N5: Metals

Metallic bonding is the electrostatic force of attraction between _____

_____ _____ and _____

_____.

Metallic elements are conductors of electricity because they contain delocalised electrons.

By reacting metals with oxygen, water and acid a reactivity series can be produced.

Metal	Symbol
Potassium	
	Na
Lithium	
	Ca
Magnesium	
	Al
Zinc	
	Fe
Tin	
	Pb
Copper	
	Hg
Silver	
	Au

Most reactive

Reacts with _____

_____

Reacts with _____

_____

Reacts with _____

Least reactive

? Put the metals W, X, Y and Z in order of reactivity (from most to least reactive).

Metal	Reaction with oxygen	Reaction with water	Reaction with acid
W	Fast	Fast	Fast
X	Slow	Slow	Moderate
Y	Fast	Fast	Very fast
Z	Moderate	Moderate	Fast

Metal + oxygen —> _____ _____

E.g

Metal + water —> _____ _____ + _____

E.g.

Metal + acid —> _____ + _____

The name of the salt depends on the acid used:

Acid	Salt name ending
Hydrochloric	
Sulfuric	
Nitric	
Phosphoric	

E.g.

Soluble salts can be made using this process:

-
-
-

Metals are found in rocks called _____. Within ores metals are found in compounds such as _____ or _____. Metals can be extracted from these ores using different methods depending on their reactivity.

Metal	Symbol
Potassium	K
Sodium	Na
Lithium	Li
Calcium	Ca
Magnesium	Mg
Aluminium	Al
Zinc	Zn
Iron	Fe
Tin	Zn
Lead	Pb
Copper	Cu
Mercury	Hg
Silver	Ag
Gold	Au

Extract by _____

_____

Extract by _____

_____

Extract by _____

During extraction the metal ions in the compounds are _____. This means they _____ _____.

During electrolysis an _____ _____ is _____ into its elements using _____. If the products are to be identified then _____ supply must be used.

The _____ ions gain electrons at the negative electrode (are _____) and the _____ ions lose electrons at the positive electrode (are _____).

The process of both _____ and _____ happening at the same time is called _____.

You can remember the two parts using this pneumonic:

O
I
L
R
I
G

Page 10 in the data book shows reduction ion-electron equations. To write an oxidation equation you flip it over.

? Write the ion-electron equations for the reduction of:

A) Magnesium ions

B) Chlorine

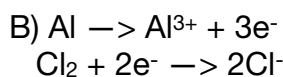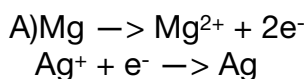Write the ion-electron equations for the oxidation of

C) Aluminium

D) bromide ions

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Ion-electron equations can be combined to show the resulting redox equation. To do this the electrons in each equation must be equal.

<table>
<tr><td>?</td><td>Combine the following equations to show the full redox equation.

A) $Mg \longrightarrow Mg^{2+} + 2e^-$
   $Ag^+ + e^- \longrightarrow Ag$</td></tr>
</table>

B) $Al \longrightarrow Al^{3+} + 3e^-$
   $Cl_2 + 2e^- \longrightarrow 2Cl^-$

Electrochemical cells produce _____ by reaction of _____.

Electrically conducting solutions are called _____.

A simple cell consists of an _____ with two _____.

The electrons flow from the metal higher in the _____ _____ (P10 of data book) to lower. The metal which loses electrons is _____ and the metal which gains is _____.
Half cells are more efficient. They avoid reactions between the _____ and the _____ by placing metals in a solution of their own metal.

An _____ _____ is used to connect the two halves.

Electrochemical cells can be set up using non-metal solutions, in this case _____ is used for the electrode.

Different pairs of metals will produce different _____. This can be used to set up an _____ series. This is similar to the reactivity series with some small differences. (P10 of the data book).

The further apart on the electrochemical series the metals are, the _____ the _____ produced.

?	A)Show the direction of electron flow in the cell below B)Write the ion-electron equations for the oxidation and reduction reactions

C) Write the overall redox equation
D) Name a metal that could replace Pb to produce a larger voltage.

Pb   Pb(NO₃)₂   Al(NO₃)₃   Al