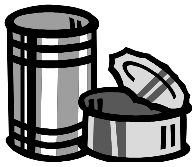


Useful

Substances

Name:___________

Like the ochre used in cave paintings and sacred ceremonies by Aboriginal people for tens of thousands of years, ancient humans used other Earth materials every day. Tools, weapons, rock shelters and ceremonial objects, all made from rock materials, were as essential to them as food and water.
A resource can be defined as anything that is useful to humans. Natural resources include soil, water, wind and materials from mining. The ways in which we use these resources have changed, and we have become more demanding of our planet as our society has developed.

Once water was used only for drinking and washing. Now we use it to generate electricity.

The wind once pushed huge sailing ships around the world. Now it also generates electricity, pushes windsurfers, pumps water and lifts hang-gliders.
Mining provides metals for cutlery, railway tracks and electrical wiring. Coal, oil and gas from deep under the ground power our cars, heat our homes and make most of our plastic products.

This book you are reading now could not have been produced without these resources. Computers were used when the writers looked up information in a library and on the Internet. They were used for word processing and when the typesetter and designer laid out the final pages. Computers are made from metals, plastics, glass and silicon microchips, all of which are manufactured from materials found in the Earth. They also need electricity generated by coal, gas or water. Then there is the paper from trees grown in soil, and finally other resources from the Earth are used to make the inks, plastics and other chemicals needed to produce this book.

Group activity

Some resources are said to be 'renewable', and others are classified as 'non-renewable'. What do you think these two terms mean? Discuss which of the following would be 'renewable' and which would not: oil, iron ore, wind, water, soil, sunlight, and timber. Does everyone agree?

In the following space write down your groups definition of 'renewable', and 'non-renewable'

Renewable:

____

____

____

____

Non-renewable:

____

____

____

____

Activity

1 What is a resource?

2 Who might have been the first people to use the wind as a resource? How might this have happened?

3 Name three objects made, or dependent on, natural resources that you have used today. Include something you ate, something you put on your body and something you operated with a switch. State how the resources were used in each case.

Where do get our resources

We think of the Earth under our feet as being a solid, unchanging structure. But this is not quite true. The Earth is not completely solid and it changes a great deal.
The outer layer of the Earth, on which we live, is called the **crust**. The crust is much thicker under the continents than under the oceans. Continental crust is between 25 and 40km deep. Oceanic crust is between 5 and 10km deep. These distances may sound quite large, but they are tiny compared with the size of the Earth. The radius of the Earth is about 6378km, so the crust is just a very thin skin on the surface. The thin oceanic crust is much denser than the thick continental crust.

The Earth's structure

The Earth is divided into three parts:

1 **The crust** is the outer layer of the Earth. It is made of hard rock. It varies in thickness from 8 km below the oceans to 40 km below the continents. The Earth's surface is not smooth. It has hills, mountains, valleys, oceans and deserts on it.

2 **The mantle** is a rocky layer under the crust and takes up most of the Earth's volume and is made of partially molten rock. It is 2900 km thick and its temperature varies from 500°C to 2200°C.

3 **The core** is the centre of the Earth. It consists of the outer core and the inner core. The core does not melt or boil because the weight of the rest of the Earth is pushing down on it. The inner core is 1200 km thick and is a ball of iron and nickel. Its temperature is almost 10000°C.

Geologists recognise two other layers:

1 **The lithosphere:** is the outside layer of the Earth. It consists of pieces of crust called plates that move very slowly over the surface of the Earth. The lithosphere is made of solid rock. The continents are part of these plates.

2 **The asthenosphere:** is the part of the Earth that moves the plates. It is the bottom of the crust and the top of the mantle. It is slowly moving. It provides the driving force that pushes the plates over the surface of the Earth.

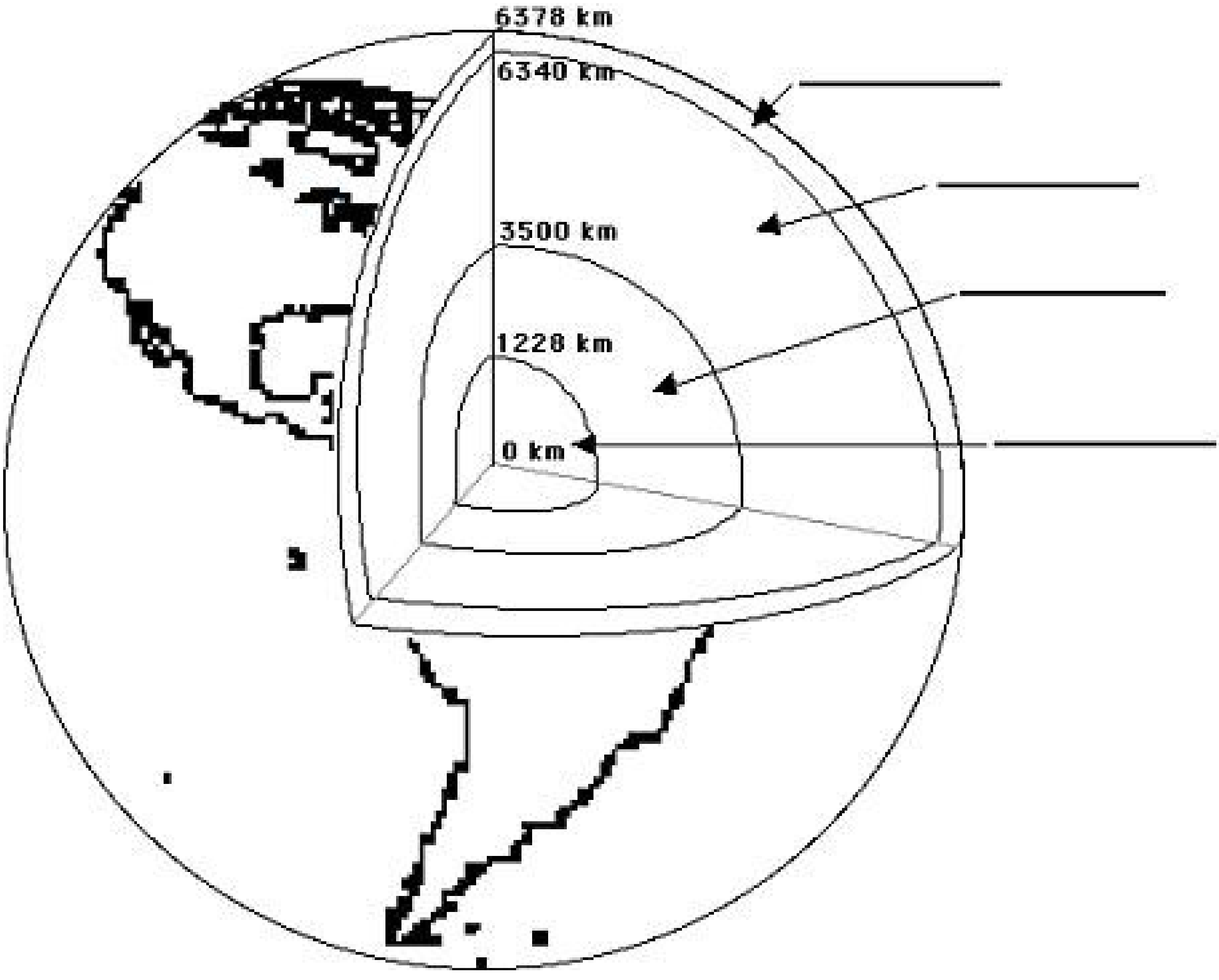
Other layers that are important to us are:

