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Photocopy Master Sheets

Years 7-8

Elements & Compounds

Disk filename = “05.Elements”

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Year 7-8 General Science

Disk Filename	Topic Name
01.Energy	Energy
02.Forces	Forces
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04.Mixtures	Separating Mixtures
05.Elements	Elements & Compounds
06.Cells	Living Cells
07.Life	Living Things
08.LifeSystems	Plant & Animal Systems
09.Astronomy	Astronomy
10.Earth	The Earth
11.Ecosystems	Ecosystems

Year 9-10 General Science

Disk Filename	Topic Name
12.Waves	Wave Energy (inc. Light)
13.Motion	Forces & Motion
14.Electricity	Electricity
15.Atoms	Atoms & Elements
16.Reactions	Compounds & Reactions
17.DNA	Cell Division & DNA
18.Evolution	Evolution of Life
19.Health	Health & Reproduction
20.Universe	The Universe
21.EarthScience	Earth Science
22.Resources	Resources & Technology

Year 11-12 Science Courses

Biology

Preliminary Core
Local Ecosystem
Patterns in Nature
Life on Earth
Evolution Aust. Biota
HSC Core
Maintain. a Balance
Blueprint of Life
Search for Better Health
Options
Communication
Genetics:Code Broken?

Chemistry

Preliminary Core
Chemical Earth
Metals
Water
Energy
HSC Core
Production of Materials
Acidic Environment
Chem.Monit.&Mngment
Options
Shipwrecks, Corrosion...
Industrial Chemistry

Earth & Envir. Science

Preliminary Core
Planet Earth...
Local Environment
Water Issues
Dynamic Earth
HSC Core
Tectonic Impacts
Environs thru Time
Caring for the Country
Option
Introduced Species

Physics

Preliminary Core
World Communicates
Electrical Energy...
Moving About
Cosmic Engine
HSC Core
Space
Motors & Generators
Ideas to Implementation
Options
Quanta to Quarks
Astrophysics

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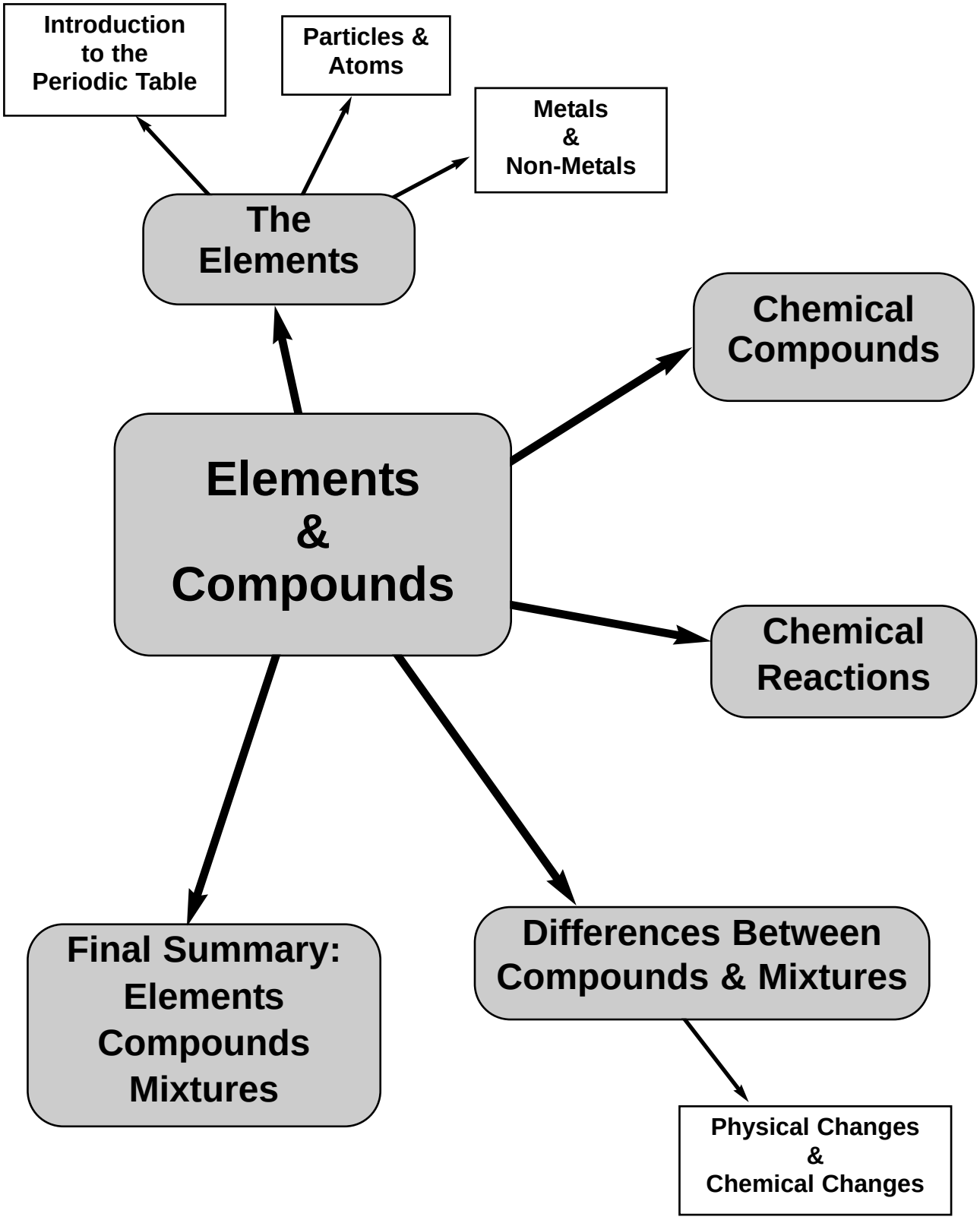
"Mind-Map" Outline of Topic

This topic belongs to the branch of Science called "Chemistry". Chemistry is the study of matter and materials. Chemistry looks at the properties of substances, and how substances can change into new forms.



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Make your own "Mind-Map" TITLE PAGE.
Cut out the boxes. Sort them into an appropriate lay-out on a page of your workbook, then glue them down. Add connecting arrows and colour in.

