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ABSTRACT

This resource booklet is designed to supplement standard textbooks used in a science curriculum. The material serves as a syllabus for Year One and Year Two in the secondary science curriculum. Some of the topics presented in this general science syllabus include being a scientist, looking at living things, solvents and solutions, energy, electricity, gases of the air, cells and reproduction, looking at living things, heat, and Earth. The booklet is organized into 12 sections that contain data analysis questions, practical suggestions, and a word search for each topic in the syllabus. Detailed safety and equipment instructions as well as worksheets are provided for each activity. (DDR)

VSO

Data Analysis Questions for Science Subjects:
A Resource Booklet

Series of Caribbean Volunteer Publications

One of a series of publications produced by **VSO** volunteers in the Caribbean. Production funded by a grant from **British Development Division, Caribbean.**

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As teachers recruited for Grenada by Voluntary Service Overseas, we have gained alot from our Grenadian experience. We hope in some small way that our efforts represent a token return.

Neil Finlayson, MacDonald College
Dave Waterman, Grenville Secondary School

January 1988

This resource booklet has been designed to supplement standard science textbooks used in Years 1 and 2 in the secondary schools. In particular it relates to "Starting Science, Books 1 and 2", Fraser and Gilchrist, OUP.

The booklet can be used by teachers and students in several ways:

* Homework assignments for students.

* Introductory teaching of basic concepts.

* Reinforcement of practical work.

* As revision exercises.

The primary aim is to increase students confidence at handling various data forms not only graphs and scientific calculations but also data presented in a written form. Used in the latter way, it could be an aid to students reading comprehension.

SCIENCE SYLLABUS - YEARS 1 AND 2

It is assumed that thirty (30) teaching weeks are available per year and that first and second year Integrated Science are timetabled four (4) periods per week, one of these being a double lab period.

The following suggested teaching outlines relate specifically to the texts "Starting Science, Book 1" and "Starting Science, Book 2", Fraser and Gilchrist, OUP.

Suggested Teaching Outline: Year 1

1.	Being a Scientist - Book 1, 1.1, 1.2, 1.3	7 weeks
2.	Looking at Living Things - Book 1, 2.1	3 weeks
3.	Solvents and Solutions - Book 1, 5.1, 5.2, 5.3, 5.4, 5.5	5 weeks
4.	Energy - Book 1, 3.1, 3.2, 3.3	5 weeks
5.	Electricity - Book 1, 7.1, 7.2, 7.3	5 weeks
6.	The Gases of Air - Book 1, 8.1, 8.2	5 weeks

Suggested Teaching Outline: Year 2

1.	Cells and Reproduction - Book 1, 6.1	3 weeks
2.	Looking at Living Things - Book 1, 2.2 The Gases in Air - Book 1, 8.3, 8.4, 8.5	7 weeks
3.	Cells and Reproduction - Book 1, 6.2, 6.3	3 weeks
4.	Heat on the Move - Books 2, 9.1, 9.2, 9.3, 9.4	7 weeks
5.	Building Blocks - Book 1, 4.1, 4.2	4 weeks
6.	The Earth - Book 2, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7	6 weeks

Format of the Booklet

The booklet consists essentially of 12 sections each containing data analysis questions, practical suggestions and a word search. Each section corresponds to the 12 categories outlined above.

Ice Cream Sales

George runs a small ice cream booth. He sells five different flavours; vanilla, chocolate, guava, coconut and banana. One Saturday George decided to find out which flavour was most popular so he counted the number of ice creams sold of each flavour. His results are shown below.

Flavour	Vanilla	Chocolate	Guava	Coconut	Banana
No. of ice creams sold	10	7	14	16	12

(a) Plot a bar graph of the results.

(b) Which flavour was most popular?

(c) Which flavour was least popular?

(d) What is the total number of ice creams sold?

(e) If each ice cream costs $1.50, how much money did George have at the end of the day?

Long Jump

Joyce, Karen, Brian, Trevor, Shelly-Ann and Morgan had a long jump contest. They measured how far they could jump from a standing start in cm. The results of the contest are shown below.

Name	Joyce	Karen	Brian	Trevor	Shelly-Ann	Morgan
Distance jumped (cm)	170	170	210	190	210	150

(a) Plot a bar graph of the results.

(b) Who could jump the furthest?

(c) How many jumps would Morgan need to make to cover a distance of 6m?

How Much Petrol?

Five different vehicles travelled from Grenville to Sauteurs; a distance of approximately 15 miles. The amount of petrol they used in making the journey was measured and recorded in the table below.

Vehicle	Toyota Bus	Cadillac	Small Motorbike	Fiat	Land Rover
Amount of petrol used (litres)	4	7	1	3	5

(a) Plot a bar graph of the results.

(b) Which vehicle used least fuel?

(c) Which vehicle used the most fuel?

(d) How much fuel do you think the Fiat will use to travel from Grenville to Tivoli, a distance of approximately 5 miles?

(e) When the amount of petrol used by the Toyota bus was measured on another day, it was found to use 5 litres to cover the same journey. Why do you think the results may be different?

Broth Temperature

John decided to measure the temperature of a fish broth which he was cooking in a home economics class. He took the temperature of the broth at 5 minute intervals. Before taking the temperature, he stirred the broth thoroughly. His results are shown below.

Time (minutes)	0	5	10	15	20	25	30	35
Temperature (°C)	30	45	60	76	92	104	105	105

(a) Plot a line graph of temperature against time.

(b) What was the temperature of the ingredients before they started cooking?

(c) How long would it take for the temperature to reach 80°C?

(d) What do you think would happen to the steepness of the graph if

(i) A larger amount of broth were cooked.
(ii) The stove were used on a lower heat.

(f) Why did John stir the broth before taking the temperature?

Fishing

Moses was a fisherman with a small boat. Each day except Sundays and stormy days he went fishing. He always kept a record of the mass of his catch. The record for one September week is shown below.

Day	Mon	Tues	Wed	Thur	Fri	Sat	Sun
Mass caught (kg)	0	25	20	27	21	19	0

(a) Plot a bar graph of the results.

(b) On which day did Moses get his largest catch?

(c) What was the total mass of fish Moses caught for the week?

(d) Can you estimate the mass of fish that Moses might catch in one year?

(e) Why do you think that on Monday Moses caught no fish?

Pendulum

A simple pendulum consists of a mass hanging on a piece of string. This can be made to swing back and forth. Geraldine was interested in how old fashioned clocks worked so she carried out some experiments using a pendulum.

In one of her experiments, she changed the length of the string and for each length she timed how long it took to make 10 swings. Her results are shown below.

Length (cm)	100	90	80	70	60	50	40	30
Time for 10 swings (s)	20	18	16	15	12	10	8	7
Time for 1 swing (s)								

Before attempting question (b) make sure that you can answer question (a).

(a) If 10 oranges cost $5.00, how much does one orange cost?

(b) Complete the table for the time for 1 swing?

(c) Plot a graph of time for 1 swing against length.

(d) What happens to the time for 1 swing as the length is decreased?

(e) How long must the pendulum be for 1 swing to equal 1 second?

Mass of a Lentil

Maria was asked by her teacher to find the mass of one lentil. She placed one lentil on the balance but it didn't move. Esther saw her do this and suggested instead that she try weighing 10 lentils. Maria found the mass for 10, 20, 30, 40, 50 and 60 lentils. Her results are shown below.

Number of lentils	10	20	30	40	50	60
Mass (g)	1	2	3	4	6	6

(a) Plot a line graph of mass against number of lentils.

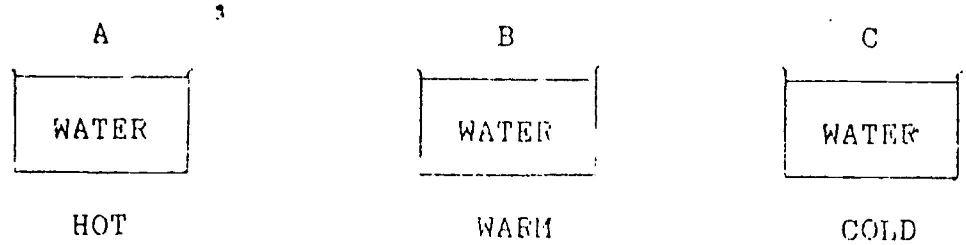
(b) Where do you think Maria made a mistake with her counting?

(c) What is the mass of one lentil? Explain how you arrived at this answer.

(d) How many lentils in (a) 5 g
(b) 10 g
(c) 100 g
(d) 1 kg

Being a Scientist, Book 1, 1.1, 1.2, 1.3

1. Estimating the duration of 1 minute.
2. Estimating lengths (eg/length of bench, length of room).
3. Measuring length of middle finger to produce a class graph (other bodily characteristics could be used; is the tallest person necessarily the person with the longest middle finger?)
4. Measuring regular and irregular areas (eg/foot or hand).
5. Illustrating the need for quantitative measurement of temperature.



Place one hand in A and one in C. Place both hands in B. Is it hot or cold?

6. Measuring the boiling point of water (emphasis on use of thermometer).
7. Find the volume of 250 g of water, sand, flour, sugar and rice.
8. Separation of sand and iron filings.
9. Separation of sand and table salt.

M	B	E	R	T	E	M	I	L	L	I	M
A	C	D	C	T	L	D	E	S	O	P	Q
X	B	N	O	I	T	A	R	T	L	I	F
W	A	O	M	I	N	U	T	E	N	M	L
X	H	C	T	A	W	P	O	T	S	S	E
Y	Z	E	E	O	H	Q	F	R	E	L	M
E	V	S	F	M	N	I	G	J	S	R	I
R	W	V	O	L	U	M	E	S	N	K	N
T	H	E	R	M	O	M	E	T	E	R	G
E	X	L	K	G	H	I	U	T	S	J	P
M	E	R	U	T	A	R	E	P	M	E	T

1. Seeing, hearing, smelling, feeling, tasting.
2. Used to measure temperature.
3. Used to measure time.
4. Small unit of length
5. Unit of time.
6. Measured in degrees celsius.
7. Measured in grams.
8. Measured in cubic centimetres.
9. Process of seperation.
10. He discovered penicillin.
11. Larger unit of time.
12. Larger unit of length.

Growing Beans

Irvine carried out an experiment. He grew bean seeds but he gave each seed a different amount of water each day. After 10 days he measured the height of the plants. His results are shown in the table below.

AMOUNT OF WATER PER DAY (cm)	0	2	4	6	8	10	12	14	16	18
HEIGHT OF PLANT (mm)	0	0	20	120	180	240	250	200	100	0

(a) Plot a bar-graph showing Irvine's results.

(b) How much water is required daily to produce maximum growth?

(c) What amounts of water produced no growth?

(d) Irvine made sure that all the pots he used were the same size. Why did he do this?

Student Heights

Dennis and Sherry-Ann measured the heights of students in their class as they wanted to find out who was tallest. The results they obtained are shown below. They plotted a bar-graph so that their findings could be seen more clearly.

NAME	HEIGHT (cm)
Andy	142
Carol	140
Curtis	150
Debra	170
Felix	162
Wellington	148
Nigel	153
Pamela	163
Kyron	162
Lynette	158
Dionne	154
Zilma	155

(a) Plot a bar-graph of the results.

(b) Why is a bar graph a good way of displaying the results?

(c) Who is the tallest?

(d) How many children are taller than Zilma?

Class_Heights

Sally and Kester decided that they would also measure the heights of children in their class, but they decided to present their results in a different way. Before they could do this they recorded their results in the same was as Dennis and Sherry and then they counted the number of children with heights between 130 cm to 135 cm, 135 cm to 140 cm, 140 cm to 145 cm etc. The constructed the result table using this method.