1 **The atmosphere:** This layer of gases surrounds the Earth. The atmosphere is densest at the Earth's surface and gets thinner as you go higher.

2 **The biosphere:** living things inhabit this layer. It extends underground into the deepest parts of the oceans and many kilometres up into the atmosphere.

3 **The hydrosphere:** This is the layer of water around the Earth. It includes the oceans, rivers, lakes, as well as the water in the ground and rocks, and the vapour and ice high in the sky.

Colour and label the following diagram.



Match the following names of layers with their meanings.

Name of the layer	Meaning
A. Lithosphere	1. The layer of water around the Earth
B. Asthenosphere	2. The layer inhabited by living things
C. Biosphere	3. The part of the Earth that moves the plates
D. Hydrosphere	4. Outside layer of the Earth that consists of pieces of crust

A	B	C	D

1 Write the names of the four layers of our planet, beginning from the centre.

________________ ________________ ________________ ________________

2 Which other two layers are recognised by scientists?

____________________________ ____________________________

Class Activity
If all the materials needed to make anything you want are in the earth, **Why** did it take so long for humans to use metals to make tools?

Before you can answer that question, you need to know the question.
Think about all of the substances around you. They include the paper of this book, the ink in the print, the air in the room, the glass in the windows, the wool of your jumper, the cotton and polyester in your shirt or dress, the wood of your desk, the paint on the walls, the plastic of your biro, the hair on your head, the water in the taps and the metal of the chair legs. The list could go on and on. There are millions and millions of different substances in the world. All substances can be placed in one of three groups-, elements, compounds or mixtures. **Elements** are substances that contain only one type of atom. Very few substances exist as elements. Most substances around us are either **compounds or mixtures.**

- Compounds are usually very different from the elements of which they are made. In compounds, the atoms of one element are chemically joined together (very tightly) to the atoms of another element or elements. The elements that make up a compound are completely different substances from the compound. For example, common table salt (sodium chloride) is a compound made up of the elements sodium (a silvery metal) and chlorine (a green, poisonous gas).