Elements & Compounds

Final Summary: Elements Compounds Mixtures

Metals & Non-Metals

Particles & Atoms

Differences Between Compounds & Mixtures

Introduction to the Periodic Table

Physical Changes & Chemical Changes

The Elements

Chemical Reactions

Chemical Compounds

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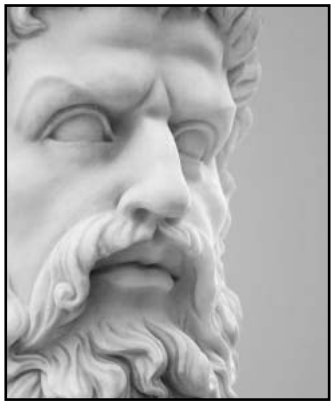
What Are the Chemical "Elements"?

To answer that, you must know about some history...

The Ancient Greeks

Much of our civilization's foundations such as government, democracy, citizenship, education and schools, (blame them!) drama, law, public health and medicine, etc, can be traced back to the Greek civilization which flourished over 2,000 years ago.



One of the most influencial thinkers of the time was Aristotle (384-322 BCE). He was one of the first people (that we know of) to try to answer the question "what is everything made of?".

He decided that everything was made of just 4 basic constituents, or "elements"; earth, water, air and fire.

"Element" means the most basic, simple thing.

About 1,000 years later, some great thinkers in the Islamic cultures carried on developments in Mathematics and Science. Among other things, they invented "Alchemy".

Alchemy in the Middle Ages

Alchemy was partly practical experimenting and partly mystical magic. The basic aim of alchemy was to "transmute" common metals into gold, and to find chemicals which could make someone immortal. From the alchemists we get our legends of sorcerers like Merlin the Magician.

Many alchemists were crooks who used various "magical" tricks to fool people into giving them money. From this, alchemy got a very bad name.

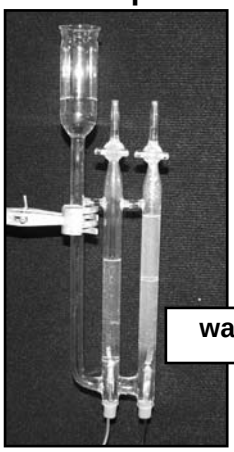
However, the alchemists did discover many facts about solids, liquids and gases. They invented processes like distillation, filtration and crystallisation and discovered new dyes and other useful substances.

One of the important processes they developed was decomposition. This means to break a substance down into simpler, more basic parts.

Alchemy becomes Chemistry

Some substances could never be decomposed any further, no matter what was done to them. These became known as "chemical elements"... the most basic substances of all matter.

For example, when electricity was discovered, it was found that water (one of Aristotle's elements) could be decomposed into simpler substances.



You might see this equipment demonstrated in class.

Using electricity, water can be broken down into 2 gases, hydrogen and oxygen.

water ⟶ hydrogen + oxygen

No matter what you do, hydrogen and oxygen cannot be decomposed into anything else.

By about 1800, Alchemy had became the modern science of Chemistry.

No more magic. Chemistry is based on the idea that there are certain substances which are the simplest and most basic. These "elements" can be understood scientifically in terms of particles, forces and energy, and chemical reactions.

That's what this topic is about.

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The Chemical Elements

How Many Elements?

We now know that about 90 chemical elements occur naturally on Earth. Another 20 (or so) can be made artificially in nuclear reactors.

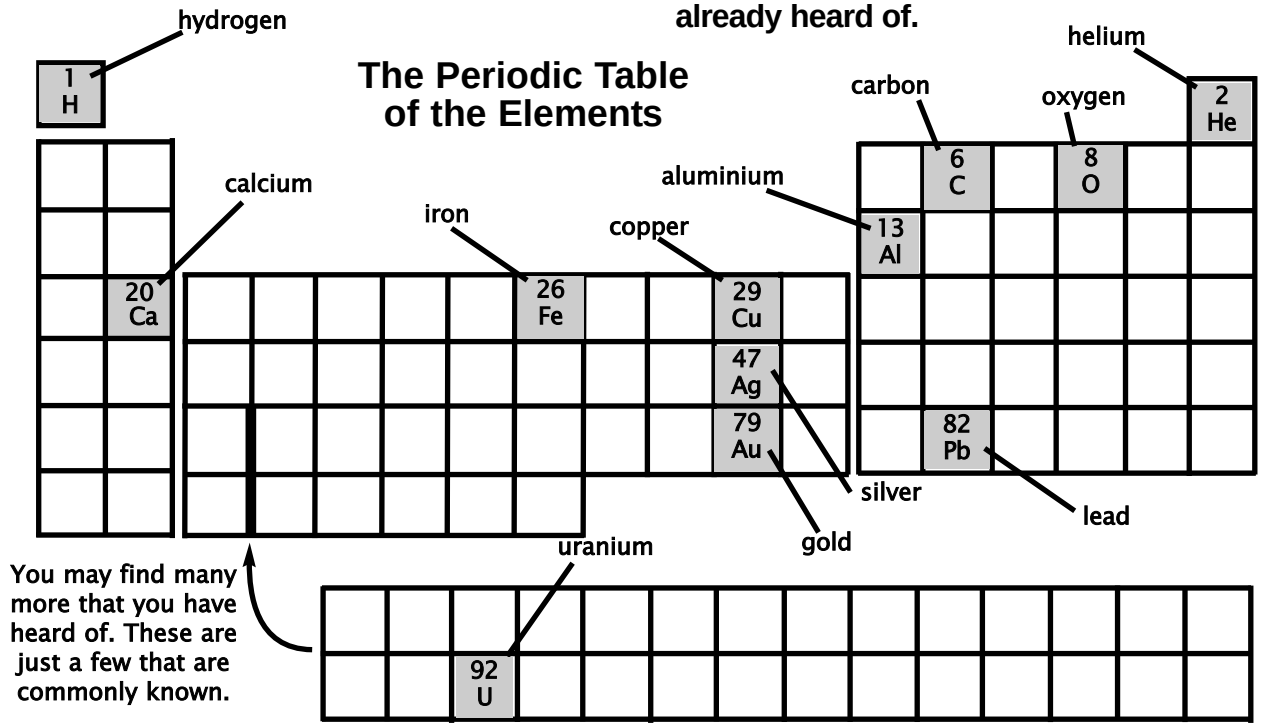
Of these elements, many are very rare. All the familiar substances on Earth are composed of only about 20-30 of the most common elements.

