Year 9

Chemistry booklet

Topic 3 – chemical changes

Name: _____

Chemical changes

Give a definition for each of these key words:

Chemical change	
Physical change	
Reactivity	
Oxidation	
Reduction	
Redox	
Acid	
Alkali	
Neutral	
pH	
Neutralise	
Soluble	
Insoluble	
Salt	
Purity	

Breakfast Time

Breakfast on a Sunday morning and nothing beats a full English. The first part of the ritual involves fixing the perfect cuppa. Once I've emerged from under the duvet and cocooned myself in the baggiest of hoodies, I flick on the kettle. Tea bag and milk ready in my favourite, extra-large mug, I wait until the water has just boiled. Boiling water to the brim I stir in three sugars, I need few calories to keep me going. Sausages and bacon on the grill, heat cranked up. Frying pan on the hob, I turn on the gas; click, click until it ignites and burns with a clean blue flame. I throw in a large knob of butter and circle it round the pan until it lazily melts into a golden liquid form. I crack an egg into the spitting fat and stand back as it coagulates. Beans are warming nicely in a pan at the back of the cooker, assisted by the occasional stir of wooden spoon. Two slices of thick, soft white slowly browning in the toaster. A large slurp of sweet tea clears my head enough for me to remember to take the bangers out before they burn. The bacon fat is crisp and the sausages a lovely golden brown. I slide a spatula under the firm white of the fried egg, taking care not to break the gooey yolk as I slide it onto a plate. Pork products nestled next to the poultry, baked beans and a good dollop of red sauce. I spread a thick layer of butter onto my toast, which instantly begins to melt in the most satisfying of manners. The comfiest seat at the dining table and a spread of Sunday papers. Like I said, nothing beats a full English.

In one colour, highlight all of the physical changes mentioned.

In a second colour, highlight all of the chemical changes.

What is the difference between a physical and a chemical change?

_____

_____

_____

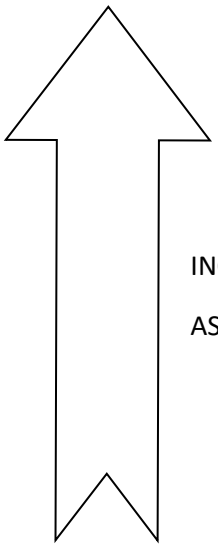
_____

_____

Reactivity Series of Metals

Elements in the Periodic table react at different speeds and some not at all. Carrying out simple experiments Chemists have been able to put the metals in an order of reactivity – called THE REACTIVITY SERIES.

Name	Symbol
Potassium	
	Na
	Ca
Magnesium	
	Al
Zinc	
	Fe
Copper	



MOST REACTIVE

INCRESING REACTIVITY

AS YOU GO UP THE TABLE

Describe some different experiments that can be carried out to help find out the order of reactivity of metals:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

GROUP 1 METALS

EXAMPLE EQUATION FOR REACTION WITH WATER:

Lithium + water →

$Li_{(s)} + H_2O_{(l)}$ →

How does reactivity differ as you move down the group? _____

_____

_____

Reaction of Acids with Metals

Complete the equations (remember hydrochloric acid makes chloride salts, sulfuric acid makes sulfate salts and nitric acid makes nitrate salts)

Metals + Acid ⟶ Salt + Hydrogen

For example,

Lithium + Sulfuric Acid ⟶ Lithium Sulfate + Hydrogen

1. **Calcium + Hydrochloric Acid ⟶ _____ + _____**
2. **Magnesium + Sulfuric Acid ⟶ _____ + _____**
3. **Lead + Nitric Acid ⟶ _____ + _____**
4. **Iron + _____ ⟶ Iron Chloride + _____**
5. **Zinc + Sulfuric Acid ⟶ _____ + Hydrogen**
6. **Tin + _____ ⟶ Tin Nitrate + Hydrogen**

OXIDATION AND REDUCTION (REDOX)

O =
I =
L =
R =
I =
G =

WHEN METALS ARE EXTRACTED FROM THEIR ORES THEY ARE <u>OXIDISED/REDUCED</u>

IRON OXIDE + CARBON →

Unreactive metals such as _____ are found in the Earth as the _____ itself.

Most metals are found as _____ that require chemical reactions to _____ the metal.

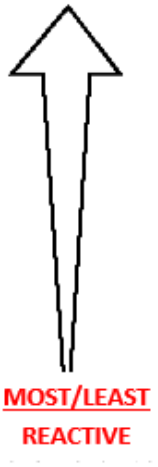
[Gold, compounds, metal, extract]

Metals that are _____ reactive than carbon in the reactivity series can be _____ from their oxides by _____ with _____.

Iron oxide is reduced in the _____ _____ to make iron.