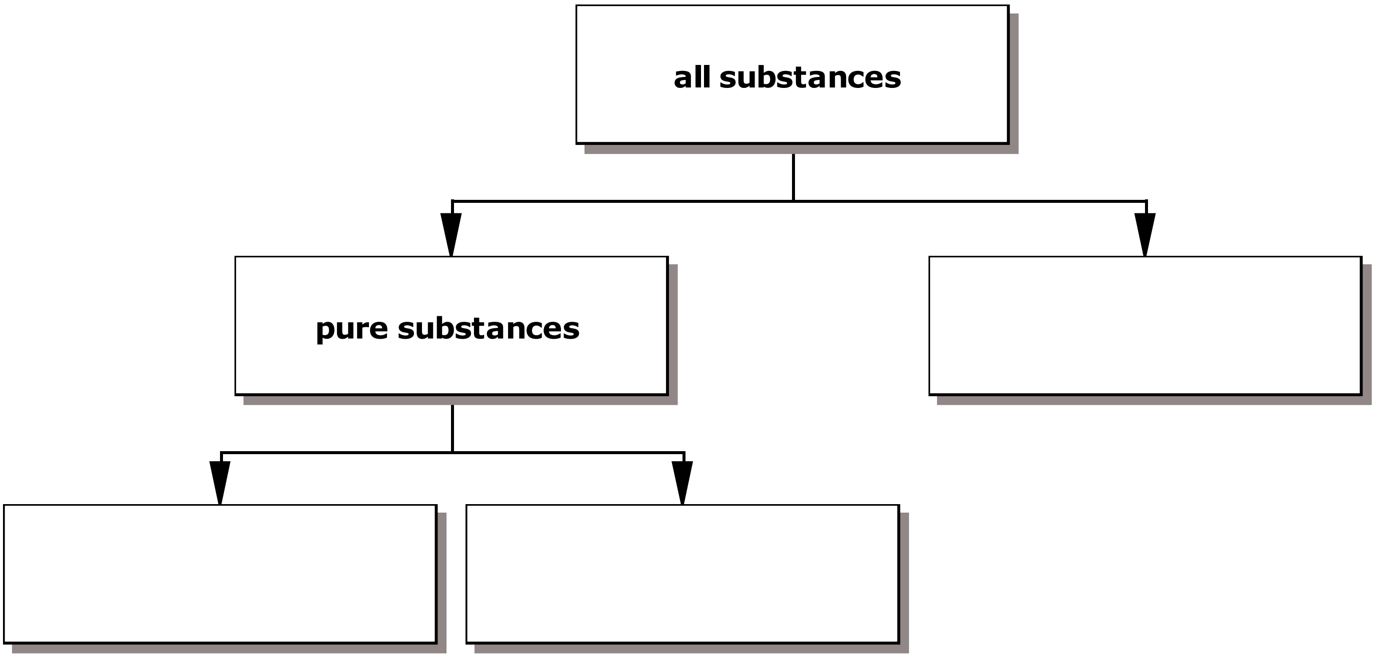
- Mixtures can be made up of two or more elements, two or more compounds or a combination of elements and compounds. The substances that make up mixtures can usually be easily separated from each other. When the parts of a mixture are separated, no new substances are formed. Fizzy soft drink is a good example of a mixture. It contains water, gas, sugar and flavours. If you shake the soft drink, the gas bubbles separate from the water and go into the air. You still have the water in the bottle and the gas in the air; they are just not mixed together any more. The parts of the mixture can be separated quite easily. The gas escapes when the lid of the container is opened, and the water can be separated by evaporation, leaving behind sugar and some other substances.

When the atoms of different elements **bond** together, a compound is formed. When heated together, the elements iron and sulfur form a new compound called iron sulfide. Iron sulfide has the formula FeS. Every compound has a formula made up of the symbols of the elements that make it up. Unlike mixtures, the elements within a compound cannot be easily separated from each other.

Some common substances

Substance	Type	Composed of:	Scientific name
Gold	Element	Gold	Gold
Diamond	Element	Carbon	Carbon
Water	Compound	Hydrogen and oxygen	Dihydrogen oxide
Table salt	Compound	Sodium and chlorine	Sodium chloride
Brass	Mixture	Copper and zinc	Brass
Soft drink	Mixture	Water, sugar, carbon dioxide and other compounds	
Sea water	Mixture	Water, sodium chloride and other compounds	

Complete this classification chart using the words
MIXTURES, ELEMENTS and COMPOUNDS



Complete these sentences

(a) A ________________ is a substance that cannot be broken down into simpler substances. Some examples are ____________, ______________ and _____________

(b) A pure substance that can be broken down into simpler substances is called a ______________. An example is ____________________.

(c) Groups of atoms joined together are called ___________________.

(d) Elements combine to form _________________.

Match the two lists below.

has one kind of atom	atom
short way of writing an element's name	compound
smallest part of an element	element
two or more elements combined	molecule
smallest part of a compound	symbol

Anything in common

There are many ways of classifying elements. For example, you could divide them into solids, liquids and gases or into **metals and non-metals.** Elements are classified on the basis of their physical features or properties. Properties such as **lustre** (shine), **malleability** (ability to be bent), **ductility** (ability to be drawn into a wire) and **conductivity** (ability to conduct heat and electrical energy) are used to separate metals from non-metals.

Metals

The metals have several features in common:

- They are solid at room temperature, except for mercury, which is a liquid.
- They can be polished to produce a high shine or lustre.
- They are good conductors of electricity and heat.
- They can all be beaten or bent into a variety of shapes. We say they are malleable.
- They can be made into a wire. We say they are ductile.
- They usually melt at high temperatures. Mercury, which melts at minus 40° Celsius, is one exception.

Non Metals

Only twenty-two of the elements are non-metals. At room temperature eleven of them are gases, ten are solid and one is liquid. The solid non-metals have most of the following features in common:

- They cannot be polished to give a shine like metals; they are usually dull or glassy.
- They are **brittle,** which means they shatter when they are hit. They cannot be bent into shape.
- They are usually poor conductors of electricity and heat.
- They usually melt at low temperatures.
- Many of the non-metals are gases at room temperature

The metalloids

The eight metalloids have properties between those of metals and non-metals. They are also called semiconductors. Chemists often use a 'staircase' line to divide metals and non-metals on the periodic table. The metalloids are either side of the 'staircase'. They are the 'elements in between'.