The Periodic Table

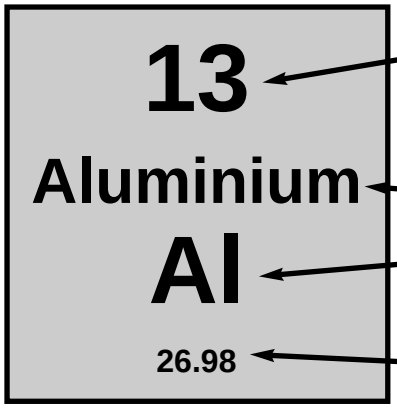
The best way to learn about the elements is to study the "Periodic Table", which is a special list of all the elements.

Your teacher may give you a copy, or show you a wall chart.

The first thing to do is to look through it and see how many elements you have already heard of.



How to read the information



"Atomic Number"
Each element is numbered, in order, across each row and then down the table. This puts the elements in a numerical order, but it also gives information about atoms... details later.

Name of the Element

Chemical Symbol
Each element has a short-hand symbol. It is always one capital letter, OR if 2 letters, always a capital followed by a lower case letter.

"Atomic Mass" This number gives the mass, or weight, of an atom of this element.

Why is the table such an odd shape?

Why not put the elements in a simple rectangular box table?
The Periodic Table has this shape so that elements that are similar to each other are under each other, or in "groups" and "blocks'.
It is called "periodic" because it has patterns that re-occur in a regular pattern.
You will learn these patterns as you learn more about Chemistry.

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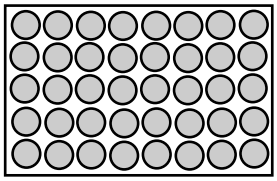
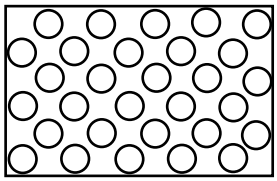
The Elements & Particle Theory

One Type of Particle = Element

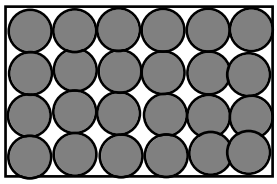
An element is a substance made entirely of identical particles.



Element 1



Element 2

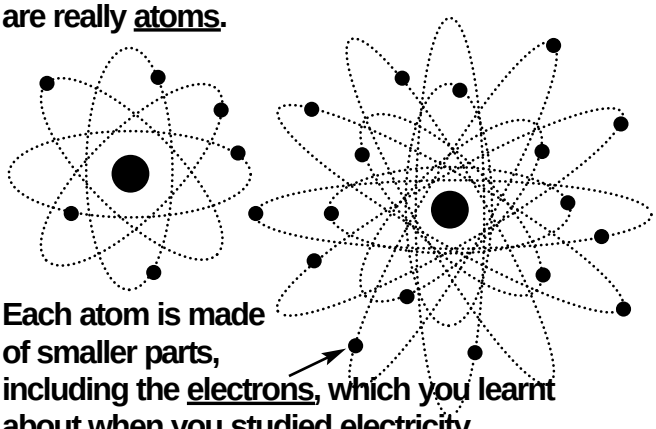


Element 3

The particles within each element are all the same.
The particles of one element are different to the particles of another element.

What is the difference between the particles of different elements?

You are already aware that these "particles" are really atoms.



Each atom is made of smaller parts, including the electrons, which you learnt about when you studied electricity.

You will learn more about the parts of atoms, and the structure of atoms at a later stage. For now, just know that every atom of a particular element contains a fixed number of electrons.

Number of Electrons = Atomic Number

The Atomic Number shown in the Periodic Table tells you how many electrons each type of atom has. So, hydrogen has 1, helium has 2, uranium has 92, and so on.

Definitions for What is an "Element"

To summarise some important ideas covered so far, you should note that we now have a variety of ways to define "element".

An element is a pure substance which cannot be decomposed into anything simpler.

An element is a substance entirely made up of identical particles.

At this stage, you should learn both the definitions above.

The information below is also very useful.

Each element is composed of atoms which have the same number of electrons.

The number of electrons is equal to the element's Atomic Number.

Different elements have atoms with different Atomic Numbers and different numbers of electrons.

Technological Inventions Affect Science

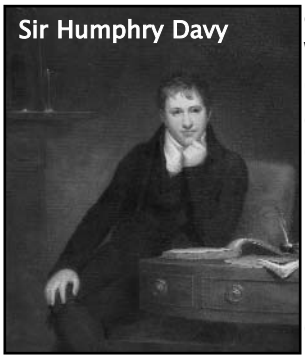
Starting about 200 years ago, the new Science of Chemistry went through a period of rapid development. One of the main areas of progress was the discovery of many new chemical elements. These discoveries were made possible by a new technology... Electricity.

Volta's Pile

The Italian scientist Alessandro Volta had discovered that the strange energy called electricity could be made using metal plates separated by paper soaked in salt solution. The device was called "Volta's Pile".

In fact, he had invented the electrical battery. No-one had any idea why it worked or what electricity was.

Humphry Davy (English, 1778-1829) experimented with this new technology and found that it could decompose chemicals.



Davy's Discoveries

Using the new and mysterious forces of electricity, Davy began decomposing chemical substances.

Some substances were thought to be elements, but Davy decomposed them. Therefore, they were really compounds, and he discovered new elements within them. Eventually, he almost doubled the count of known chemical elements and set Chemistry on a new course.

Davy died relatively young, probably from the effects of breathing toxic fumes from his experiments.

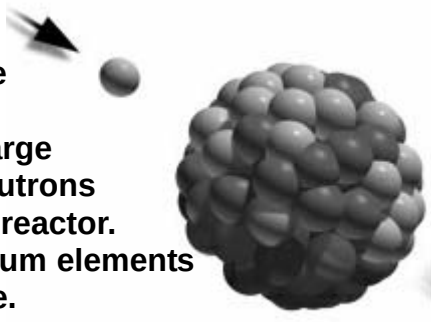
Modern Research to Find New Elements

If you read a Science text from 50 years ago, it will probably state very definitely that there are exactly 92 chemical elements. Look at a modern Periodic Table and it will list well over 100.

Trans-Uranium Elements

The largest atoms which occur naturally on Earth are those of uranium. For many years it was believed that atoms larger than uranium could not exist.