NAME	HEIGHT (cm)	NAME	HEIGHT (cm)
Carol	168	Marcia	136
Curtis	151	Ted	146
Eric	144	Leslie Ann	151
Pamela	164	Lisa	170
Peter	167	Michael	162
Rholda	152	Ronald	149
Debra	148	Regina	152
Desmond	166	Dionne	142
Jeffrey	132	Sally	153
Andy	152	Arnoste	162
Marlene	147	Marlene	137
Jenny	148	Nigel	146
Beverly	145	Kyron	140
Deanne	136	Kathy	141
Kester	140	Charlie	161

(a) Use the results above to complete a second table in the same manner as Sally and Kester.

(b) What is the total number of children in the class?

(c) Plot a bar-chart with a vertical axis showing the number of children and label the groups along the horizontal axis.

(d) Which group has the greatest number of children?

(e) Who do you think has the better way of displaying their results; Sally and Kester or Dennis and Sally-Ann?

Animal_Sizes

Nigel's uncle worked in the market. He bought animals from farmers to sell as meat on Saturdays. To help him decide how much an animal weighed without using scales, he had a table that told him the approximate weight of an animal from its girth (the distance around the body near the heart). Here is the table he had for sheep.

HEART GIRTH (cm)	MASS (kg)
71	196
74	209
76	222
79	238
81	260
84	282
86	304
89	326
91	348
94	370

(a) Plot a line graph of mass against girth.

(b) What would be the approximate mass of a sheep of girth:

(i) 90 cm
(ii) 80 cm

(c) If a sheep is valued at $1.00 per Kg when alive, what would be the approximate value of a sheep of girth 85 cm?

<u>Kolewoch</u>

The number of Kolewoch on a rock on a beach was counted. The rock was divided into four areas:

Dry and Shady
Dry and Sunny
Wet and Sunny
Wet and Shady

The number of Kolewoch in each area was counted.

AREA	NO. OF KOLEWOCH
Dry and Sunny	4
Dry and Shady	6
Wet and Sunny	14
Wet and Shady	22

(a) Draw a bar graph of the results.

(b) What was the total number of Kolewoch on the rock?

(c) What was the total number of Kolewoch in the wet areas?

(d) Can you think of any possible reasons that could explain the uneven distribution of Kolewoch on the rock?

Looking at Living Things, Book 1, 2.1

1. It is a familiar fact that moths are attracted to light. Is this true of all small creatures. An investigation could be carried out using a simple choice chamber with ants, maggots, snails, congeree etc.

2. The above may also be used with dampness substituted for light. (Use anhydrous copper sulphate to create dry conditions).

3. How do mosquitoes reproduce?

4. How do snails move? (Putting snails on a sheet of damp glass allows their muscle movements to be observed).

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

1. Name for any living thing.
2. Living thing that can move from place to place.
3. Process by which organisms reproduce others like themselves.
4. Glands which produce milk in mammals.
5. Rats, mice etc.
6. Covering on an earthworm's body.
7. Place where animal lives.

Preparing a Saturated Solution of Copper Sulphate

The following statements are all required steps in determining what mass of copper sulphate can be dissolved in 100 cm^3 of water. They are written down in the wrong order. Read through all the statements, then write them down in the correct order.

(a) Add one spatula-ful of copper sulphate crystals to the water.

(b) Record the final weight of the beaker and copper sulphate crystals.

(c) Put 100 cm^3 of water in a beaker.

(d) Continue adding copper sulphate crystals and stirring until no more will dissolve.

(e) Weigh out a large quantity of copper sulphate crystals in another beaker.

(f) Subtract the final weight from the initial weight to obtain the weight of copper sulphate now in solution.

(g) Reweigh the beaker containing only the copper sulphate crystals.

(h) Stir until all the copper sulphate crystals have dissolved.

(i) Record the initial weight of copper sulphate crystals and the beaker.

Solubility Changes with Temperature

Jerome noticed that it was difficult to make juice with very cold water because the sugar would not dissolve well. He decided to compare the effect that the temperature has on the total amount of sugar that can be dissolved in 100 cm^3 of water. He then did a similar experiment with salt. His results are shown below.

Temperature ($^\circ C$)	10	20	30	40	50
Amount sugar dissolved (g)	3	4	5	6	6
Amount salt dissolved (g)	4	6	7.5	9	10.5

(1) Plot a line graph of mass of solute (y-axis) against temperature (x-axis).

(2) Which is the more soluble, sugar or salt.

(3) From the graph
 (a) How much sugar could be dissolved at 25°C?
 (b) How much salt could be dissolved at 32°C?
 (c) At what temperature would 100 cm^3 of water need to be at in order to dissolve a mass of salt equal to the mass of water which can be dissolved at 15°C?

(4) What will happen to the sugar dissolved in 100 cm^3 at 50°C if the temperature of the solution is lowered?

(5) How would the action of stirring affect

 (a) the time taken for the solutes to dissolve?
 (b) the amount of solute which could be dissolved?

Evaporation Times

A comparison of evaporation under different conditions. Andray poured 200 cm^3 of methylated spirits into a measuring cylinder, and 200 cm^3 of methylated spirits into a 1,000 cm^3 beaker. He then put both containers on a sunny window sill and recorded the volume of methylated spirit lost every day. His results are shown below.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Vol. in the measuring cylinder	200 cm^3	195 cm^3	192 cm^3	187 cm^3	183 cm^3	178 cm^3
Vol in the beaker	200 cm^3	185 cm^3	175 cm^3	160 cm^3	144 cm^3	129 cm^3

(1) Plot a line graph of volume of water (y-axis) against number of days (x-axis). Show both sets of results on the same graph. Make sure each line is correctly labelled.

(2) Less liquid evaporated on Day 3. How can you account for this?

(3) How would you expect the rate of evaporation to have changed if water had been used instead of methylated spirit?

(4) Andray's friend Mickey carried out a similar experiment, but he put one container on the window sill and one in a cupboard. Why would his results not be as valid as Andray's?

Rainfall in Grenada, W.I.

A second year class studying weather collected the following rainfall statistics.

Rainfall (mm)	J	F	M	A	M	J	J	A	S	O	N	D
Botanical Gardens (St. George's)	106	131	23	15	118	85	235	296	219	243	328	164
Bocage Estate (St. Mark's)	170	247	71	27	113	128	318	310	336	385	516	270

(1) Plot 2 bar graphs of rainfall (y-axis), each month (x-axis). Use the same scales for both graphs.

(2) What is the total quantity of rainfall in each place over the whole year?

(3) In which month is there (a) most rainfall, (b) least rainfall?

(4) Why do you think there is more rainfall in Bocage in St. Mark's than the Botanical Gardens in St. George's?

Rainfall in Two African Towns

The following statistics show the rainfall in two African towns over a period of one year.

Rainfall (mm)	J	F	M	A	M	J	J	A	S	O	N	D
Town (A) (Entebbe, Uganda)	70	85	160	255	245	125	70	65	65	90	140	130
Town (B) (Timbuktu, Mali)	0	0	5	0	10	20	60	75	40	5	0	0

(1) Plot a bar graph of rainfall (y-axis) for each month (x-axis). Plot both sets of data on the same axis (you can differentiate by shading).

(2) What is the total quantity of rain falling in each place over the whole year.

(3) For each town, in which month is there (a) most rainfall, (b) least rainfall.

(4) Find out from an atlas where these two towns are, then try to explain why the rainfall in Entebbe is much greater than in Timbuktu.

(5) The town of Entebbe is surrounded by tropical rainforest. What do you think would happen to the quantity of rain falling if the forest was chopped down?

Pollution of the Oceans

In 1972, the Norwegian explorer, Thor Heyerdahl sailed across the Atlantic ocean in a boat made from papyrus reeds. The following extract is taken from his book of the voyage. Read the passage then answer the questions below.

Next day we were sailing in slack winds through an ocean where the clear water on the surface was full of drifting black lumps of asphalt, seemingly never-ending. Three days later we awoke to find the sea about us so filthy that we could not put our toothbrushes in it and Abdullah had to have an extra ration of fresh water for his ritual washing. The Atlantic was no longer blue but grey-green and opaque, covered with clots of oil ranging from pin-head size to the dimensions of the average sandwich. Plastic bottles floated among the waste. We might have been in a squalid city port. I had seen nothing like this when I spent 101 days with my nose at water level on board the Kon-Tiki. It became clear to all of us that mankind really was in the process of polluting its most vital well-spring, our planet's indispensable filtration plant, the ocean. The danger to ourselves and to future generations was revealed to us in all its horror. Shipowners, industrialists, authorities, they would all have seen the sea gliding past at a fair speed from an ordinary ship's deck and would never have literally dipped their toothbrushes and noses in it week after week, as we had. We must make an outcry about this to everyone who would listen. What was the good of East and West fighting over social reforms on land, as long as every nation allowed our common artery, the ocean, to become a common sewer for oil slush and chemical waste? Did we still cling to the medieval idea that the sea was infinite?

The strange thing is that when you are bobbing over the wavecrests on a few papyrus bundles, aware at the same time that whole continents are gliding past, you realize that the sea is not so limitless after all; the water which rounds the African coast in May passes along the American coast some weeks later with all the floating muck which will neither sink nor be eaten by the inhabitants of the sea.

(1) What first problem did the men encounter when they awoke on the third day?

(2) What changes had taken place in the colour of the sea?

(3) What was the range in size of the clots of oil?

(4) What does the author compare the sight to?

(5) How long did the author spend on board the Kon-Tiki?

(6) In what three ways does the author describe the ocean?

(7) What difference is there between the author's boat and an ordinary ship?

(8) According to the author, what has the ocean become?

(9) (a) What is normally carried in arteries?
(b) Why is that term now applied to the ocean?

(10) (a) In the passage, the word medieval means

(a) wicked (b) old fashioned (c) exciting

(b) The word infinite means

(a) never ending (b) warm (c) filthy

(11) Why do you think the author sees plastic bottles, but no glass bottles?

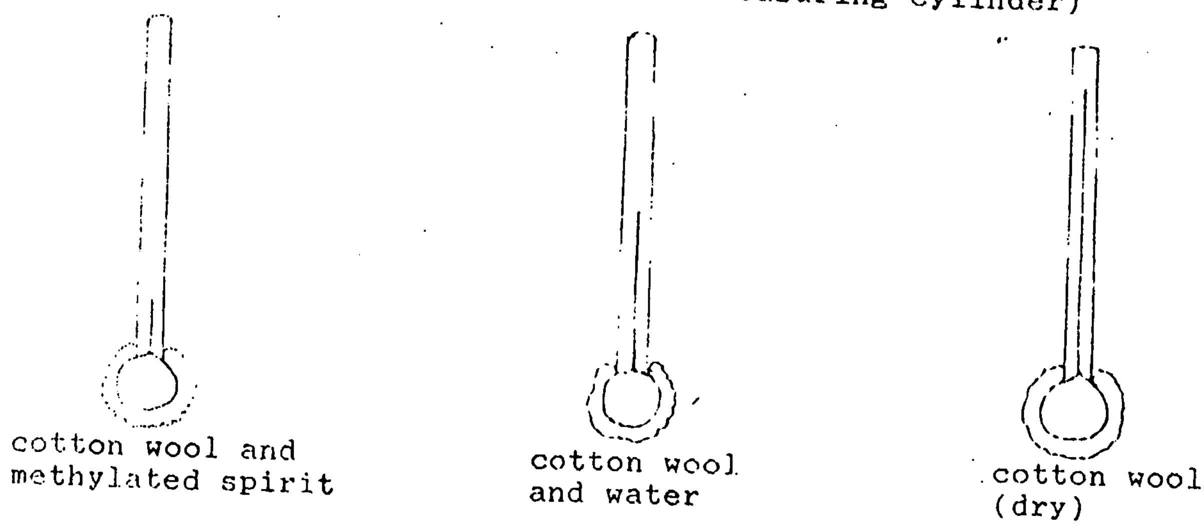
(12) What steps could be taken to prevent the pollution of the oceans described here?