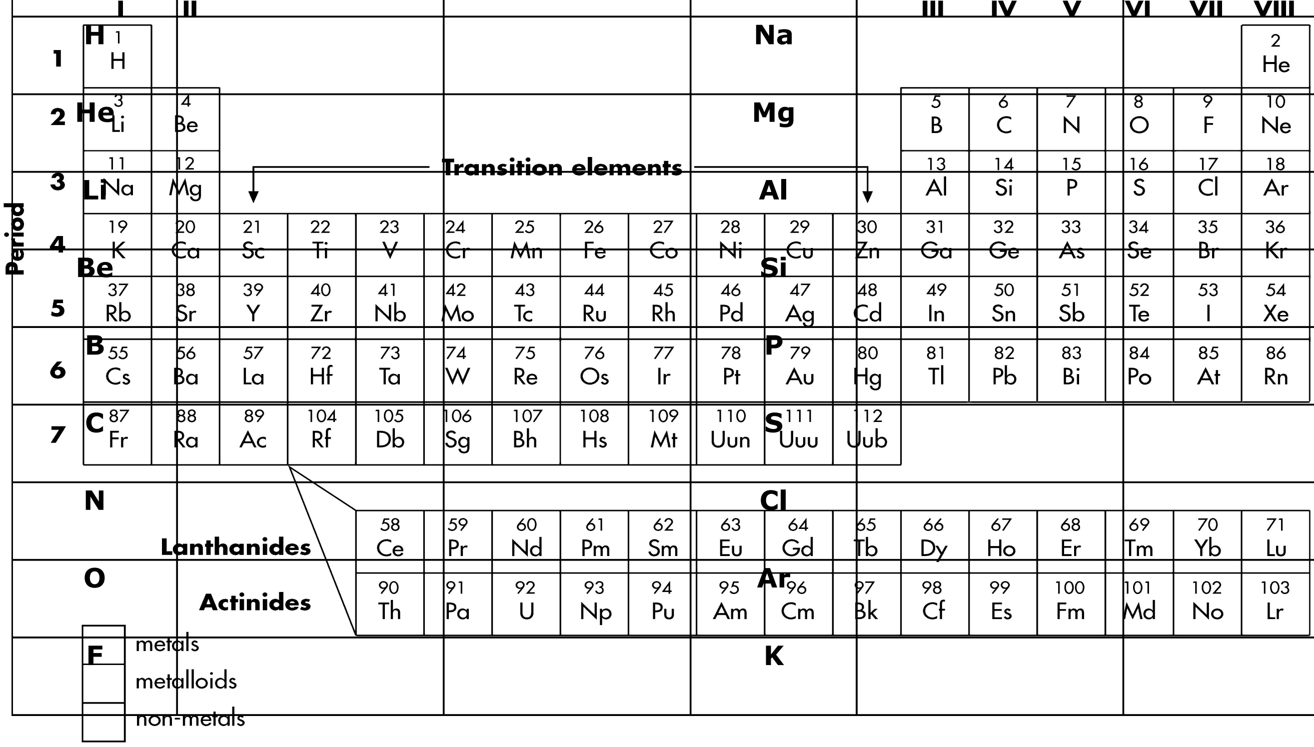
Germanium and silicon have similar properties: part metal, part non-metal. Shiny to look at, grey or silver in colour, they are easy to break (brittle). They are typical metalloids. They are also semiconductors used in transistors and solar cells. They have revolutionised the electronics industry through their use in computer chips and communication

Complete the following table

Property	Metals	Non-metals
Conductivity of heat		
Conductivity of electricity		
State		
Lustre		
Malleability		
Ductility		
Colour		

Colour the follow periodic table

Element	Name	Metal, Non-metal or metalloid	Element	Name	Metal, Non-metal or metalloid
H			Na		
He			Mg		
Li			Al		
Be			Si		
B			P		
C			S		
N			Cl		
O			Ar		
F			K		



Fill in the following Table

Table of metal

A table of common metals

Metal	Symbol	Properties	Uses
Aluminium	**Al**	Soft, light, good electrical conductor, corrosion resistant	Cans, foil food wrap, power lines, roofing materials, boat hulls, aircraft
Cast iron	**Fe**	Hard, brittle, magnetic, easily corroded	Steel for the construction industry, engine parts, tools
Copper	**Cu**	Malleable, soft, good electrical conductor, good conductor of heat, corrodes slowly	Water pipes and tanks, roofing, electric wiring
Gold	**Au**	Soft, malleable, ductile, very dense, low melting point, good electrical conductor, corrosion resistant	Jewellery, electronic circuits
Lead	**Pb**	Soft, malleable, very dense, low melting point	Plumbing, flashing, leadlight, ingredient in solder, car batteries
Nickel	**Ni**	Hard, magnetic, corrosion resistant	Ingredient in alloys for coins, jewellery and stainless steel
Silver	**Ag**	Malleable and ductile, soft, low melting point, good electrical conductor, corrosion resistant	Jewellery, silverware, coins
Tin	**Sn**	Malleable and ductile, soft, corrosion resistant	Tin plate, corrosion-resistant coatings, ingredient in solder
Zinc	**Zn**	Hard, low melting point, corrosion resistant	Ingredient in brass, corrosion-resistant coatings (galvanising)

Revision on Physical and Chemical Change

The changes to materials that we see around us can be classified as either **physical changes or chemical changes.**

During a physical change no new substances are formed. Some of the properties (characteristics) of the substances change, but the substance are still the same. A change in the size, shape or state (solid, liquid or gas) of a substance is a physical change.

Examples of physical changes include chocolate melting, glass bottles breaking and the filament in a light globe glowing white-hot. One feature of physical changes is that they can usually be easily reversed. Melted chocolate can be changed back into solid chocolate. Broken glass can be recycled into a new bottle and when the electricity is turned off the filament in the light globe returns to its usual appearance.

In a chemical change, one or more new substances are formed. For example, when wood burns, smoke and colourless gases form, leaving behind ash (carbon). These are new substances different from those originally present in the wood. When iron tools are left outside, a crumbly brown layer forms over them. The iron combines with oxygen in the air to form a completely new substance, iron oxide (rust). Cooking food is an example of a chemical change. When you boil an egg, bake a cake or barbecue sausages, the carbohydrates, fats and proteins in the foods are changed into new substances.

The following can be used as evidence of a chemical change.

- The production of a gas, when a cake is cooked, the presence of bicarbonate of soda allows carbon dioxide gas to be released, which causes the cake to rise. The gas that is produced tells us that a reaction has taken place.
- A permanent change in colour, the colours displayed when fireworks explode are due to chemical reactions.
- The formation of a precipitate, a precipitate is a solid that forms when two solutions are mixed.
- Energy is either taken in or given off (i.e. heat and light).