When nuclear reactors were first built (tight military secrets to start with) it was discovered that atoms larger than uranium could be made artificially by bombarding large atoms with neutrons in the nuclear reactor. All trans-uranium elements are radioactive.



The manufacture of some "trans-uranium" elements is now routine. Element 95, Americium, is made for use in everyday devices such as smoke detectors.

Elements up to No.118 have been confirmed to exist, but they have not been named above No.111 because only about 3 single atoms of some have ever been made.

Warning label on a household smoke detector

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The Chemical Symbols for the Elements

It will help future learning if you begin to learn the chemical symbols for some of the common elements.

As you study them, you may notice something that needs to be explained.

Some Logical Symbols

Most elements have chemical symbols that match their name:
e.g. Ca = calcium, N = nitrogen, etc.

Some Make No Sense

What about **Na = sodium, Pb = lead, or Fe = iron**. These seem to make no sense. What is the reason for this?

It is all a matter of history.
The elements with "nonsense" symbols are mostly those that were known to the alchemists, and used to have different names.

Their modern symbols still refer to their old names. (Mostly Latin) Examples:

Element	Old Name	Symbol
iron	ferrum	**Fe**
silver	argentum	**Ag**
copper	cuprum	**Cu**
gold	aurum	**Au**
lead	plumbum	**Pb**

(from which we get "plumber", a lead-pipe worker)

Worksheet 1
The Elements

Fill in the blanks

Student Name.....

The ancient Greek, a)..... believed that everything was made of 4 "elements"; earth, air, b)..... and .....

The aim of Alchemy was to turn ordinary metals into c)..... and to find a chemical which could make a person d).....

While searching for these impossible chemicals, the alchemists discovered many new chemicals and invented equipment and processes such as filtration and e).....

By learning to break chemicals down into the simplest parts ("f).....") the true concept of a chemical element was finally discovered.

We now know there are about g)..... naturally occurring elements. These are listed on the h)..... Table. Each element has its own unique i)..... and j)..... number.

An element can be defined as a substance composed of atoms which are k)..... ..... It can also be defined as a substance which cannot be l)..... into anything simpler.

Each element's atoms have the same number of m)..... This number is equal to the n)..... ..... shown on the Periodic Table.

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Worksheet 2

Elements & Periodic Table

Student Name.....

Search the Periodic Table and find the information to complete the table

Element Name	Chemical Symbol	Atomic Number	Number of Electrons in each atom
Zinc			
Krypton			
	Ne		
	Ba		
		15	
		74	
			11
			53
Fluorine			
		79	
	Am		

Worksheet 3

What's in a Name?

Student Name.....

1. At least 6 of the elements were named after countries (or places) of the world. Search the Periodic Table and find 2.

Name	Atomic No.
.....	.....
.....	.....

2. About a dozen elements have been named in honour of famous scientists. List 2 of these. (hint: very high atomic numbers)

Name	Atomic No.
.....	.....
.....	.....

3.

Some minerals have been named because they contain a lot of certain elements, or the element was named after being discovered in that mineral. Can you find them?

Mineral	Element	At. No.
Calcite	.....	.....
Fluorite	.....	.....
Beryl	.....	.....
Zircon	.....	.....

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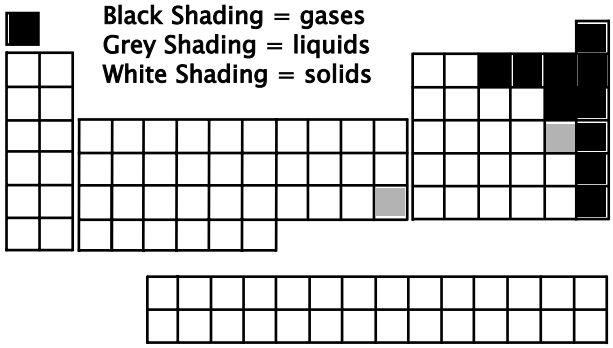
Worksheet 4
Classifying the Elements

Student Name.....

Solid, Liquid or Gas?

The vast majority of the elements are solid at "room temperature".
About a dozen are gases.
Only 2 are liquids.
(In Chemistry, "room temperature" is defined to be 25ºC)



1.
Use the information in this table, and refer to a Periodic Table to list all the elements which are <u>liquids</u> at room temperature.

Atomic Number	Name	Symbol
.....	.....	.....
.....	.....	.....

2.
Use the information above, and refer to a Periodic Table to list all the elements which are <u>gases</u> at room temperature.

At. No.	Name	Symbol	At. No.	Name	Symbol
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....

Another Way to Classify the Elements: Metals & Non-Metals

You might do some <u>Practical Work</u> in the laboratory to investigate the different properties of substances which we call "<u>metals</u>" and those which are not.

The important questions are:

Is the substance shiny, or dull?

Is it a conductor of electricity?

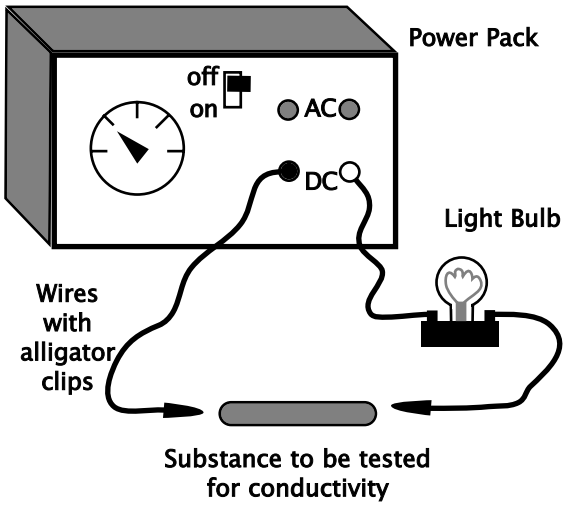
Can it be flattened into flexible sheets, or drawn out into flexible wires, or not?

Basically, if the answer to all 3 questions is "YES", then the substance is a metal.

If 2 or more answers are "NO", then it is a non-metal.

You might do the test on each substance to find out if it conducts electricity. The equipment to do this is shown below.

If the bulb lights up, then the test item is an electrical conductor. If not, it's not.