(13) Try to find out what type of vessel the Kon-Tiki was and where it sailed to?

1. At what temperature does ice melt?

2. At what temperature does wax melt?

3. Illustration of the increase in the rate of evaporation with an increase in surface area but with the same starting volume. (i.e. evaporation from a beaker and measuring cylinder)

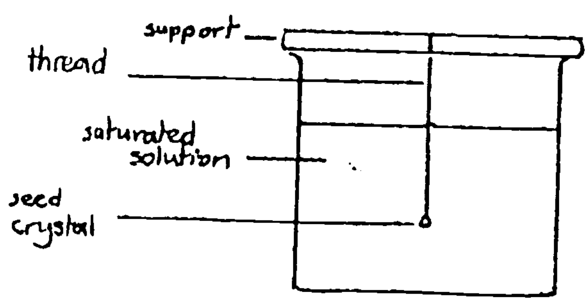


4. Why is the temperature in each situation different?

5. Investigation of factors effecting speed of solution (i.e. particle size, stirring, temperature of solvent. Use crushed copper sulphate and copper sulphate crystals; rock salt and granular salt.)

6. Watching crystals growing under a microscope (Place a hot saturated solution on a microscope slide and view it through the microscope. Try with sodium chloride, potassium dichromate, and copper sulphate as different shapes are produced.)

7. Growing crystals from saturated solutions.



8. Using a siphon to separate clear water from cloudy water.

D	N	M	L	K	N	O	I	S	N	E	P	S	U	S	J	G
I	P	R	E	C	I	P	I	T	A	T	I	O	N	H	I	P
S	E	C	R	E	T	A	W	B	C	D	E	F	G	E	N	E
T	R	Y	Z	V	A	Z	A	B	F	G	M	H	I	X	O	D
I	E	X	W	A	V	U	T	E	T	L	A	S	J	P	I	E
L	O	X	Y	P	S	O	L	V	R	Q	E	S	K	A	T	N
L	P	W	C	O	N	D	E	N	S	A	T	I	O	N	A	I
A	Q	P	A	R	A	F	F	I	N	P	S	L	M	D	G	R
T	M	E	L	T	I	N	G	P	O	I	N	T	N	S	I	O
I	R	S	D	I	C	E	S	O	L	V	E	N	T	O	R	L
O	B	C	B	O	I	L	I	N	G	P	O	I	N	T	R	H
N	A	T	U	N	V	D	E	T	A	R	U	T	A	S	I	C

1. 70% of the earth's surface is covered with it.
2. Water leaves the sea by ________.
3. Rain is formed bu ________.
4. Solid water.
5. Gaseous water.
6. 100°C (water).
7. 0°C (water).
8. Water ________ when it freezes.
9. If this is added to water the freezing point is lower.
10. Rain or snow.
11. Bringing extra water to dry areas.
12. Water is a good ________.

13. A solution when no more dissolves.

14. Mixture of a powder in water.

15. A good solvent for oil.

16. Added to water to kill germs.

Paper Pellets and Elastic Bands

Christopher never behaved. One day he was flicking paper pellets with an elastic band. His science teacher saw him and he got a good beating. After this his teacher suggested that if he really wanted to flick pellets, he could do it in the science class. Next lesson he carried out an experiment.

He stretched an elastic band by different amounts and measured the distance over which it could propel a paper pellet. His results are shown below.

Amount of stretch (cm)	2	4	6	8	10
Distance travelled by pellet (cm)	96	147	198	257	300

(a) Plot a line graph of distance travelled (cm) against amount of stretch (cm).

(b) How far would the pellet travel for a 7 cm stretch?

(c) By what amount would the elastic need to be stretched for the pellet to travel 350 cm?

(d) What precautions might Christopher have taken to make his experiment fair?

(e) What happens to the energy stored in the stretched elastic when the pellet is released?

The Cricket Match

Outline what energy changes take place in sentences (a) to (d) in the following passage.

(a) Frederick took a long run up and bowled the ball straight down the wicket at a tremendous pace.

(b) Terry lifted his bat and brought it into contact with the ball. The ball climbed high into the air.

(c) The ball seemed to hang in the air before it fell rapidly into the hands of Brian.

(d) The crowd in the pavilion cheered loudly.

Saturday Morning with the Smiths

The Smith family were doing many different things at 11.15 one Saturday morning.

(a) Mrs. Smith was cooking using a coal pot.

(b) Mr. Smith was driving his crowded bus up the hill out of Birchgrove towards St. George's.

(c) Kenny Smith was listening to loud reggae music on his large battery powered tape recorder.

(d) Sharon Smith was trying to lift a heavy bucket of water up the steps into the house.

(e) Shelly, the baby, was screaming loudly.

What energy changes are taking place in each of the sentences?

Mr. Smith and the Electric Drill

Mr. Smith was using an electric drill. This requires energy. Where does the energy come from? Put the following sentences in the correct order.

(a) The movement energy in the generator becomes electrical energy which is carried along wires from the power station.

(b) Oil is burned in the power station and heat is given out.

(c) Plants get energy from the sun.

(d) Mr. Smith plugs in his electric drill. The electrical energy becomes movement energy in the motor.

(e) The heat produced makes gases expand. This produces movement energy as the generator in the power station turns.

(f) Plants rot and are compressed for millions of years. This forms coal.

Peanuts

A group of students carried out an experiment in which they heated water using 1 g of different types of peanut; salted, dry roasted and unroasted. Each time they used 20 cm3 and they measured the initial and final temperature of the water in each case. Their results are shown below.

Type of nut	Salted	Dry Roasted	Unroasted
Original Temperature of water (°C)	28	28	28
Final Temperature of water (°C)	34	32	31
Temperature Rise (°C)			

(a) Copy and complete the result table shown above.

(b) Plot a bar graph of the results (temperature rise (°C) against type of nut.

(c) Which type of nut produces the greatest temperature increase?

(d) Which type of nut contains the greatest amount of energy?

(e) What would happen to the temperature rise if 5g of peanut were burned instead of 1g?

(f) What would happen to the temperature rise if 10 cm3 of water were used?

(g) Why do you think a metal container should be used to heat the water instead of a glass one?

Energy, Book 1, 3.1, 3.2, 3.3

1. Energy changes

   (a) Movement to heat (friction; try rubbing a thumb tack on a desk top).

   (b) Movement to sound (shaking nails in a tin).

   (c) Electrical energy to light (connecting a bulb to a battery).

   (d) Electrical energy to sound (connecting an electric bell to a battery).

   (e) Electrical energy to heat (connecting resistance wire to a battery).

   (f) Heat energy to electrical energy (construct a simple thermocouple using constantan, copper wire and a milliammimeter).

2. Energy contained in foods (heating a set amount of water in a small metal container using a given mass of food). (This may be tried with unroasted peanuts, dry roasted peanuts and salted peanuts).

Energy, 3.1, 3.2, 3.3

K	J	N	U	S	I	T	I	K	I	N	E	T	I	C	A
F	O	E	G	E	H	H	L	A	C	I	M	E	H	C	Q
D	E	V	F	L	G	G	B	P	V	W	T	S	Y	X	R
U	A	B	E	U	D	I	C	N	O	O	M	A	N	Y	D
H	Y	D	R	O	E	L	E	C	T	R	I	C	I	T	Y
C	K	L	M	J	A	T	O	M	I	C	R	A	L	O	S
R	O	T	O	M	C	I	R	T	C	E	L	E	S	T	U

1. Energy stored in a battery.
2. Energy stored in uranium.
3. "Movement energy".
4. In a light bulb electrical energy becomes heat energy and ________.
5. Another name for a generator.
6. The energy in food comes from the ________.
7. Energy is measured in ________.
8. Electricity produced from water turbines.
9. Energy from the sun.
10. First produced in 1873.

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The Gases in Air. 8.1. 8.2.

How Much of Each Gas ?

The following table contains the percentage of different gases in the air.

Nitrogen	Oxygen	Argon	Carbon Dioxide and other gases
78%	20%	1%	1%

(a) Plot a bar graph for the results.

(b) How many litres of nitrogen will there be in:

(i) 100 litres of air
(ii) 1,000 litres of air
(iii) 1 litre of air

(c) Repeat question (b) but consider oxygen instead of nitrogen.

(d) Why is carbon dioxide considered to be an important gas even though there is very little of it?

(e) 1% of the air consists of carbon dioxide and other gases. What other gases are there?

(f) What is argon used for?

Very Cold Boiling Liquids

When a substance boils it is not necessarily hot. Substances that are gases at room temperature have very low boiling points. The boiling points of the main gases in air are given below in °C.

	Boiling Point
Oxygen	-183 °C
Nitrogen	-196 °C
Argon	-186 °C
Carbon dioxide	- 78 °C

(a) Draw a bar chart using the values above (think <u>very carefully</u> before you draw the axis).

(b) If the temperature of air were gradually lowered which gas would become a liquid first?

(c) If the temperature of liquid air were lowered to 200°C and then gradually increased which would be the first substance to become a gas?

(d) Which substance or substances will be gaseous at -120°C?

(e) Which substance or substances will be liquids at -190°C?

Candle Burning Times

When a burning candle has a jar placed over the top of it, it continues to burn for a short time and then it goes out. Shirley noticed that if a larger jar is placed over a candle it continues to burn for a longer time. Shirley collected a number of different sized jars and measured the amount of time for which a candle continued to burn after the jar was in place. Her results are shown below.

Volume of jar (cm3)	145	210	270	300	360
Burning time (s)	5	8	10	12	14

(a) How do you think Shirley may have found the volumes of the jars?

(b) Plot a line graph of burning time (s) against volume of jar (cm3).

(c) What would be the burning time of a candle in a jar with a volume of 100 cm3?

(d) What volume would a jar need to be to allow a candle to continue burning for 20 seconds?

(e) If a candle is placed in a 200 cm3 jar of exhaled air, it burns for a shorter time when placed in a jar of inhaled air. Why?

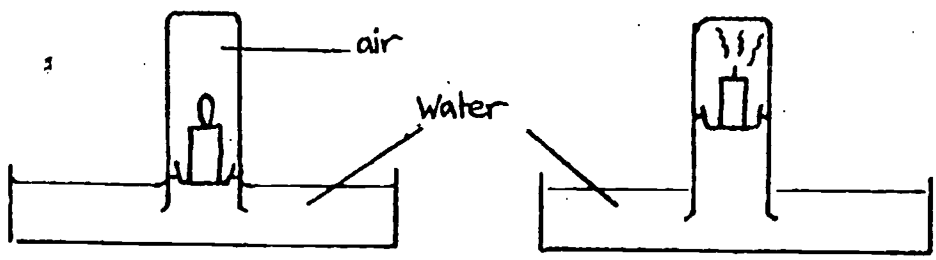
NB To prepare gases for investigation

(a) Oxygen - Manganese dioxide in hydrogen peroxide. Collect gas over water.

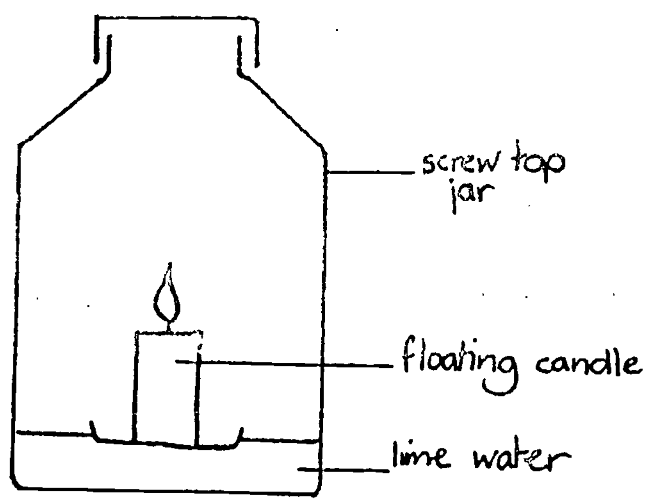
(b) Carbon dioxide - Calcium carbonate in dilute hydrochloric acid. Collect gas over water.