Chemical changes are also called chemical reactions. In a chemical reaction the substances you begin with are called the reactants. The atoms that make up the reactants become rearranged in the reaction to form new substances called the products. It is important to understand that no atoms are created or destroyed in a chemical reaction. What do change are the bonds that hold the atoms together. The bonds inside the reactants are broken then new bonds form to hold the atoms together in the products. This breaking of bonds and rearranging of atoms means it is often much harder to reverse chemical changes. Sometimes it is impossible. When a stick of dynamite explodes, releasing heat energy and gases in all directions, it is impossible to reverse the reaction.

Making a Compound
PART A: Testing iron and sulphur

AIM

To make a compound from iron and sulphur.

Materials

- Powdered sulphur
- Iron filings
- Spatula
- Magnet
- Dilute hydrochloric acid (2M)
- 3 small test tubes
- Test tube holder
- Hammer
- Paper towel
- Bunsen burner

Method

1. Place a small amount of iron filings in a test tube. Use a magnet as shown to test whether you can pull the iron filings up the side of the test tube. If you can, then the iron filings are magnetic. Test some sulphur in the same way.
2. Add a few drops of dilute hydrochloric acid to some iron filings in a test tube.
   - Observe what happens.
3. Do the same with the sulphur
4. Put *two* spatulas of sulphur in a test tube, then one spatula of iron filings. Mix them well by shaking the test tube.
   - Test the mixture with the magnet. What do you notice?

Questions and conclusions

1 Did the properties of the iron and sulphur change when you mixed them?

____

____

2 Was there a chemical reaction when you mixed them?

____

3 Have the iron and sulphur formed a mixture or a compound? Explain your answer.

____

____

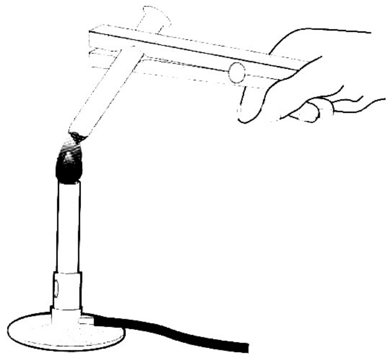
____

PART B: Making iron sulphide Method

1 Heat the test tube containing the iron filings and sulphur over a Bunsen burner. As soon as the mixture begins to glow, take it out of the flame and let it cool.

2 When the tube has cooled, wrap it in a paper towel as shown. Break it by carefully tapping the bottom of the tube with a hammer.
   - Remove the towel and describe the properties of the substance that was in the test tube.
   - Is the substance magnetic?
   - Can you separate the iron and sulphur?

3 Put a piece of the substance in a test tube.
   - What happens when you add dilute hydrochloric acid?
   - Is this the same gas that was formed when you added hydrochloric acid to iron filings?



***Caution:** The fumes from burning sulphur can be dangerous. Be careful not to breathe any of them.*

Questions and conclusions

1 Did the properties of the iron and sulphur change when you heated the mixture?

___

___

2 Was there a chemical reaction? How do you know?

___

___

___

3 What was needed to make the reaction go?

___

___

___

4 Have the iron and sulphur formed a mixture or a compound? Explain your answer.

___

___

___

5 The new substance you have made is called *iron sulphide.* What are the elements in it?

Aim

To find out what substances are produced when water is decomposed (split up) by passing electricity through it.

Materials

- distilled water
- dilute sulphuric acid
- voltameter
- power pack
- *2* test tubes
- taper

Note: *Your teacher will probably do this experiment for you. Instead of a voltameter you can use two test tubes inverted in a beaker of water, with electrodes.*

Method

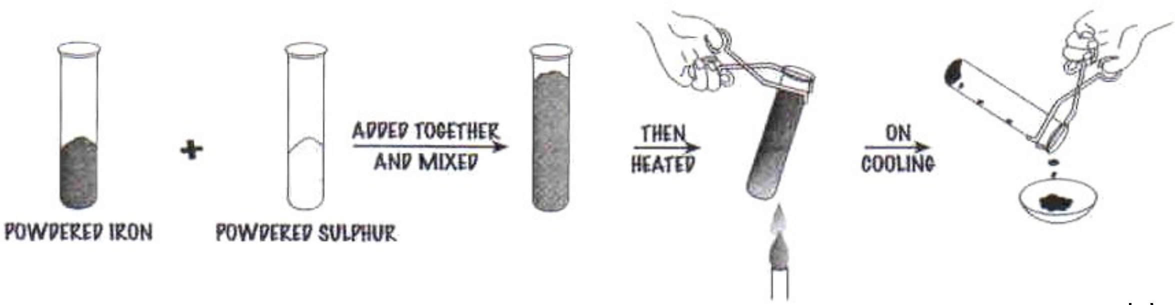
1. Set up a voltameter.
2. Open the taps at the top and add water containing a few millilitres of dilute sulphuric acid to the middle tube. (The acid makes the water conduct electricity more easily.) When the side tubes are full, close the taps.
3. Connect the voltameter to a power pack set on about six volts DC. Turn it on
4. Allow the current to flow, and observe the gases that collect in the tubes.
   - Compare the volumes of the gases in the two tubes.
5. Invert a test tube over the tube with the most gas in it. Then open the tap and collect the gas.
6. Light a taper, tilt the test tube upwards, and put the burning taper near its mouth. A 'pop' indicates the gas is hydrogen.
   - After the 'pop' look for water droplets inside the tube. Where did they come from?
7. Collect a test tube full of gas from the other tube. Light the taper again but blow it out before you put it into the test tube. If the taper bursts into flame again, the gas is oxygen.

