and malleable.
Aluminium	Used in window frames because it is strong and light.
Metals & Oxygen	Most metals react with oxygen. metal + oxygen → metal oxide <i>e.g. zinc + oxygen → zinc oxide</i>
Metals & Halogens	Metals react with halogens and other non-metals. <i>e.g. zinc + fluorine → zinc fluoride</i>
Catalysts	Speed up chemical reactions without being permanently changed themselves.
Catalytic Converter	Found in cars to help convert dangerous gases into harmless ones- often contain platinum, palladium and rhodium.
2. Corrosion	
Corrosion	Any reaction with oxygen at the surface of a metal.
Rusting	The corrosion of iron.

Word Equation for Corrosion of Titanium				
titanium + oxygen → titanium oxide				
Symbol Equation for Corrosion of Titanium				
$Ti + O_2 \rightarrow TiO_2$				
Formula	Used to represent the products and reactants in a symbol equation.			
Ratio	Comparison of the proportion of two quantities <i>e.g. in <math>TiO_2</math> there are two oxygen atoms for every titanium- the ratio is 1:2</i>			
Rusting of Iron	More complex than general corrosion- requires water as well.			
Rusting of Iron Word Equation				
Iron + oxygen + water → iron hydroxide				
Preventing Rust	Use a barrier such as paint/plastic/oil to keep away air/water			
3. Metals and Water				
Reactivity of Metals				
Metal	Reaction with oxygen in air	Reaction with cold water		
potassium	can catch fire	can catch fire		
sodium	can catch fire	reacts very quickly		
lithium	can catch fire	reacts quickly		
calcium	can catch fire	reacts quickly		
magnesium	can catch fire	reacts quickly		
aluminium	reacts quickly	slow or partial reaction		
zinc	reacts quickly	slow or partial reaction		
iron	reacts quickly	slow or partial reaction		
tin	reacts	slow or partial reaction		
lead	reacts	slow or partial reaction		
copper	reacts	no reaction		
mercury	slow or partial reaction	no reaction		
silver	slow or partial reaction	no reaction		
gold	no reaction	no reaction		
platinum	no reaction	no reaction		

Increasing reactivity ↑

Key:

- can catch fire
- reacts very quickly
- reacts quickly
- reacts
- slow or partial reaction
- no reaction

Reactivity	How quickly / vigorously something reacts.
Reactivity Series	A list of metals in the order of their reactivity.
Metals & Water	Metals produce metal hydroxides and hydrogen when reacting with water. <i>(sodium + water → sodium hydroxide + hydrogen)</i>
4. Metals and Acids	
Potassium - Lithium	React explosively with dilute acids.
Calcium - Zinc	React very quickly with dilute acids.
Iron - Lead	React slowly with dilute acids.
Copper - Platinum	Do not appear to react with dilute acids at all.
Effervescence	The production of a gas. Occurs when metals react with an acid.
Metals & Acids	Metals react with acids to form hydrogen and a salt.
Metals & Acids Word Equation	
metal + acid → salt + hydrogen	
<i>e.g. magnesium + sulfuric acid → magnesium sulfate + hydrogen</i>	
Naming Salts	The first word in the salt is the metal the second depends on the acid used.
Hydrochloric Acid	HCl – forms salts ending in chloride
Sulfuric Acid	$H_2SO_4$ – forms salts ending in sulfate
Nitric Acid	$HNO_3$ – forms salts ending in nitrate
Obtaining Salts	Mix the acid and the metal. Filter the solution to remove any excess metal. Heat the solution to evaporate water leaving just the solid salt.

5. Pure Metals and Alloys	
Pure	Substance made up of one type of atom.
Alloys	Mixtures of metals.
Solder	Lead mixed with tin- lower melting point than lead used for fixing pipes / electrical equipment.
Duralumin	Aluminium mixed with copper and magnesium making it lighter and stronger. Used in aircraft.
Stainless Steel	Iron mixed with carbon, chromium and nickel making it stronger and more resistant to corrosion. Used in cutlery.
Explaining How Alloys Are Strong	
Melting / Boiling Points	Melting and boiling points for pure substances are fixed and occur at precise temperatures. Alloys melt and boil over a range of temperatures.
Lesson	
1. Metal Properties	Memorised?
2. Corrosion	
3. Metals and Water	
4. Metals and Acids	
5. Pure Metals and Alloys	