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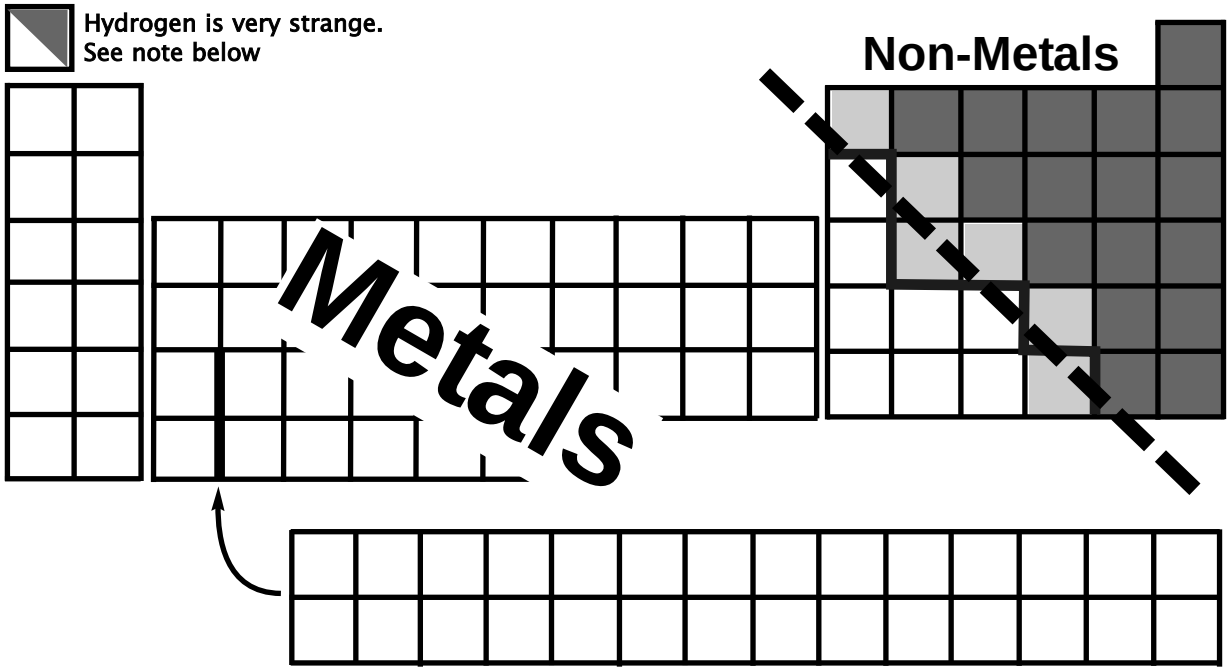
Metals & Non-Metals on the Periodic Table

If you have examined some elements in the laboratory, you will now have a good idea of the differences between metals and non-metals.

Metals	Non-Metals
Shiny appearance	Most not shiny (some exceptions)
All solids (except liquid mercury)	Some solids, many gases, 1 liquid
All are good conductors of electricity	Most are poor conductors of electricity (important exception = carbon)
All are good conductors of heat	Most are poor conductors of heat
All are malleable, and ductile **	Brittle, not malleable nor ductile

In the Periodic Table, the metals and non-metals are in different parts of the table as shown below. The dotted line is the approximate dividing line.
You can see that most of the elements are metals. The 20-odd non-metals are clustered in the top-right corner of the table.

Some of the elements near the dividing line (shown here in lighter shading) have some characteristics of metals, and are a bit "in-between".
For now you can consider them as non-metals.



Hydrogen has all the physical characteristics of a non-metal, but it can also behave chemically like a metal. That's why it is usually shown detached from the main table... it doesn't fit in with the others.

****Malleable** means it can be hammered or pressed by rollers and flattened into sheets.
Ductile means it can be pulled out so it will stretch into wires, especially if hot.
Try this with a solid non-metal and it will shatter or snap.

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Worksheet 5
Metals & Non-Metals
Fill in the blank spaces

Student Name.....

Most of the elements are metals. They typically have these properties:

They are a)..... in appearance.

They are good b)..... of both electricity and c).....

They are d)....., which means they can be flattened into sheets.

They are e)....., which means they can be drawn out into wires.

At room temperature, they are all f)....., except the liquid metal g).....

In contrast, the non metals are generally:

h)..... in appearance.

poor i)..... of electricity.

j)....., which means they will shatter or snap if hammered or stretched.

Many are solids, but there are also many k)..... and 1 liquid.

In the l)..... Table, the non-metals are clustered in the m)..... (top or bottom) n)..... (left or right)

Worksheet 6
Useful Elements

Student Name.....

1.
We use the element <u>copper</u> for electrical wires. Which 2 typical properties of a metal make it suitable for this use?

2.
Aluminium is familiar to you in the form of <u>aluminium foil</u>. Which property of metals allows thin sheets of aluminium to be made like this?

3.
Pure <u>iodine</u> is a solid non-metal, in the form of shiny, purple crystals. What do you expect to happen if you were to tap it with a hammer? Explain.

4.
Silicon is an element used to make "silicon chips" for computer circuits. Silicon is <u>shiny</u>, <u>brittle</u> and a "<u>semi-conductor</u>" of electricity. On balance, should we classify silicon as metal or non-metal? Explain.

5.
<u>Helium</u> is a gas with such low density that it can make balloons rise into the air.
a) Why do you think it has such a low density?

b) There is one other element which can also lift balloons. Name it.

c) Of these 2, helium is preferred. Find out why.

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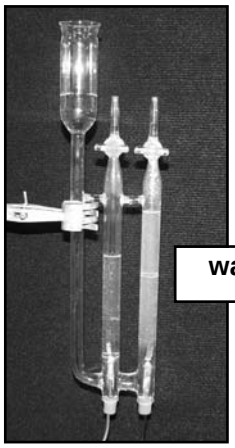
Chemical Compounds



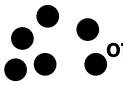
It was previously mentioned that water can be <u>decomposed</u> into the <u>elements</u> hydrogen and oxygen.

water ⟶ hydrogen + oxygen

You may also be aware that scientists used the **<u>chemical formula</u> H_2O** to describe water.