1. Investigation of reactions of carbon dioxide and oxygen with lime water, burning splint, glowing splint and bicarbonate indicator).

2. Oxygen consumption of a burning candle.



3. Showing that carbon dioxide is produced by a burning candle.



The Gases of the Air, 8.1, 8.2

L	A	B	L	A	N	O	I	T	C	A	R	F	H
E	C	A	R	B	O	N	D	I	O	X	I	D	E
U	C	R	I	A	P	O	N	E	G	Y	X	O	L
F	D	G	S	U	L	P	H	U	R	N	K	X	I
Z	N	O	B	L	E	G	A	S	H	I	S	I	U
E	Q	N	I	T	R	O	G	E	N	E	F	O	M
D	R	E	R	E	H	P	S	O	M	T	A	E	G
E	D	I	X	O	N	O	M	N	O	B	R	A	C

1. Gases around the earth.
2. Mixture of gases we inhale.
3. Most common gas in air.
4. Gas needed for burning.
5. Turns lime water milky.
6. Argon is a ________.
7. Used in airships.
8. Used in light bulbs.
9. Process used to separate gases (_________ distillation).
10. When an element is burned an ___________ is formed.
11. If a fire is to burn it needs heat, air and _________.
12. Harmful gas from burning fuel (________ dioxide).
13. Poisonous, non-smelling gas.

Electricity, 7.1, 7.2, 7.3.

Conductors and Insulators

Four students, Delroy, Natasha, Amanda and Christopher, make a list of the items they brought to school. The lists are as follows:

DELROY	NATASHA	AMANDA	CHRISTOPHER
Coins	Exercise Book	Coins	Plastic Comb
Metal Pencil	Metal Comb	Plastic Pen	Key
Sharpener	Pencil	Pencil	Exercise Book
Plastic Pen	Plastic Pen	Metal Ruler	Plastic Pen
Wooden Ruler	Key	Rubber	Pencil
Exercise Book	Textbook	Key	
	Dollar Note		
	Plums		

1. Who has brought the most conductors?

2. Who has brought the most insulators?

3. Use Natasha's things to make a pie chart of conductors and insulators.

4. Add up the total number of conductors and the total number of insulators brought to school. Make a pie chart to show this distribution.

Current Through a Bulb

Michael did an experiment to measure the current through a bulb using an ammeter and one 1.5V cell. He recorded a value of 0.3A. He then repeated the experiment using 2, 3, 4 etc cells.He recorded the following results in his notebook.

CURRENT (A)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	
NO. OF CELLS	1	2	3	4	5	6	7	8

1. Draw a current diagram for 3 cells used.

2. Plot a bar-chart of current (y-axis) against No. of cells.

3. What can you say about the effect of adding the 8th cell?

Voltage of a Dry Cell

A science teacher gave Johnny eight new cells and told him to find the voltage of them. To save time, Johnny joined them together and measured the voltage drop across various combinations. The results were:

VOLTAGE (V)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	10.5
NO. OF CELLS IN SERIES	1	2	3	4	5	6	7	8

1. Plot a line graph of voltage (y-axis) against the number of cells in series.

2. Find the gradient of the line obtained.

3. From the gradient, find the average voltage drop across each cell.

4. What can you conclude about the 8th cell to be joined in series?

5. Draw a circuit diagram for the experiment.

Sticking Balloons by Static Electricity

Donna has discovered that balloons can be 'stuck' to the wall if they are stroked on her hair to pick up a charge. As she strokes the balloon over her hair, she finds a relationship between the amount of strokes and the length of time which the balloon sticks to the wall. She carrys out a simple experiment to investigate this and her results are illustrated below.

NO. OF STROKES	4	8	12	16	20	24	28
STICKING TIME (s)	2	4	6	8	10	10	11

1. Plot a line graph of the number of strokes (x-axis) against time (y-axis).

2. Use the graph to predict the sticking time after 9 strokes.

3. What happens to the sticking time after 20 strokes? Why do you think this should be?

[illegible] did a survey of a relative's house to determine the number of electrical sockets in each room. The results he obtained were as follows:

ROOM	NO. OF SOCKETS
Large Bedroom	2
Small Bedroom	1
Kitchen	4
Living Room	3
Bathroom	0

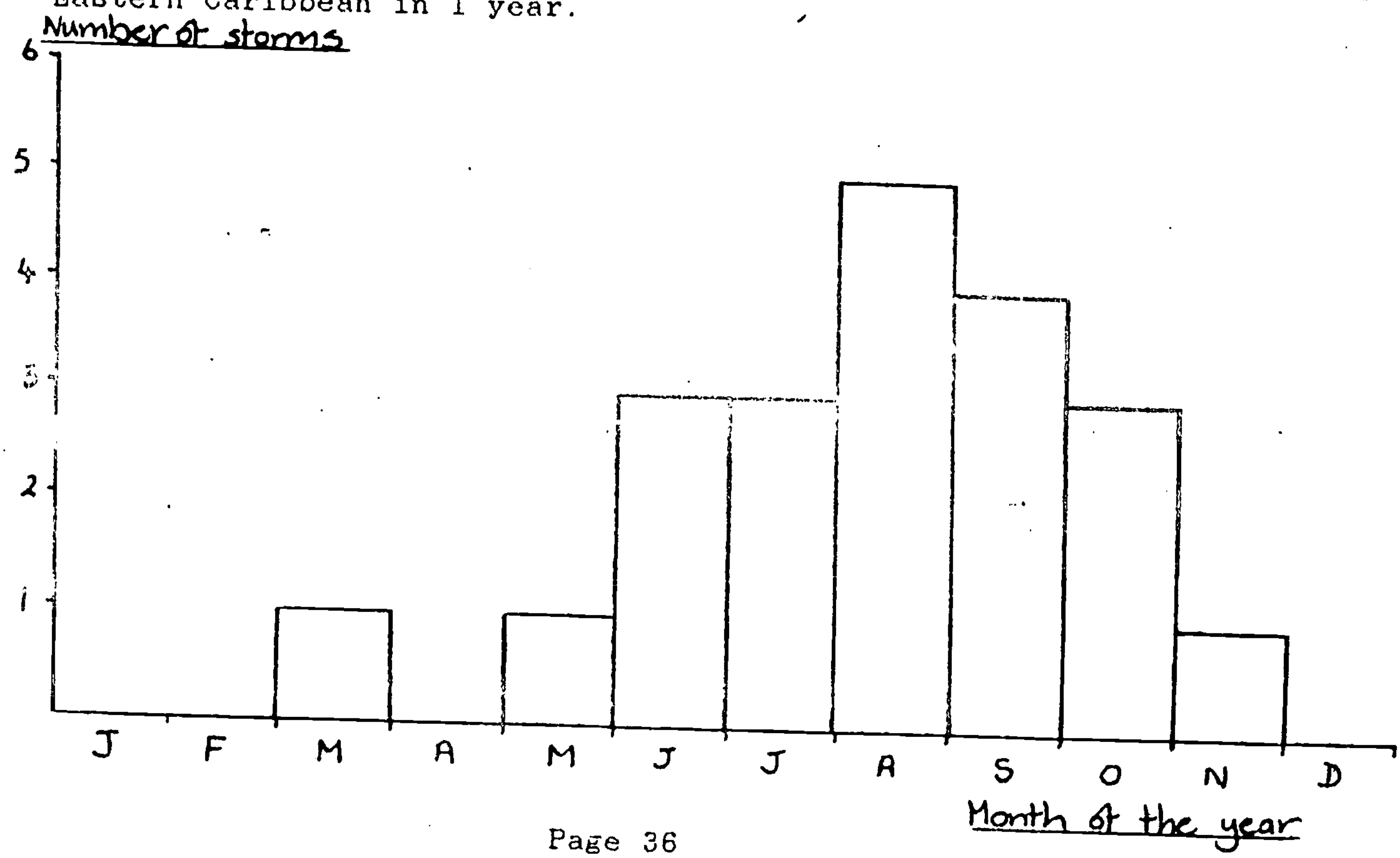
1. Draw a bar chart showing the number of sockets (y-axis) in each room (x-axis).

2. Which room has the most electrical sockets? Why do you think this should be?

3. Why are there no electrical sockets in the bathroom?

Thunder and Lightning Storms

The bar graph below shows the frequency of lightning storms in the Eastern Caribbean in 1 year.



1. Which month has the greatest number of lightning storms?

2. What is the average number of lightning storms:

   (a) Between July and December
   (b) Between January and June
   (c) In one year?

3. What is the cause of lightning?

Static Electricity - Charged Rods

Gideon rubbed a polythene rod with a duster and it became negatively charged. When he brought it close to another rod which could swing freely, he found that this rod was attracted to the polythene rod. He also noticed that the amount of rubbing (charging time) affected the amount of attraction. This is shown below.

CHARGING TIME (s)	1	2	3	4	5	6	7
DISTANCE OF ATTRACTION (mm)	1.0	1.5	2.5	3.5	3.8	3.9	3.9

1. What was the charge on the freely swinging rod? Explain your answer.

2. Plot a bar graph of distance of attraction (y-axis) against charging time.

3. Why do you think the distance of attraction is becoming constant at 3.9 mm?

Electricity, Book 1, 7.1, 7.2, 7.3

1. Rub a polythene rod (pen or plastic ruler) to generate static electricity. Use the rod to attract small pieces of paper. What happens if other substances are rubbed instead of polythene?

2. Construct a simple circuit with cell, switch, bulbs and ammeter. What happens to the current when the switch if off?

3. Testing for electrical conductivity (Allow the students to devise the experiment where possible).

4. Where is the circuit in flashlight? (Look inside a flashlight. There are no wires. How does the electricity travel?)

5. Investigation of bulb brightness with various cell combinations.

6. Investigation of voltage variation with various cell combinations.

C	D	E	O	N	F	F	A	A	R	G	E	D	N	A	V
B	E	L	E	C	T	R	I	C	C	U	R	R	E	N	T
A	Q	E	G	A	T	L	O	V	M	L	S	C	R	E	K
Y	R	C	O	N	D	U	C	T	O	R	W	O	E	A	J
R	E	T	E	M	M	A	X	Y	Z	N	I	P	P	A	I
X	D	R	S	T	U	V	W	V	O	L	T	P	M	D	D
W	P	O	L	Y	T	H	E	N	E	O	C	E	A	H	A
V	E	N	F	Y	R	U	C	R	E	M	H	R	P	G	D
I	N	S	U	L	A	T	O	R	N	A	V	B	C	D	E
U	T	S	D	I	C	A	D	A	E	L	A	R	Q	F	E

1. Plastic that becomes negatively charged if rubbed.
2. Negatively charged particles.
3. Machine that builds up charge (________ generator).
4. Flow of charge.
5. Unit of electric current.
6. Meter for measuring current.
7. Component to stop flow of current.
8. Substance that lets current flow easily.
9. Substance that does not let current flow easily.
10. Very good metallic conductor.
11. "Electrical push".
12. Unit of voltage.
13. Type of cell in a watch.
14. Type of cell in a car battery.

Cells and Reproduction 6.1

Tearing Paper

1. A teacher was not pleased with a student's work so she tore it in half. Then she tore each half in half again. She continued like this until the floor was covered with small pieces of paper. A student counted the number of pieces after each tear.