Questions and conclusions

1. What were the two gases produced when electricity was passed through water?
2. Copy and complete this sentence: Water is a compound of ____ and ____.
3. The volume of hydrogen produced was twice the volume of oxygen. Suggest a reason for this.
4. When hydrogen burns it combines with the oxygen in the air. Infer what substance is formed. (See Step 5 above.)

Activity

1 When a mixture of iron and sulphur are heated as shown, a compound called iron sulphide is produced



a. What type of change is this? Explain your answer.

b. Write down a word equation for this reaction

2 Silver oxide is heated in a test tube. A word equation for the reaction is as follows.
SILVER OXIDE —>- SILVER + OXYGEN

a. Name the reactants

b. Name the products

c. If the total mass of silver and oxygen was 1O grams, how much silver oxide was there to begin with? Explain your answer.

3 Which of the following are chemical changes? Put a tick next to them.

i) A puddle 'drying up' in the sun

ii) Ice cream melting

iii) Baking a cake

iv) Water condensing on a window

v) Melting butter

vi) Making a cup of coffee

vii) Frying an egg

viii) A car rusting:

Experiment: Extracting Metals from compounds

Aim: To extract metallic lead from lead oxide

Method:

1. Burn the end of a wooden splint in a Bunsen burner flame and put it out under the tap.

2. Dip the wet burnt end of the wooden splint into the sodium carbonate powder. This will assist will assist the reaction to take place.

3. Dip the same end of the wooden splint into the lead oxide then hold the powdered end of the wooden splint in the hottest part of the blue Bunsen burner flame until the mixture glows.

4. Allow it to cool and examine the end of the wooden splint for beads of lead using hand lenes.
5. Draw a diagram.

Conclusion:

Write a conclusion for the experiment.

Chemical building blocks

The ninety-two elements are the building blocks of everything in our world. The atoms of elements can be joined together in a wide variety of ways to produce many compounds. Elements and compounds can be mixed together in many ways to make countless mixtures.

Atoms can join, or bond, in many different ways. In some substances, atoms are joined together in groups called molecules. For example, in oxygen gas, oxygen atoms are joined together in groups of two. In the compound carbon dioxide there is one carbon and two oxygen atoms joined in every molecule. Atoms can join together to form small or large molecules of many different shapes.

Some compounds are not made up of molecules. Instead the atoms bond by lining up one after the other. Common table salt is an example of a substance which is bonded in this way.

MIX AND MATCH

Materials

- Shape hand out
- Scissors
- Pencil
- Ruler

Method

1 large sheet of cartridge paper

- Cut out 25 diamonds, colour green.
- Cut out 30 equilateral triangles, colour red.
- Cut out 15 squares, colour blue.

Imagine that particular shapes represent different types of atoms:

- a blue square = carbon
- a green diamond = oxygen
- a red triangle = hydrogen

By placing them side by side on the sheet of paper you are joining them together. Place two green diamonds next to each other on the sheet. This represents the element oxygen.

Place one blue square on the sheet between two green diamonds. This represents the compound carbon dioxide. Label it with its name and symbol.

Represent and label the following substances:

1. Water, which contains 1 oxygen and 2 hydrogen atoms

2. Methane (natural gas), which contains 1 carbon and 4 hydrogen atoms

3. Benzene (in petrol), which contains 6 carbon and 6 hydrogen atoms

4. Glucose (sugar), which contains 6 carbon, 12 hydrogen and 6 oxygen atoms

5. Hydrogen peroxide (found in hair bleach), which contains 2 oxygen atoms and 2 hydrogen atoms.

1 Which of these compounds contain only hydrogen and carbon atoms?

____

____

2 In what ways are these two substances different to each other?

____

____

3 Which of the compounds contain only oxygen and hydrogen? Do these compounds have the same characteristics?

____

____

4 Think about the appearance of the compound sugar. How does it differ in appearance from the elements from which it is made?

The metal elements that are found inside rocks in or on the ground are joined together with other elements, in compounds and mixtures. The metal elements found in the rocks of the Earth's crust are usually bonded to the element oxygen. One example is iron, which is found bonded to oxygen in the compound called iron oxide. Compounds that are found in the Earth and are not formed by living things are called **minerals.** Iron oxide is a mineral. Rocks that are mined because they contain useful or valuable minerals or elements are called **ores.** It takes a lot of time, money and energy to get the metal elements out of rocks. Mining companies obtain metals from rocks in two separate stages.
Mineral extraction is the separation of minerals from the ores taken from the ground. It involves crushing, grinding and washing to separate the minerals from the unwanted rock
Metal extraction is the process by which the metal is obtained mineral.
There are many different ways of doing this.

Scientific Eye Metals

Video 115b

1. Lead is soft and is also very easy to ________________.
2. Which metal springed back after the masses were removed ________________.
3. After making two springs, one out of steel and one out of lead which one worked best when they were tested? ___________________________
4. Jewellers are searching for certain properties in metals what are they?
    - ____________________________________
    - ____________________________________
    - ____________________________________
    - ____________________________________

5. What machine did the doctors use to take the picture to find the bullet in the mans knee? ____________________________