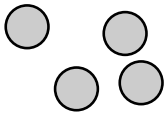
Does this mean that water is a <u>mixture</u> of hydrogen and oxygen? **NO !!**

If the element hydrogen is represented by this particle diagram:



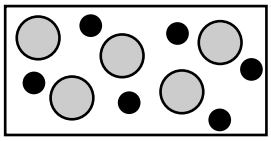
particles (atoms) of hydrogen

and oxygen is represented by:



particles (atoms) of oxygen

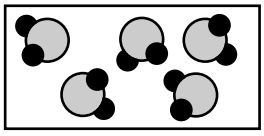
then a <u>mixture</u> of hydrogen and oxygen would be:



This is not water!

The diagram for water would be:

H_2O molecules



Each "particle" of water is made of an oxygen atom with 2 hydrogen atoms strongly attached to it. Particles like this, made of 2 or more atoms joined together, are called "**<u>molecules</u>**".

The atoms are not just mixed. They are "**<u>chemically bonded</u>**" together in a fixed ratio of 2:1. You will learn later how chemical bonding works... for now think of it as a strong force which joins the atoms together.

Compounds Have Different Properties Compared to Their Elements

If you <u>mix</u> 2 substances together, the mixture usually has characteristics of both of its parts.

For example, if you mix salt and water, the mixture still looks like water and it still tastes like salt... it is like both things.

When 2 elements combine to make a compound, it is a <u>totally new substance</u>.

<u>For example</u>:
Hydrogen = explosive, low-density gas.
Oxygen = gas which we need to breathe.

Water = clear liquid, good solvent.
Won't explode! Don't try to breathe it!

This is how just a few dozen common elements can make many thousands of different substances around us. Each combination of elements makes a substance with totally new and different properties.

<u>Another example</u>:
"Salt" is the compound "<u>sodium chloride</u>", with <u>chemical formula</u> NaCl.

Sodium = soft, shiny, silver-grey metal.
Chlorine = yellow-green, poisonous gas.

Salt = white crystals. Good on chips!

The compound is a new substance, totally different to the elements that are combined to make it.

Notice that many compounds have a common name, <u>and</u> a chemical name which describes the elements within.
e.g. "salt" is sodium chloride.
"water" is hydrogen oxide.

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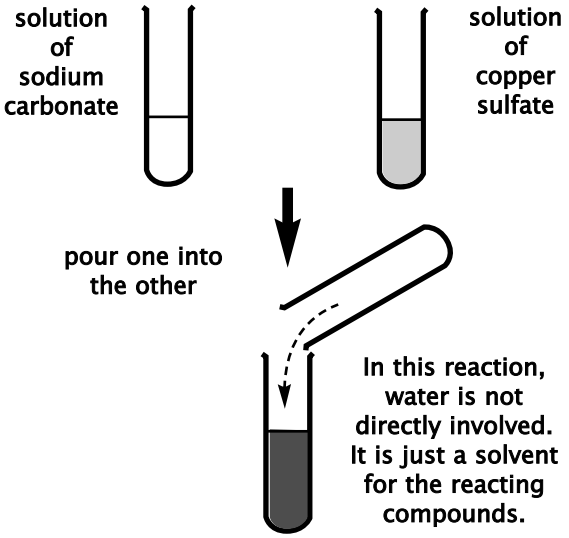
Chemical Reactions

**A chemical reaction alters the way atoms are bonded together.
The atoms are re-combined in new ways, and new substances are made.
The numbers of atoms, types of atoms and the total weight of material is still exactly the same as it was before the reaction, but new substances have been made by changing the way the atoms are bonded together.**

**How do you know when a chemical change has occurred?
The best way to learn that is to observe some chemical reactions.
You might do, or see, these reactions, or others similar.**

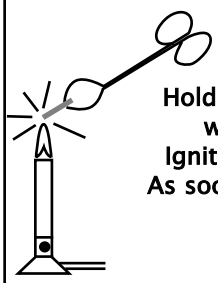
Mixing 2 Dissolved Chemicals



Observed Changes
Change of colour.
Clear solutions become a cloudy suspension.

Follow all Safety Directions your teacher gives you.

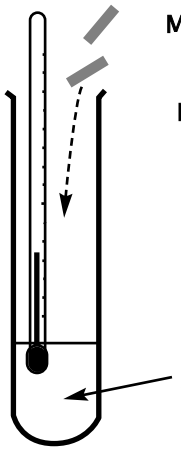
Burning Magnesium metal



Hold a piece of magnesium with a pair of tongs.
Ignite it in a bunsen flame.
As soon as it lights, remove it from the flame.

Observed Changes
Hot, bright flame.
Magnesium is replaced by a new substance... a white powder.

Acid Reacts With Magnesium



Measure the temperature of the acid first.

Drop in one or two pieces of magnesium.

Check the temperature again at the end.

Observed Changes
Temperature rises.
Bubbles form, because a gas is produced.
Magnesium is "eaten away" and disappears.

Signs of a Chemical Change

If you observe a number of chemical reactions, you will see that the same sorts of changes happen again and again.

- **Original substance(s) disappear.**
- **New substance(s) appear. This may involve:**
  - **changes of colour.**
  - **gas is made which causes bubbles.**
  - **change from solution to suspension.**
- **The temperature changes. In some cases there may be flames, as a substance burns.**

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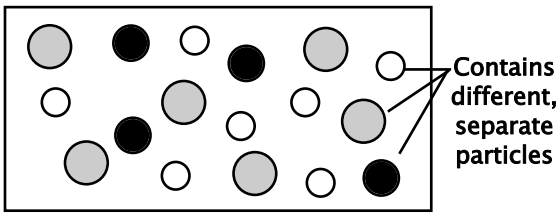
The Differences Between Compounds & Mixtures

Mixtures

A Mixture of 3 Elements



A mixture is not "pure" because it contains a variety of types of particles.

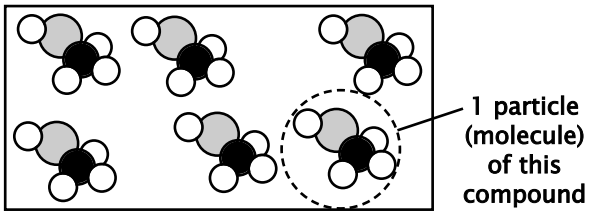
In a mixture, the parts may be mixed in any proportions, so its composition can vary.

The properties of a mixture are a "blend" of the properties of the parts of the mixture.