NO. OF PIECES OF PAPER	1	2	4	8	16	32	64	128
NO. OF TEARS	0	1	2	3	4	5	6	7

(a) Plot a bar graph of the results with the number of tears made as the horizontal axis.

(b) What would be the number of pieces of paper after 8 tears.

(c) How many tears would be needed to produce 512 pieces of paper.

Amoeba Populations

2. A biologist studying amoeba observed one amoeba in a small enclosed area of water under a microscope. Every two hours over a twenty hour period, the population was counted. The results are shown below.

TIME (hrs)	0	2	4	6	8	10	12	14	16	18	20
POPULATION	1	4	17	70	260	440	490	500	510	500	500

(a) Plot a line graph of population against time.

(b) What was the population after five hours?

(c) Why does the graph not follow the pattern shown in the results from the previous experiment?

Cells and Reproduction, Book 1, 6.1

This unit introduces the student to cells. It is essential that all students have the opportunity to use a microscope to view plant and animal cells. practice in microscopy can be had by viewing paper, hair, insects, etc under the microscope.

Suitable plant cells to observe are onion (in water), and cheek cells can be easily obtained as an example of an animal cell. Cheek cells should be stained with iodine solution or methylene blue solution.

Cells and Reproduction, 6.1

L	Y	H	P	O	R	O	L	H	C	V
W	X	Y	T	K	S	Q	K	M	J	A
Y	A	E	D	S	N	L	P	S	L	C
R	B	V	L	R	A	P	O	A	M	U
A	E	U	L	T	G	O	N	L	N	O
N	O	B	E	S	R	P	Q	P	R	L
I	M	I	C	R	O	S	C	O	P	E
B	A	C	E	U	S	S	I	T	F	H
C	E	L	L	W	A	L	L	Y	G	I
A	Z	D	E	S	U	E	L	C	U	N

1. Building block of all living things.
2. Instrument for looking at very small things.
3. Cell "control centre".
4. Jelly-like substance in a cell.
5. Surrounding a plant cell.
6. Contains cell sap.
7. Chemical in chloroplasts.
8. Type of one celled creature.
9. Process of reproduction in one celled creatures (________ fission).

Animal Habitats

The following table shows the living and feeding habits of a group of animals.

ANIMAL	Where it lives		When it feeds		Animals home		
	Wet	Dry	Day	Night	Air	Water	Land
Frog	✓			✓		✓	✓
Spider		✓	✓	✓			✓
Lizard		✓	✓				✓
Cockroach		✓		✓			✓
Sparrow		✓	✓		✓		
Butterfly		✓	✓		✓		
Caterpillar		✓	✓				✓
Woodlouse	✓?	✓	✓	✓			✓
Land Crab	✓		✓			✓	✓
Rat		✓		✓			✓

Using the information given in the table, answer the following questions.

1. Make a list of those animals who prefer to feed at night, and then say why this is so.
2. Which animals feed both in the day and at the night time.
3. Which animals live in both water and on the land. Why do they need to do this?
4. Which particular habitat does the woodlouse prefer to live in, and why?
5. The spider mostly feeds during the day, why is this so?
6. Lizards would find it difficult to feed at night. Give two reasons for this.

The Habitats of Living Things

Form 2A were sent on a trip to record the animals they recognised in the different habitats around the school. The habitats were as follows:

(1) A rocky seashore (2) Dry pasture land (3) Forest/river

The animals they found were as follows:

Water Spider, Goat, Pelican, Lizard, Frog, Lobster, Crayfish, Sea Egg, Congeree, Chiton, (Limpet), Toad, Butterfly, Donkey, Centipede, Land Crab, Mosquito.

1. From your knowledge of the habitats of the above amimals, make a table with the three habitats above as headings, and put the animals into the correct column.

2. List any animals which you think may be found in more than one habitat.

3. Draw a pie chart (or bar graph if appropriate) to show the distribution by habitat of the animals recorded.

Vertebrate Classification

After learning the characteristics of vertebrates at school, Peter was asked for homework to list all the vertebrates he could think of. Here is his list:

Tiger, Tuna Fish, Frigate Bird, Mouse, Rat, Serpent, Octopus, Whale, Manicoo, Elephant, Giraffe, Lizard, Salamander, Dog, Chicken, Goat, Chicken-Hawk, Sparrow, Congeree, Newt, Frog, Toad, Tortoise, Turtle, Cat, Squirrel, Monkey, Mongoose, Shark, Flying Fish, Barracuda, Humming Bird, Cow.

1. Make a table to sort out the animals into the five different classes of vertebrates.

2. Make a bar-chart to show the distribution into each class.

3. What fraction of the vertebrates listed are mammals.

4. Peter has made a small mistake in his homework. What two animals listed are not vertebrates?

The Process of Breathing

The following statements are a description of what happens in your chest cavity when you breathe in. The statements, however, are in the wrong order. Read through all the statements then copy them into your book in the correct order.

(a) Air goes into the air sacs from the very small tubes in the lungs.

(b) The heart pumps the blood to every part of the body.

(c) The air passes down large tubes called the windpipe and the bronchus.

(d) The air passes into tiny blood-filled tubes around the air sac.

(e) Fresh air travels through your nose and mouth.

(f) The cells use up the oxygen.

(g) Air enters the lungs. Each lung has a network of very small tubes in it. Each tube has an air sac at the end of it.

(h) Oxygen passes from the blood into the cells.

(i) Blood travels in these tubes from the lung to the heart.

(j) Air, which contains oxygen, passes through the air sac walls.

Pulse Recovery Time

After failing to make the Inter-College sports team, Judy-Ann decides to train seriously for next year's games. She begins training in June to be ready for the following April.

She notices that as her fitness improves, the time taken for her pulse to return to normal becomes less. This is recorded in her training schedule, as shown below:

MONTH	J	J	A	S	O	N	D	J	F	M
PULSE RECOVERY TIME (s)	400	300	250	250	210	180	145	115	95	95

1. Plot a line graph of recovery time (y-axis) against the month (x-axis).

2. The line obtained on the graph is a curve. What does this tell you about the change in recovery time over the year?

3. Judy-Ann did very little training one month because of an injury. What month do you think this was? Explain your answer.

4. Judy-Ann's pulse will always increase during exercise. Will it increase to the same amount as her training progresses? Explain your answer.

A Comparison of Lung Volumes

The amount of air which can be held in the lungs of five adults was measured by allowing them to take a big breath and blowing the air out into a bell jar. The bell jar was filled with water and blowing into it caused the water to be displaced. By measuring the amount of water displaced, the amount of air held in the adults lungs could be measured. The results obtained were as follows:

NAME	HEIGHT	DESCRIPTION	LUNG VOLUME
Loxley	1.75 m	Competitive swimmer	6.4 litres
Carlyle	2.03 m	Cocoa worker	4.8 litres
Louise	1.60 m	Secretary	3.2 litres
Michael	2.03 m	Cigarette smoker	2.0 litres
Alison	1.66 m	Shop worker	3.6 litres
Delbert	1.75 m	Cocoa worker	4.4 litres
Judy	1.75 m	Receptionist	3.7 litres
Rickey	1.60 m	Office Worker	3.3 litres

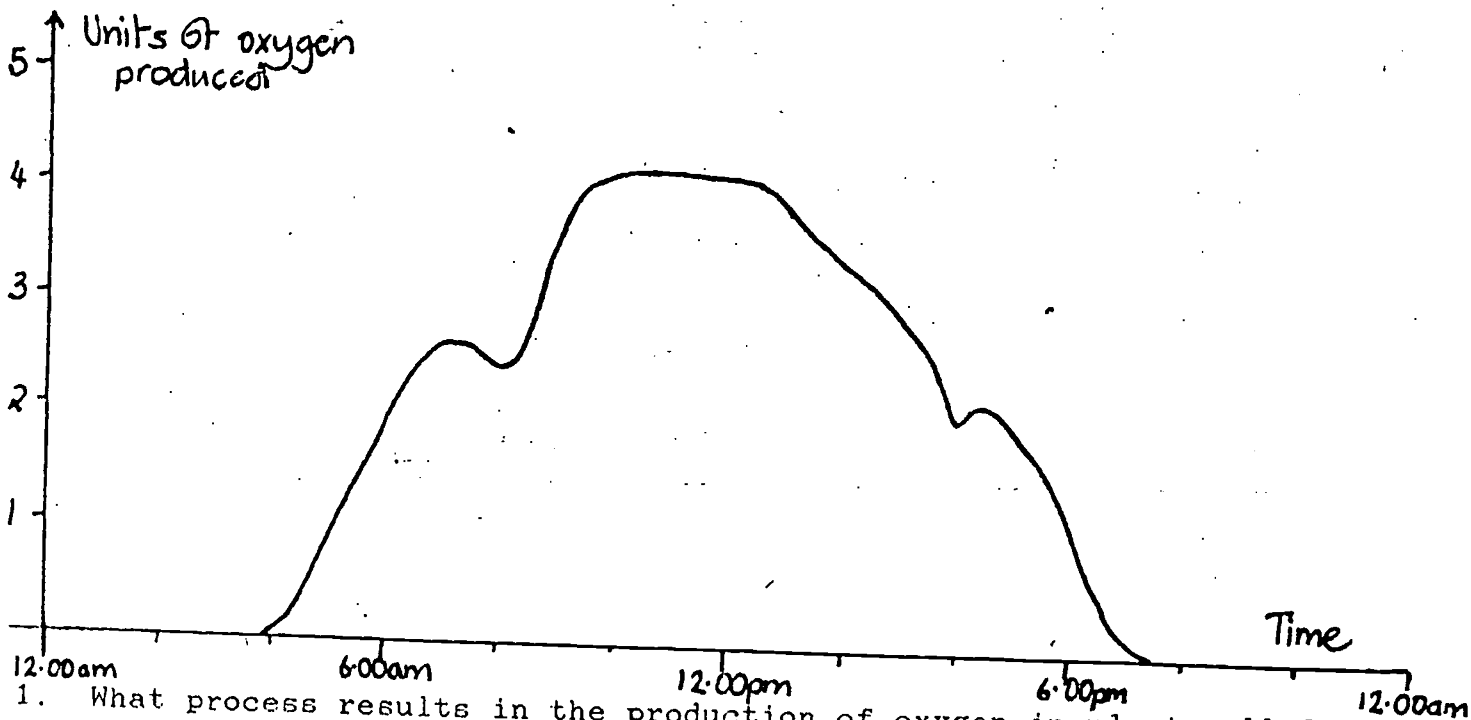
1. Plot a bar graph of adults names (x-axis) against lung capacity (y-axis).

2. Give 2 reasons why Louise may have a small lung capacity.

3. Who has the lowest lung capacity? Why do you think this is? What effects will this have on his/her breathing rate? How may he/she improve his lung capacity?