6. Name two magnetic metals

    - ____________________

    - ____________________

7. How old is Saxon jewellery? _________________ years old.

8. What does the acid do to brass? ____.

9. Name one weak acid? ________________________________.

10. What would be the best two metals to make a lemon battery

    - ______________________

    - ______________________

11. What is the name give when two metals are mixed? ______________________

12. Why is aluminium usually used in alloy and not by itself?

    ____

    ____

    ____

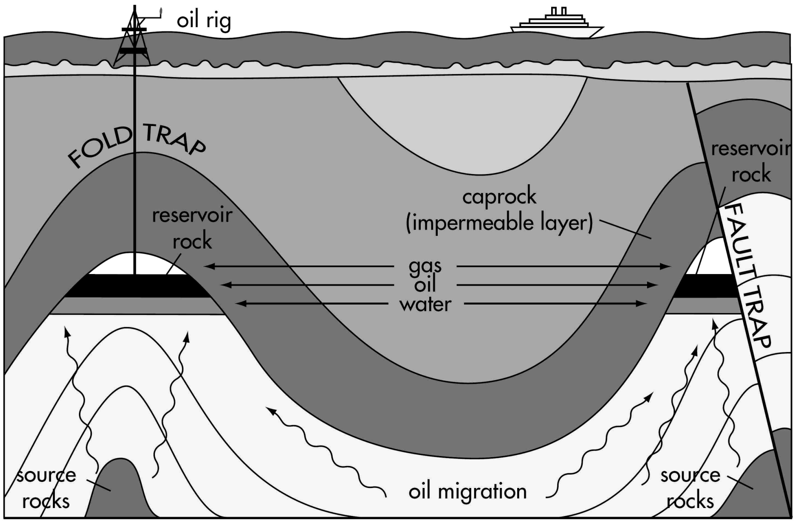
Fossil fuels

Coal, oil and natural gas are referred to as fossil fuels because they formed from the remains of plants and animals that lived millions of years ago. Ancient plants trapped energy from the Sun and converted it into chemical energy using photosynthesis. In turn, the chemical energy was transferred to the animals that ate the plants.

Coal formed from the remains of plants that grew in swamps. When the plants died, they did not decompose completely. During river flooding or sea level changes, sediment was dumped over the swamps and the rotting plant material sealed in a layer. Sometimes the swamps returned, and were buried again. The trapped material went through complex changes due to increasing pressure and temperature. Over time it slowly changed into peat as water was squeezed out, then into forms of coal.

Australia has about 8% of the world's coal reserves. Large deposits of black coal are mined in New South Wales and Queensland. Large deposits of brown coal are mined in Victoria. Coal is mainly used for electricity generation and the production of iron and steel. It is also exported overseas to Japan, Europe and other countries.

Oil and **gas** formed from the remains of ancient marine organisms broken down by bacteria in the absence of oxygen. This took place in layers of buried sediment which compacted over time. The oily mixture gradually seeped up through layers of porous sedimentary rock. If it reached a non-porous layer, it could no longer rise. Structures such as folds and faults caused the oil to accumulate. These are referred to as **oil traps.**



When trapped oil is heated, some of it changes into natural gas.
Australian deposits make up only 0.2% of world oil reserves and 0.3% of world gas reserves. While gas production is currently meeting demand, crude oil production is insufficient for our needs. We import up to 25% of the oil we consume each year. Most of our oil and gas comes from wells under Bass Strait. It is pumped ashore through pipelines to Sale in Victoria. There are large oil and gas fields off the coast of Western Australia and South Australia.

Plastics

You probably own many things made of plastic. Walkmans, CD players, cassettes, pens, toothbrushes and even nylon socks are all made of plastic! Plastics are compounds of carbon that can be moulded into different shapes. The starting materials for making plastics are usually obtained from oil (petroleum).
Plastics are all **polymers,** which means that they consist of very long molecules made by joining many small molecules together, just like a string of beads. The small molecules are called **monomers.** Most plastics are made in laboratories or chemical plants from oil and natural gas. However, a simple plastic can be made from **casein,** the curds that form in milk.

AIM
To make plastic from milk.
MATERIALS
- 100 ml milk
- 5ml vinegar
- Beaker
- Stirring rod
- Sieve
- Paper towel
- Shape to use as a mould
- Hotplate

METHOD
1 Pour the milk into a beaker and warm it on a hotplate. Do not boil.
2 Add the vinegar gradually. Stir until the milk separates into curds (solid) and whey (liquid).
3 Strain the curds (chemically known as the protein casein) and discard the whey.
4 Squeeze out any remaining liquid from the curds.
5 Dry the curds with the paper towel.

6 Pack the curds into the mould and leave for a few days to dry.

Read this passage and then answer the questions below.

For a long time now there has been much talk about the need to reduce the amount of energy we use. Electrical energy is the most convenient form of energy and in this country the majority of electricity is generated in power stations using fossil fuels. Fossil fuels are the fossilised remains of living organisms that died millions of years ago. They are very precious materials since they can also be used to produce plastics and chemicals, two substances that are extremely valuable to us. If we carry on using fossil fuels at the rate we are doing then there is a distinct possibility that one or more of these fossil fuels will run out within your lifetime. One way of saving energy and the precious fossil fuels as well as saving money is to reduce heat energy losses in the home. For a typical house, fibreglass roof insulation in the roof space would cost about $400, but it would save you $80 a year on your heating bill. Draught excluders cost about $40 and they save you $20 a year. Cavity wall insulation costs about $600 with $30 being saved every year and double glazing would cost about $1800 with a saving of $60 a year.

1 Why is electrical energy our most convenient form of energy?

____

____

2 What are the THREE fossil fuels?

____

____

3 Give TWO reasons why fossil fuels are likely to run out in your lifetime.

____

____

4 If you were to install fibreglass roof insulation in your home, how many years would it take before it repaid the money it cost you to install?

____

5 It would take you 30 years to recoup the cost of installing double-glazing. Why then do homeowners install double-glazing?