A mixture can be separated by <u>physical</u> means (e.g. filtering, distilling)

Compounds

A Compound of 3 Elements



A compound is "pure" because there is only one type of particle present.

In a compound, the elements are "bonded" together in a definite, fixed ratio. This ratio is shown in the chemical formula. e.g. CH_4O

A compound has unique properties which are different to those of its elements.

A compound cannot be separated into parts by any physical process.

A compound can be separated into its elements by <u>chemical decomposition</u>.

Physical Changes

Physical changes are those which change only the <u>shape</u>, <u>size</u>, or the <u>state</u> of a substance, or the way things are <u>mixed</u>.

The "particles" in the substance are not changed, and no new substances are formed

<u>Physical Changes include</u>:

- **changes of state** — melting, evaporation, condensation, etc
- **breaking something into bits (e.g. smashing a rock into powder)**
- **separating a mixture** — sieving, filtration, distillation, etc

Chemical Changes

Chemical changes involve <u>chemical reactions</u> which create new substances.

The atoms are re-combined in new arrangements, forming new molecules.

Chemical bonds within molecules are broken, and new bonds are formed.

<u>Chemical Changes include</u>:

- **combustion (burning)**
- **decomposition (breaking down)**
- **changes that cause colour changes, release of heat, bubbles of gas, etc.**

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Worksheet 7
Compounds & Reactions
Fill in the blank spaces

Student Name.....

A compound is formed when 2 or more a)..... combine. The atoms are not just mixed but are chemically b)..... together to form a new particle called a c).....

The elements always combine in a fixed d)..... which is described by the chemical e)..... for that compound. For example, H_2O means that there are 2 atoms of f)..... and 1 atom of g)..... in each molecule of h).....

The properties of a compound are usually i)..... compared to the properties of the elements in the compound.

When a chemical reaction occurs, the atoms remain the same, but are j)..... to form new substances. The signs of a chemical change are that:

- original substance(s) k).....
- new substance(s) l)..... This may show as a change of m)....., or n)..... of a gas.
- the o)..... changes.

Compounds are p)..... substances and cannot be separated by any q)..... process. They can be chemically split into r)..... by the process of s).....

Worksheet 8
Reading Chemical Formulas.
Physical & Chemical Changes.

Student Name.....

1. For each compound below, state which elements are present, and how many atoms of each are in 1 molecule. <u>The first one is done for you</u>.

a) Water, H_2O contains:

2 atoms of hydrogen & 1 atom of oxygen

b) carbon dioxide, CO_2 contains:

.....

c) aluminium chloride. $AlCl_3$ contains

.....

d) ethane, C_2H_6 contains

.....

e) copper sulfate, $CuSO_4$ contains

.....

2. For each change described, state if it is a physical change, or a chemical change.

a) melting ice .....

b) burning paper .....

c) grinding sugar to a powder .....

d) collecting clear water by filtering mud .....

e) decomposing salt to sodium and chlorine .....

f) mixing two solutions which change colour and form a sediment .....

g) water is heated so that <u>bubbles</u> of steam form .....

h) water is zapped with electricity so that bubbles of hydrogen and oxygen form .....

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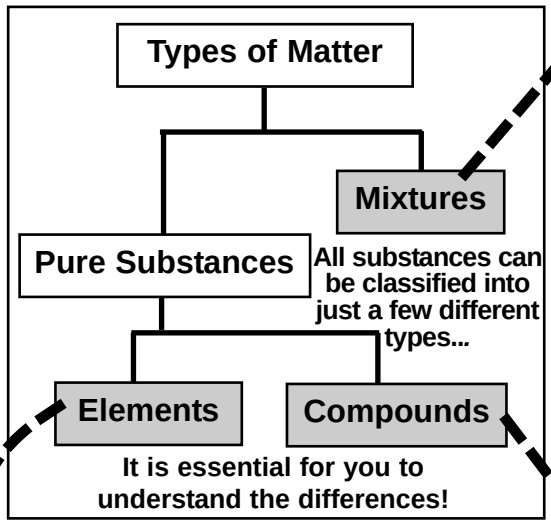
A Final Summary: Elements, Compounds & Mixtures

The information on this page is absolutely vital to your future education in the area of Chemical Science. Do yourself a favour and learn it now!

Every substance is either an element, a compound, or a mixture



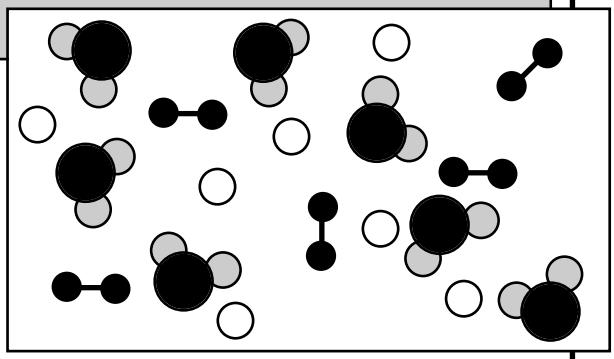
Mixtures

Not pure.
(Different particles within.)

Variable composition and properties.

Can be separated into parts by physical processes.
(filtering, distilling, etc)

May contain elements and/or compounds within the mix.



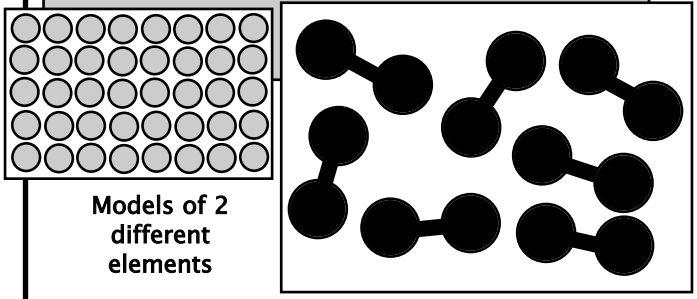
Elements

Pure.
Only one type of atom present.

Each has a unique set of properties.

Listed on the Periodic Table, with its own symbol and Atomic Number.

Cannot be separated into parts by any physical or chemical process.



Models of 2 different elements

Compounds

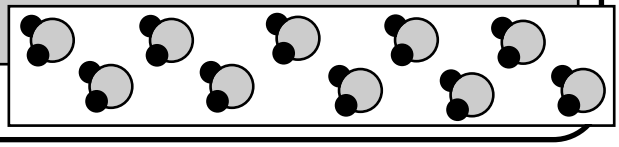
Pure.
Only one type of particle present.