4. Give one reason why Alison may have a higher lung capacity than Louise.

Using specialised equipment, some scientists were able to determine the oxygen production in an area of grassland. Their results are shown on the graph below:

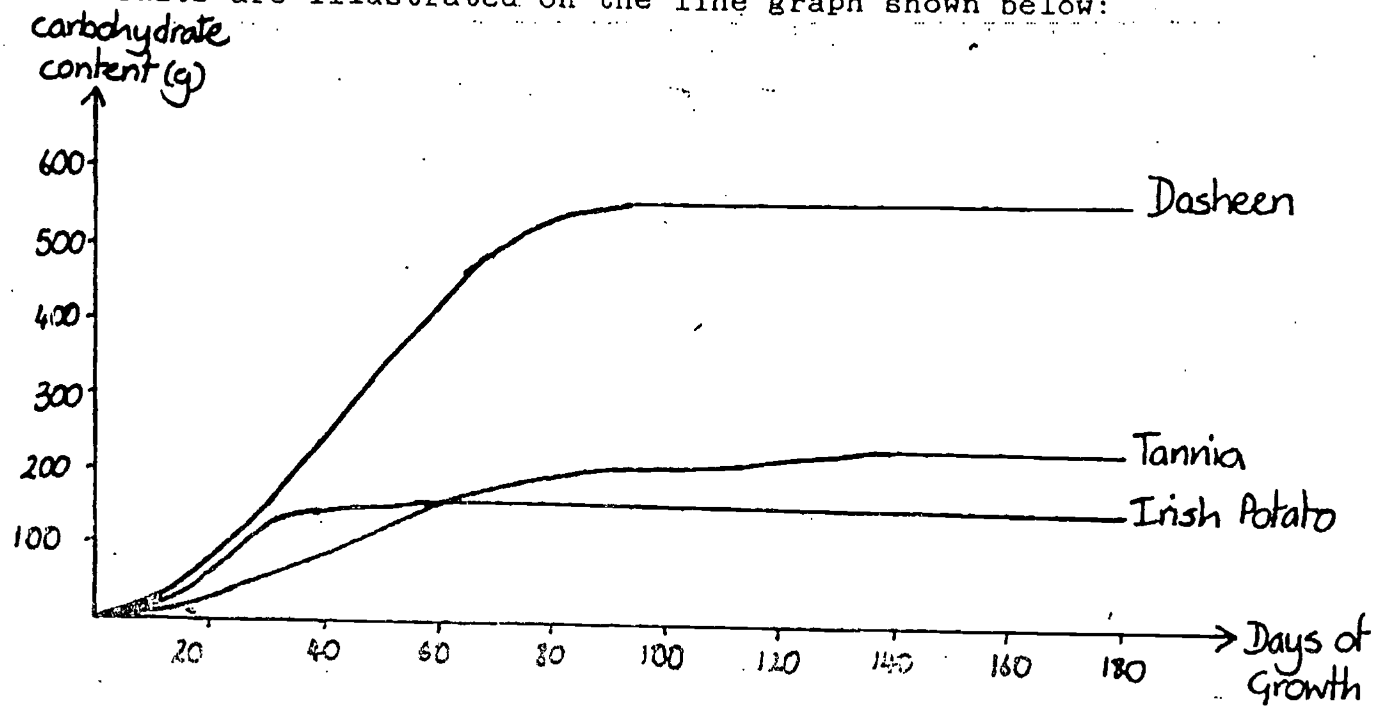


1. What process results in the production of oxygen in plant cells?
2. During what hours is there no oxygen produced? Give a reason for this.
3. What is the (a) maximum rate of oxygen production per hour (b) the average rate of oxygen produced per day.
4. What factors may have caused the dips in the graph at 8.00 a.m. and 4.00 p.m.?

Carbohydrate Content in some Foods

During the growth of some plants, the underground part of the stem swells up to act as a food store. These underground stems are an important source of carbohydrate for man. Tannia, dasheen, and Irish potato are all examples of this type of plant.

Some senior students grew some of each type of plant listed above and measured the change in carbohydrate content as the plant matured. Their results are illustrated on the line graph shown below:



1. Which is the first plant to store 100g of carbohydrate?
2. During which time period is the rate at which carbohydrate is stored greatest in (a) Irish potato (b) tannia?
3. Which plant is the first to stop storing carbohydrate?
4. What final weight of carbohydrate does tannia store?
5. Which plant is still storing carbohydrate? Explain your answer.

Gas Exchange in Plants: A Puzzle!

The following story represents the movement of gases into and out of a plant cell during two important reactions you have studied. Read the story then answer the questions which follow.

A shopkeeper is in business selling only soft drinks. His shop is open 24 hours per day, and over this period people continually bring in money to the shop in exchange for soft drink, which they take away.

Each day, during daylight hours, a delivery truck brings soft drink to the shop. This is taken into the shop and the delivery man takes away money from the shop in payment for the soft drink.

The shopkeeper sells soft drink at a constant rate throughout the day and night, even when the soft drink is delivered to the shop. The soft drink is only brought to the shop during daylight

1. Which item is leaving the shop continuously over the 24 hour period?
2. Which item only leaves the shop during daylight hours?
3. Which Item is brought into the shop continuously over the 24 hr period?
4. Which item is only brought into the shop in daylight hours?
5. Which two important reactions do you think this story is suppose to represent?
6. What gas is represented by the money?
7. What does the soft drink represent?
8. What does the shop itself represent?
9. What reaction is taking place during daytime when the delivery truck arrives?
10. What reaction is taking place 24 hours a day?

Food Chain Investigation

During an agricultural science practical session in the school garden, Form III made a list of the plants and animals they observed.

SPECIES	NO. OF INDIVIDUALS
Cabbage	40
Spinach	30
Slug	7
Mint	20
Greenfly	20
Butterfly	4
Lizard	2
Sparrow	1

1. Divide the list above into producers, primary consumers and secondary consumers. Make a table to show your lists.

2. Make a bar-graph of the number of individuals in each group (y-axis) against the three groups (x-axis).

3. From the graph, which group contains the greatest number of individuals.

4. Which is the most abundant primary consumer.

5. Why are greenfly numbers able to be much higher than slug numbers.

6. Why do you think only one bird was found in this small area? What would happen if 20 birds were confined to this area?

Gases in the Air, Book 1, 8.3, 8.4, 8.5

1. Students can be introduced to the idea of classification by putting objects into sets depending of different characteristics.

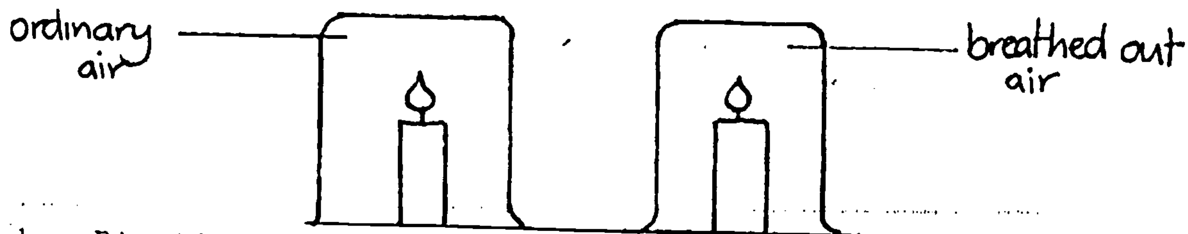
   (a) Coloured card cut into different shapes; squares, triangles, circles, etc can be classified by colour or shape, or size.

   (b) Trays of laboratory objects; stoppers, spatulas, rubber tubing, droppers etc sorted out into rough or smooth, soft or hard, round or edged etc.

   (c) Laboratory glassware can be collected and sorted in a similar way.

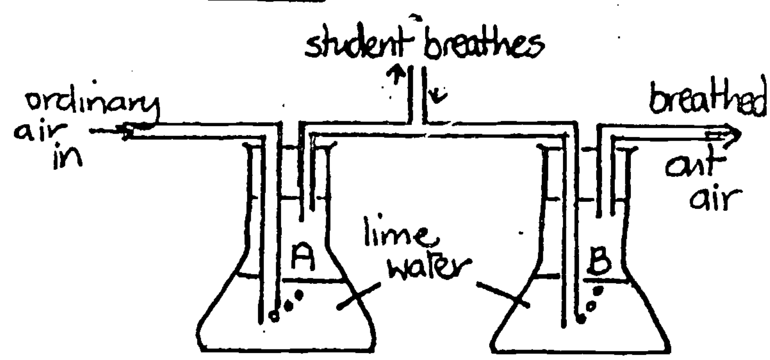
2. The differences in ordinary and breathed out air.

   (a) Oxygen Content - measure the burning time of a candle in ordinary and breathed out air.



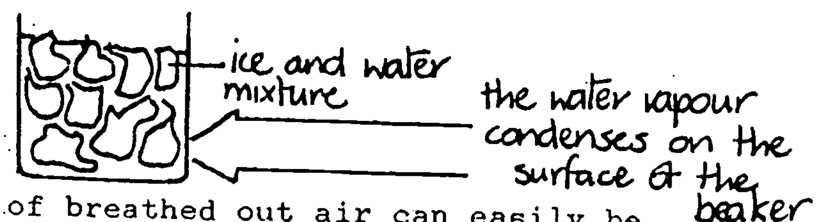
   (b) Carbon Dioxide Content

   Tell the student to breathe slowly and steadily. After several breaths, the lime water in B will turn chalky.



   (c) Water Vapour Content

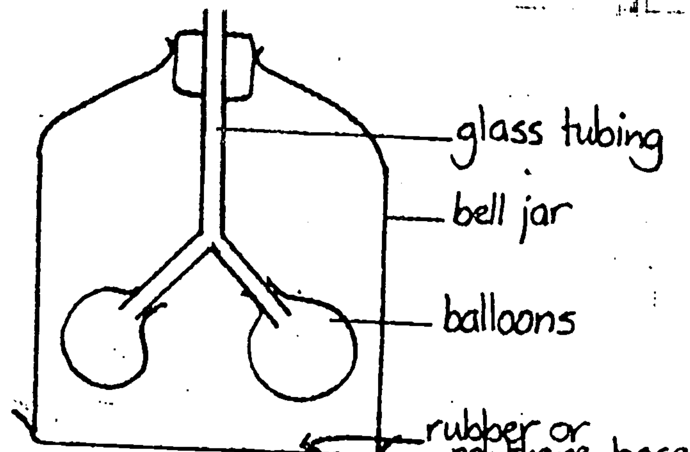
   Students breathe onto a cold surface and can see water vapour condensing.



   (d) The increased temperature of breathed out air can easily be felt by putting a hand in front of your mouth and exhaling.

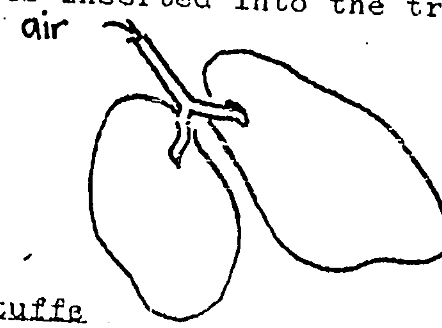
3. Demonstration of a model lung.

This model has its limitations but it is useful in demonstrating that an increase in volume of the chest cavity causes the lungs to fill with air. This is done by pulling down on the base of the bell jar.



4. Looking at Lungs

Sheep or pig lung is readily available from the market. Students can observe the texture and buoyancy of the lung by floating it in water. If a piece of glass tubing is inserted into the trachea and blown into, the lung can be inflated. A lung dissection can be carried out to show the network of very small tubes. (Contrast the colour with that of a smoker's lung which would be black and unhealthy.)



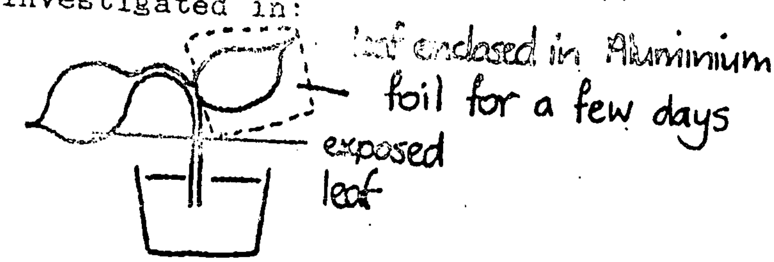
5. Testing for Starch in Various Foodstuffs

A drop of iodine solution can be put on meat, rice, dairy produce, yam, etc. It will turn blue/black if starch is present.