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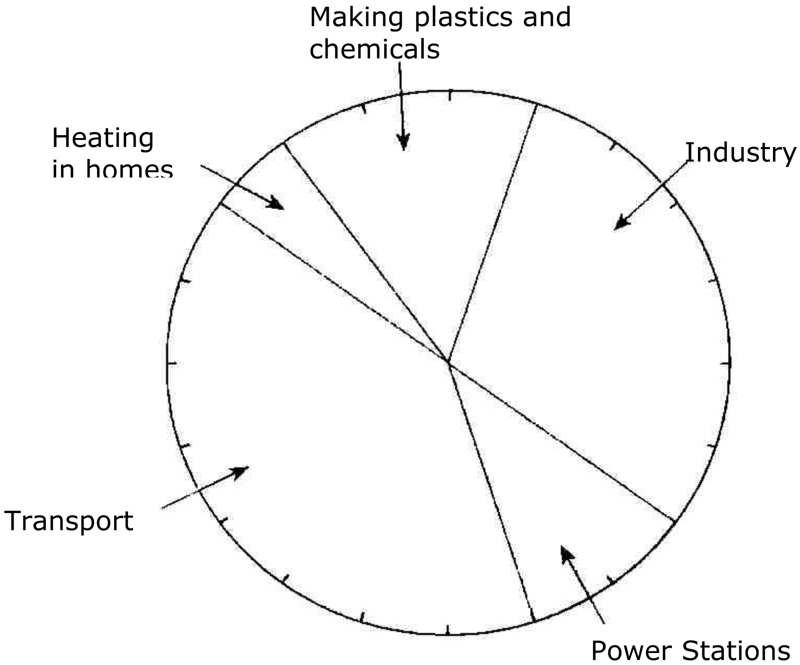
6 Which of the above energy saving methods do you think is the most effective? Explain your answer.

The pie chart below shows the uses of mineral oil in Australia



1 If each division represents 5%, complete the following table

Use	**Industry**	**Power Station**	**Transport**	**Heating in Homes**	**Making Plastics and chemicals**
Percentage of oil used					

2 Draw a column graph to show the above table

Reactivity	Metal	Symbol	Some ore minerals	Treatment to extract metal
Most active	Potassium	K	$KMgCl_{3}6H_{2}0$ (carnallite)	Complex chemical processing, ending with electrolysis (very hard to extract)
	Sodium	Na	NaCl (halite)	
	Calcium	Ca	CaF_2 (fluorite), $CaC0_3$ (calcite)	
	Magnesium	Mg	$MgC0_3$ (magnesite)	
	Aluminium	Al	$Al_20_3.3H_20$ (gibbsite), $Al_20_3.H_20$ (boehmite)	
	Zinc	Zn	ZnS (sphalerite)	Can be extracted by heating with carbon in blast furnace once in oxide form
	Iron	Fe	Fe_20_3 (haematite), Fe_30_4 (magnetite), $Fe_20_3.H_20$ (limonite)	
	Nickel	Ni	$(Fe.Ni)_9S_8$ (pentlandite)	
	Tin	Sn	SnO (cassiterite)	
	Lead	Pb	PbS (galena), $PbC0_3$ (cerussite)	
	Copper	Cu	$CuFeS_2$ (chalcopyrite), Cu_20 (cuprite), Cu (native copper)	
	Mercury	Hg	HgS (cinnabar), Hg (native mercury)	Require heating only
	Silver	Ag	Ag_2S (argentite), Ag (native silver)	
	Platinum	Pt	Pt (native platinum)	Already found free in nature
Least active	Gold	Au	Au (native gold)	

Find each of the following words.

	MALLEABILITY	LITHOSPHERE	RESOURCE
	FUEL	ALUMINIUM	METAL
	SOLID	FOSSIL	CONDUCTORS
	COMPOUND	IRON	BRITTLE
	OIL	LUSTRE	COAL
POLYMERS		ELEMENT	ASTHENOSPHERE

I	S	T	T	C	R	C	O	N	D	U	C	T	O	R	S	Y	I	U	C	L	T	O
O	A	S	T	H	E	N	O	S	P	H	E	R	E	E	E	T	S	S	O	S	O	F
E	R	L	A	T	P	I	S	E	N	L	R	E	R	P	P	I	F	M	A	D	U	L
F	O	I	L	E	P	O	U	L	B	O	M	T	F	L	Y	L	U	N	L	R	R	N
B	O	F	R	F	L	A	L	I	P	I	S	M	L	N	D	I	E	E	U	O	O	Y
B	R	E	O	I	T	L	I	M	L	U	E	E	F	A	L	B	C	O	E	T	N	E
T	E	M	D	N	S	T	T	N	L	E	U	U	M	I	R	A	U	E	T	I	F	A
H	T	S	O	R	R	A	H	R	N	D	E	O	R	L	L	E	I	L	O	M	D	P
E	E	E	I	S	L	O	O	P	O	L	Y	M	E	R	S	L	P	O	B	N	M	U
L	M	M	S	B	U	Y	S	R	L	R	P	L	A	T	T	L	M	M	U	I	L	P
T	S	T	U	P	M	B	P	H	E	L	E	M	E	N	T	A	E	O	F	O	I	M
T	E	T	P	I	P	E	H	I	M	E	T	A	L	T	P	M	P	S	S	E	S	T
I	T	F	I	O	B	U	E	A	L	U	M	I	N	I	U	M	E	E	I	M	S	T
R	R	T	D	E	L	E	R	E	E	L	E	R	E	S	O	U	R	C	E	D	O	E
B	U	I	R	O	N	L	E	U	B	I	I	U	Y	C	O	P	O	O	C	R	F	T
D	D	N	L	I	F	S	H	O	N	I	E	E	U	I	N	E	C	E	D	O	B	H