Each has a unique set of properties.

Contains 2 or more elements, chemically bonded together in a fixed ratio.

Cannot be separated into parts by any physical process.

Can be separated into its elements by chemical decomposition.



Topic Test
Elements & Compounds

Student Name.....

Score / 22

Answer all questions in the spaces provided.

1. (8 marks)

True or False? (T or F?)

a) Alchemy was mainly concerned with making gold. .....

b) There are about 20-30 chemical elements. .....

c) The atoms of an element are all the same as each other. .....

d) An element can be chemically decomposed into simpler things. .....

e) Every metal is a solid at room temperature. .....

f) Non-metals are found on the left side of the Periodic Table. .....

g) A compound contains elements chemically bonded together. .....

h) Compounds can be decomposed into elements. .....

2. (6 marks)

a) The ancient Greek, Aristotle, believed that everything was composed of just 4 basic substances, or "elements". Name 2 of Aristotle's elements.

..... and .....

b) If the atoms of 2 different elements are represented by these symbols, ○ ●
use a sketch to show:

i) a mixture of these elements.

ii) a compound of these elements.

c) List 2 things you might observe or measure which indicate that a chemical reaction has occurred.

3. (5 marks)
Give one word for:

a) a substance which cannot be separated by any physical processes, but can be decomposed chemically into simpler substances.

.....

b) the general name for a shiny, malleable element which conducts electricity.

.....

c) a substance which can be separated into parts by physical processes.

.....

d) the property of being able to stretch a substance to form wires.

.....

e) a substance which cannot be decomposed into any simpler substances.

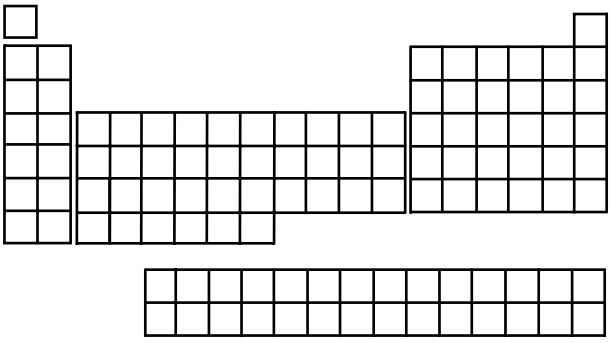
.....

4. (3 marks)
Answer each part by clearly marking the blank Periodic Table as instructed.

a) Write "a" where you would find an element which is a gas at room temperature.

b) Rule a straight line to show the approximate dividing line between the "metals" and the "non-metals". Indicate on which side of the dividing line the "metals" are located.

c) Write "c" to show the location of the element with Atomic Number = 11.



Answer Section

Worksheet 1

a) Aristotle b) fire and water
c) gold d) immortal
e) distillation / crystalisation, etc
f) decomposition g) 90
h) Periodic i) symbol
j) Atomic k) identical
l) decomposed m) electrons
n) Atomic Number

Worksheet 2

Zinc	Zn	30	30
Krypton	Kr	36	36
Neon	Ne	10	10
Barium	Ba	56	56
Phosphorus	P	15	15
Tungsten	W	74	74
Sodium	Na	11	11
Iodine	I	53	53
Fluorine	F	9	9
Gold	Au	79	79
Americium	Am	95	95

Worksheet 3

1.
Any 2 of Germanium (32), Francium (87), Polonium (84), Europium (63), Americium (95), Californium (98)

2.
Curium (96) and Einsteinium (99) are best known, but also elements 100 - 109.

3.

Calcium	20
Fluorine	9
Beryllium	4
Zirconium	40

Worksheet 4

1.

35	Bromine	Br
80	Mercury	Hg

2.

1	Hydrogen	H
2	Helium	He
7	Nitrogen	N
8	Oxygen	O
9	Fluorine	F
10	Neon	Ne
17	Chlorine	Cl
18	Argon	Ar
36	Krypton	Kr
54	Xenon	Xe
86	Radon	Rn

Worksheet 5

a) shiny b) conductors
c) heat d) malleable
e) ductile f) solids
g) mercury h) dull (not shiny)
i) conductors j) brittle
k) gases l) Periodic
m) top n) right

Worksheet 6

1. ductile & electrical conductor

2. malleable

3. It would shatter. Being a non-metal it is brittle, not malleable.

4. non-metal. Although it is shiny like a metal, it is brittle and not a good conductor.

5.
a) Its atoms are very small & light weight.
b) Hydrogen
c) Hydrogen is explosively inflammable, so helium is much safer to use.

Worksheet 7

a) elements
b) bonded
c) molecule
d) ratio
e) formula
f) hydrogen
g) oxygen
h) water
i) totally different
j) re-arranged
k) disappear
l) appear
m) colour
n) bubbles
o) temperature
p) pure
q) physical
r) elements
s) decomposition

Worksheet 8

1.

a) 2 atoms of hydrogen & 1 atom of oxygen
b) 1 atom of carbon & 2 atoms of oxygen
c) 1 atom of aluminium & 3 atoms of chlorine
d) 2 atoms of carbon & 6 atoms of hydrogen
e) 1 atom of copper, 1 atom of sulfur & 4 atoms of oxygen

2.

a) physical
b) chemical
c) physical
d) physical
e) chemical
f) chemical
g) physical
h) chemical

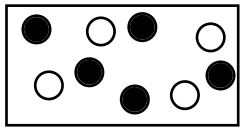
Topic Test

1.

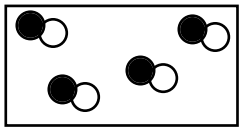
a) T b) F c) T d) F e) F f) F
g) T h) T

2.

a) earth, air, fire, water (any 2)
b) i) (separate, different particles)



ii) (identical molecules, each one made of different atoms bonded together)



c) (any 2)
• Original substance(s) disappear.
• New substance(s) appear.
• Temperature changes (as energy is released or absorbed)

3.

a) compound
b) metal
c) mixture
d) ductility, or substance is ductile
e) element

4.

a) “a” at any one of the positions shown
b) aprox. as shown. metals to <u>left</u> of line.
c) as shown