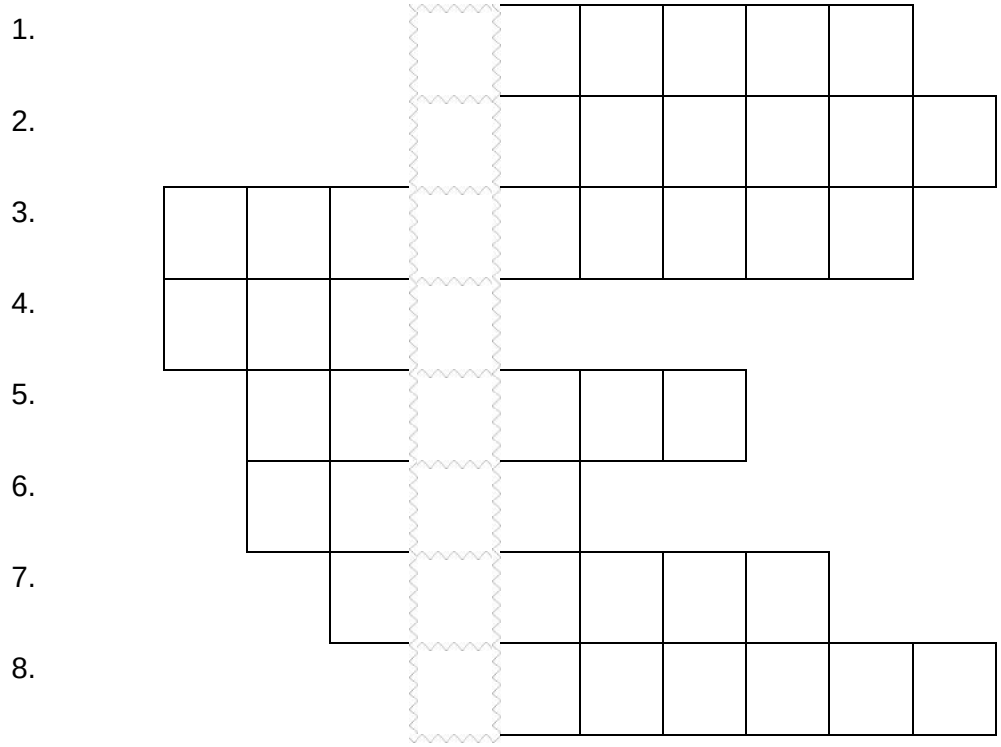
[extracted, reduction, carbon, less, blast furnace]

REACTIVITY SERIES AND EXTRACTION



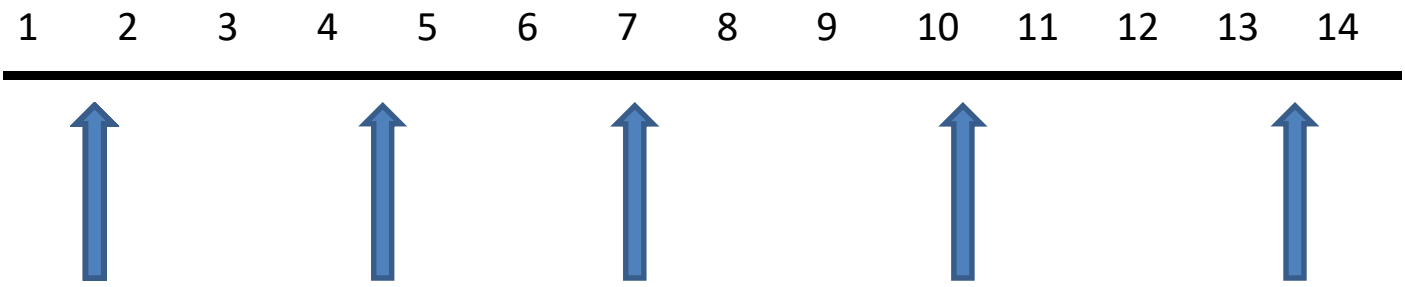
	REACTS WITH	EXTRACTION METHOD	COST OF EXTRACTION
Potassium			MOST/LEAST EXPENSIVE
Sodium			
Calcium			
Magnesium			
Aluminium			
Carbon			
Zinc			
Iron			
Tin			
Lead			
Hydrogen			
Copper	UNREACTIVE		
Silver			
Gold			
Platinum			MOST/LEAST EXPENSIVE

Use the answers to the questions below to fill in the grid. The answers will spell out a word mystery word down the grid. Can you work it out?



1. An _____ has a pH of 8 or higher.
2. Acid can _____ metal, stone and other substances
3. An _____ can tell us whether something is an acid or alkali
4. A _____ has a pH of 6 or lower.
5. A _____ alkali has a pH of over 12
6. A _____ acid has a pH of about 6.
7. A _____ fruit is acidic
8. A _____ substance turns universal indicator green.

Label the pH scale below, add colours of Universal indicator and examples:



Reacting Metal Carbonates with Acids

Metal Carbonate + Acid ⟶ Salt + Water + Carbon Dioxide

For example: Calcium Carbonate + Nitric Acid ⟶ Calcium Nitrate + Water + Carbon Dioxide

Now you have a go:

Magnesium carbonate + Hydrochloric Acid ⟶ _____ + _____ + _____

Sodium Carbonate + Nitric Acid ⟶ _____ + _____ + _____

Calcium Carbonate + Sulphuric Acid ⟶ _____ + _____ + _____

Potassium Carbonate + Hydrochloric Acid ⟶ _____ + _____ + _____

Lithium Carbonate + _____ ⟶ Lithium Sulphate + _____ + _____

Reacting Acids and bases

Acid + Metal oxide → salt + water OR Acid + Metal hydroxide → salt + water

For example: Lithium Hydroxide + Sulphuric Acid ⟶ Lithium Sulphate + Water

Your turn:

Sodium Hydroxide + Hydrochloric Acid ⟶ _____ + _____

Magnesium Oxide + Sulphuric Acid ⟶ _____ + _____

Calcium Hydroxide + Nitric Acid ⟶ _____ + _____

Challenge:

Can you write symbol equations for these reactions?