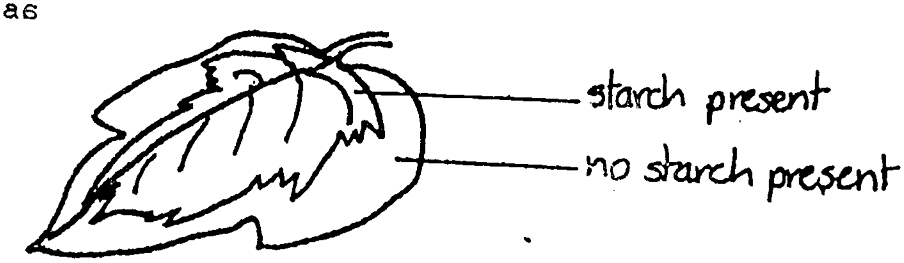
6. Testing a Leaf for Starch

The method for this is outlined in Starting Science I (p. 113). The presence of starch can be investigated in:

(a) leaves kept in light and dark.



(b) variegated leaves (only green areas contain starch)



A	E	E	S	U	O	M	Y	E	K	C	I	M	N	G
X	P	T	U	Y	R	A	D	N	O	C	E	S	O	T
D	I	A	P	H	R	A	G	M	S	P	N	T	I	E
Y	M	O	C	P	Z	Q	N	S	I	F	C	D	T	D
R	O	X	D	B	L	P	N	E	S	I	T	M	A	I
A	T	Y	M	N	I	J	K	T	E	E	N	Q	R	X
M	B	G	A	C	Z	R	D	A	S	S	U	V	I	O
I	M	E	L	T	A	E	S	R	O	L	B	Q	P	I
R	I	N	V	E	R	T	I	B	R	A	T	E	S	D
P	O	N	E	C	R	A	T	I	M	M	H	A	E	N
L	D	P	O	N	K	W	O	T	O	M	G	C	R	O
U	I	T	L	P	A	C	D	R	C	A	I	D	S	B
N	N	U	I	X	P	A	N	E	X	M	L	O	O	R
G	E	R	T	A	B	C	D	V	F	U	M	N	K	A
S	I	S	E	H	T	N	Y	S	O	T	O	H	P	C

1. Animals without backbones.
2. Animals with backbones.
3. Animals with wet scales and fins.
4. Animals which give birth to live young.
5. Process occuring in all cells which releases energy.
6. Two things required for respiration (food and ________).
7. Two waste products of respiration (carbon dioxide and ________).
8. Turns lime water milky.
9. Organs for gas exchange.
10. Large muscle involved in breathing.
11. Air sacs consist of many ____________.
12. Used to test for carbohydrates.
13. Process by which green plants produce food.
14. To produce food a plant needs water, carbon dioxide and __________.
15. Country which uses sugar cane to produce fuel.
16. Cows are ____________ consumers.
17. Lions are ___________ consumers.

Patterns in Reproduction

The table below lists several animals, the number of eggs produced by the female, and the number of eggs fertilised by the male.

ANIMAL	NO OF EGGS PRODUCE	NO OF EGGS FERTILSED AFTER MATING	"FERTILISATION CHANCE" (EGGS FERTILISED / EGGS PRODUCED)
Frog	300	200	
Human	1	1	
Tuna-Fish	400	40	
Chicken	4	4	
Stickleback (small fresh water fish)	200	100	
Toad	200	160	

1. Copy the above table in your exercise book and complete the last column "Fertilisation Chance". This is $\frac{\text{no. eggs fertilised}}{\text{no. eggs produced}}$

2. Draw a bar-chart of "Fertilisation Chance" (y-axis) against animal name (x-axis).

3. Which eggs have the greatest fertilisation chance? Are these eggs fertilised internally or externally?

4. Which animal has the lowest fertilisation chance? Why do you think this should be?

5. Why do you think the fertilisation chances of the toad are greater than those of the stickleback?

Cell Division in Sea-Eggs

For his biology lesson the following day, Glimus collected the sex cells from sea-eggs in order to study cell division. He put eggs and sperm together to allow fertilisation to take place and then counted the number of cells every five seconds for 40 seconds. His results were as follows:

TIME	0	5	10	15	20	25	30	35	40
NO. OF CELLS	1	1	1	2	6	15	32	70	144

1. Roughly how many cells do you think there would be after 55 seconds?

2. Plot a line graph of the number of cells (y-axis) against time (x-axis).

3. From the graph, estimate how many cells there would be after 24 seconds.

4. How long do you think it would take to produce 40 cells? Use the line graph to help you.

5. The line of the graph is curved rather than straight. Suggest a reason for this.

Cells and Reproduction, Book 1, 6.2, 6.3

This section looks at human reproduction. There are no practical investigations suitable for this section. The use of appropriate audio-visual material is strongly recommended.

B	C	D	S	U	T	E	O	F	R
X	S	U	E	R	N	X	F	O	O
P	C	O	M	A	D	T	O	R	N
U	D	V	O	G	G	E	T	A	M
L	A	U	S	V	M	R	E	P	S
K	N	L	O	D	E	N	F	R	E
N	A	A	M	D	E	A	T	E	T
O	N	T	O	E	A	L	A	E	S
S	E	I	R	A	V	O	G	N	E
C	D	O	H	N	H	N	K	E	T
A	M	N	C	O	R	D	L	G	W

1. Male sex cell.
2. Female sex cell.
3. Male reproduction organ.
4. Female reproductive organ.
5. Fertilization in fish.
6. Instructions for the developing organisms are contained in these.
7. Release of an egg from the ovary.
8. Connection between baby and mother.
9. Unborn child after 3 months.
10. Part of a chromosome.

Conduction of Heat Through Different Metals

Kenny was given 3 metal rods made of copper, iron and aluminium. In an experiment to find out which one was the best conductor of heat, Kenny attached 5 thumb tacks to the underside of the metal rods using grease as shown in the diagram. He then heated the rods from one end and recorded the time (in seconds) taken for the tacks to drop off. The results are shown in the table below.

Tack	1	2	3	4	5
Iron	2	5	12	22	35
Copper	1	3	7	13	20
Aluminium	1	4	10	17	25

(1) Plot a line graph of tack number (x-axis) against dropping time. Plot all three sets of results on the one graph.

(2) Which metal is the best conductor of heat?

(3) The dropping time between tacks increases as more tacks fall off. Why do you think this is?

(4) In this experiment we are comparing three metals. What must be done in order to make the experiment fair?

Keeping Liquids Cool

Some Form 3 girls went on a picnic. They each took cold juice with them in a container. Two hours later when they sat down to have some juice, they found that the temperatures of the juices were all different. They all had different kinds of containers with lids and the temperatures were as follows:

Container	Metal Can	Plastic Bottle	Unsulated Flask	Polystyrene Beaker
Temperature of juice	24 °C	15 °C	5 °C	8 °C

(1) Draw a bar graph to show the temperature (y-axis) against the container used.

(2) Did the juices become warm by giving out cold or taking in heat?

(3) Which container (a) absorbed most heat?
(b) absorbed least heat?

(4) After 4 hours, the temperature of the juice remaining in the metal can was still 24°C

(a) What does this tell you about the air temperature that day?
(b) What temperature would the juices in the other containers eventually reach?

(5) (a) How would the temperatures of the juices have been affected if the containers had no lids?
(b) By what process is heat absorbed in this case?

Absorbing Heat

In an attempt to heat up water for cooking and washing, Aldo takes 4 containers and paints them black, red, white, brown. He covers a fifth container with tin foil. He pours 300 cm^3 of water in each, puts on a lid and places the containers in the sun. After 4 hours he records the temperature of the water. His results are shown below.

Colour of Container	White	Brown	Black	Red	Tin foil Covered
Temperature of water	31°C	43°C	51°C	38°C	27°C

(1) Plot a bar graph of the water temperature against the colour of the container.

(2) (a) Which container absorbed most heat?
(b) Which container absorbed least heat?

(3) Which container is the most suitable for heating up water?

(4) If you wanted to keep liquids cool, what would be the best container to use?

(5) When Aldo goes home from school in the afternoon he finds that the temperature inside the buses is not always the same. What would cause these temperature differences?

(6) (a) By what process is heat absorbed by the containers?
(b) How will heat be transferred through the water?

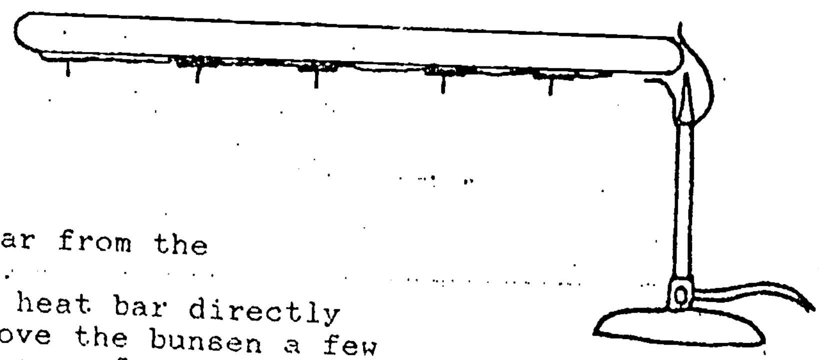
Heat on the Move, Book 2, 9.1, 9.2, 9.3, 9.4

1. Conduction

(a) Dip a plastic and metal spoon into a beaker or boiling water - which becomes hottest?

(b) Conduction through a Metal Bar

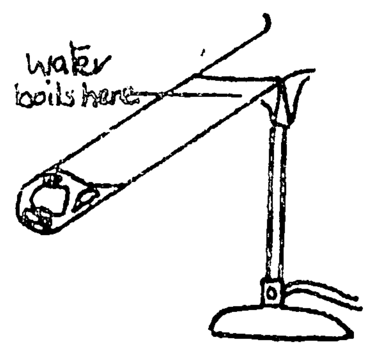
Thumb tacks are held are held onto the metal bar with vaseline. As heat travels along the bar the vaseline melts and the tacks drop off.



Alternatives: (1) heat bar from the middle.
(2) do not heat bar directly i.e. move the bunsen a few inches away from the rod.
(3) Angle the bar instead of horizontal.

(c) Water as a Heat Conductor

Trap ice cubes in the bottom of a test tube with some wire gauze, and heat the water at the top. The water will boil before the ice cubes melt.



(d) The Insulating Properties of Trapped Air

Compare the temperature drop in different containers of water insulated with cotton wool, sack, packing material, etc and uninsulated containers.

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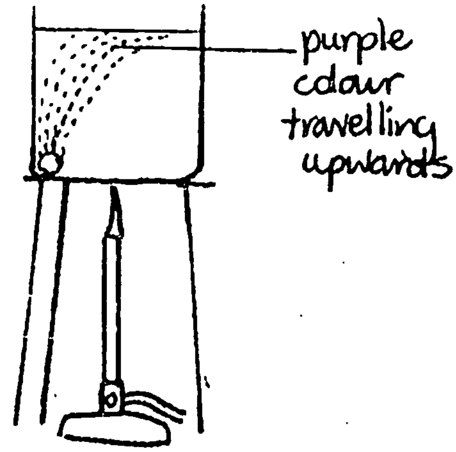
2. Convection

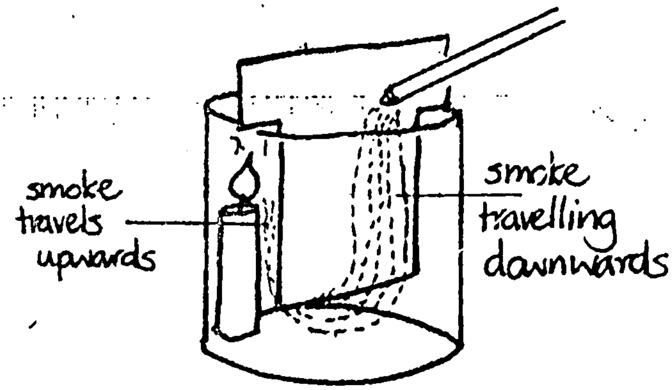
(a) Convection in Liquids

Place a crystal of potassium permanganate in a beaker of cold water. The crystal acts as a dye and colours the water at the base of the beaker. When the beaker is heated, the purple coloured water moses upwards.



(b) Convection in Gases

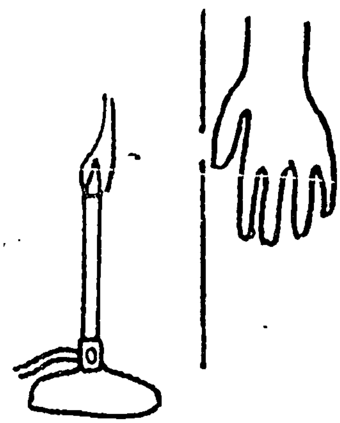
Introduce a smoking taper to a beaker containing a candle and card or metal divider. Smoke from the taper passes under the divider and up beyond the candle.



3. Radiation

(a) Heat Radiation Travels in Straight Lines

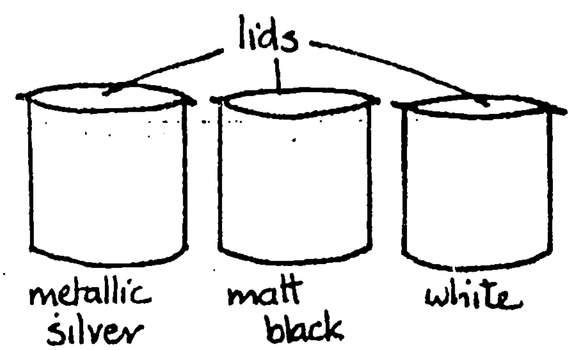
Place a card or metal divider with a small hole in it near a bunsen flame. If a student places his/her hand next to the divider, heat will only be felt in the region next to the hole. Move the position of the divider to show that heat radiation travels in all directions.



(b) Absorption and Emission of Heat Radiation

(1) Fill the containers with cold water and record temperature increase at regular intervals when placed in the sun.

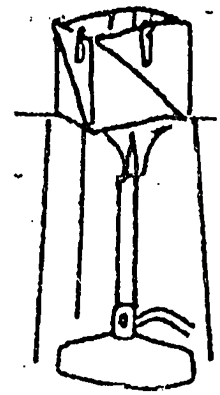
(2) Fill the containers with boiling water and measure the temperature at regular time intervals as each cools down.



4. An Unlikely Saucepan

The melting point of aluminium is 660 °C. The temperature of a flame from a gas burner is over 900 °C. Why does a saucepan not melt when water is put on a stove to boil?

The apparatus shown on the right can be used to answer this question. Make a paper box as shown using paper clips. The paper must not be folded over too hard or torn, otherwise it might leak.



Tiny bubbles and steam will be seen rising from the box. The water is boiling, and taking heat energy away from the box, so the paper never becomes hot enough to catch fire.

Heat on the Move. 9.1. 9.2. 9.3. 9.4

A	N	A	V	W	X	E	D	O	N	M
N	O	I	T	C	U	D	N	O	C	L
O	I	M	U	O	T	F	C	N	O	K
O	T	R	H	N	Y	B	Q	O	P	J
S	A	E	J	V	K	K	M	N	P	R
N	I	H	I	E	G	A	T	S	E	Q
O	D	T	Z	C	S	O	L	A	R	P
M	A	O	I	T	H	E	R	M	A	L
B	R	P	J	I	K	D	B	A	I	H
C	E	Y	H	O	L	E	C	M	N	G
D	F	H	G	N	A	B	C	D	E	F

1. Movement of heat through solid.
2. Poor conductor of heat.
3. Metal which conducts heat very well.
4. Movement of heat through gases and liquids.
5. A rising current of hot air.
6. Wind affecting Asia.
7. Heat travels from the sun to the earth by ________.
8. Illness caused by intense cold.
9. Heat from the sun.

Building Blocks 4.1, 4.2.

Melting Points

The melting point of a substance is the point at which it changes to a liquid. The boiling point of a substance is the point at which it changes from a liquid to a gas. (Room temperature = 30 °C)

	MELTING POINT (°C)	BOILING POINT (°C)
Water	0	100
Alcohol	-114	64
Sand	1610	2230
Aluminum	659	2447
Salt	808	1465
Napthalene (moth balls)	80	218
Sulphur	120	444
Butane	-139	1

(a) Which substance or substances is a gas at room temperature?

(b) Which substance or substances is a liquid at room temperature?

c) Which substance or substances is a solid at room temperature?

d) Which substance or substances is a gas at 100 °C?

e) Which substance or substances is a liquid at 100 °C?

f) Which substance or substances is a solid at 100 °C?

g) If a scientist wanted to melt a substance which had a melting point of 827 °C, do you think he would heat it in a glass container or an aluminum container? Give a reason for your answer.

ester and the Ink

ester got bored when he was trying to do his homework so he just sat ropping ink from his pen into a glass of water. He noticed that the nk spread through the water even if he did not stir it.

school the next day, he carried out an experiment to measure how ickly ink spread through water in a 250 cm measuring cylinder. He t one drop of ink carefully on the surface and measured the distance e colour had spread every ten seconds.

s results are shown below

TIME (seconds)	DISTANCE (cm)
10	7
20	12
30	16
40	20
50	23
60	25
70	27
80	30
90	33
100	35
110	36

(a) How do you think Kester judged how the ink had spread through the cylinder?

(b) What could Kester have done to have made sure that his results were reliable?

(c) Plot a line graph of the distance the colour had spread against time.

(d) How long did the ink take to spread 15 cm?

(e) Can you predict how long the ink will take to spread 50 cm? Give a reason for your answer.

Moses and the Balloon

Moses blew up a balloon and then tied the end tight. After two weeks, he noticed that there was hardly any air left in it. Moses decided to try to find out how quickly the air was lost so he blew up another balloon and then he measured its volume every two days over a two week period. His results are shown in the table below.

NO. OF DAYS	0	2	4	6	8	10	12	14
VOLUME OF BALLOON (cm^3)	3000	2500	2000	1500	1250	1100	900	800

(a) How could Moses have found the volume of the balloon?

(b) Plot a line graph of volume (cm^3) against the number of days.

(c) What was the volume of the balloon after five days?

(d) Can you explain how air might get out of the balloon even if the end is tied very tightly?

How Many Blows ?

Pamela watched Moses blowing up the balloon for his last experiment. He took such a long time that she wondered how much the volume increased each time he blew into the balloon. To find the answer, Moses blew into the balloon a number of times. After every two blows Pamela measured the volume of the balloon. Their results are shown below:

NO. OF BLOWS	2	4	6	8	10
VOLUME OF BALLOON (cm)	600	1200	1800	2400	3000

(a) How do you think Pamela measured the volume of air in the balloon each time?

(b) Plot a graph of volume of balloon against number of blows.

(c) Use the graph to find the volume of one blow.

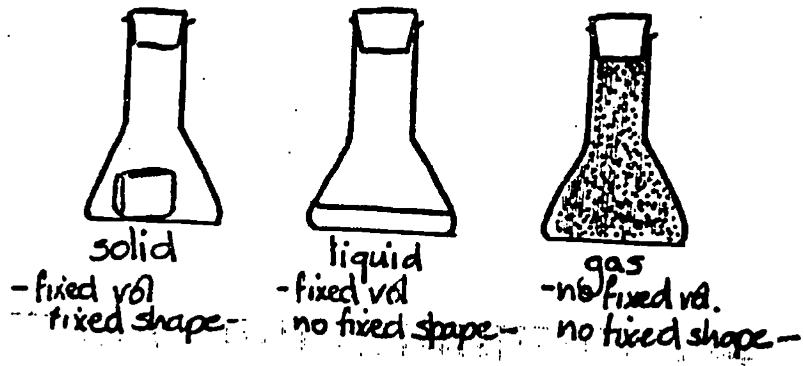
(d) How many times would Moses need to blow into the balloon to give it a volume of 4000 cm ?

(e) Explain why the balloon gets larger when you blow into it more in terms of the movement and number of molecules.

In this section, students investigate the properties of matter and, hrough experiment and observation, evidence is obtained which allows he particle theory of matter to be introduced.

1 Properties of Solids, Liquids and Gases

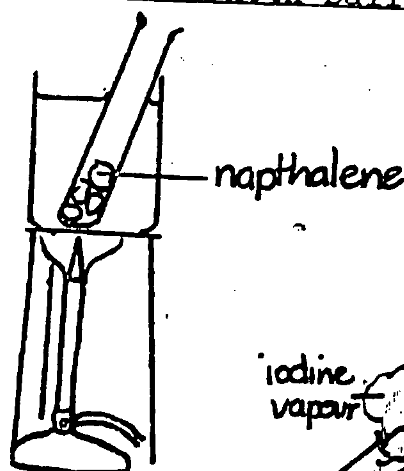
The properties of solids, liquids and gases can be compared by studying 3 identical flasks, containing solid, liquid and gas.



2 Changes of State

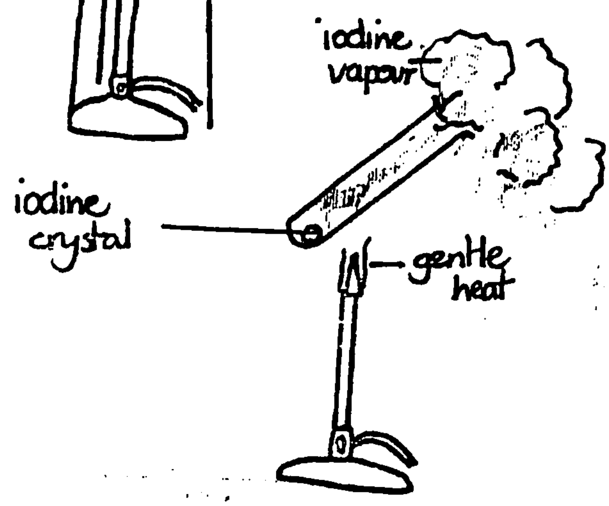
(a) Determination of the Melting Point of Napthalene (Moth Balls)

Place a test tube containing napthalene in a beaker of water. Heat this water until the napthalene melts. Remove the heat source and record the temperature of the napthalene every 2 minutes. (These results can be graphed)



(b) Sublimation of Iodine

Drop a small crystal of iodine into a dry test tube, using a pair of forceps. When the tube is heated gently the crystal turns to iodine vapour, occupying a much larger volume.



3. <u>Air Loss from Inflated Balloons</u>

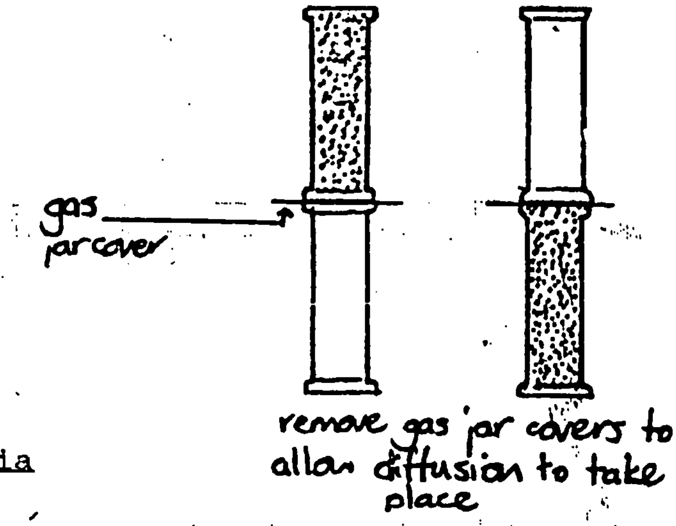
If a balloon is inflated and tightly knotted, air will slowly escape from the balloon through tiny "holes" in the wall. Air must, therefore, be composed of particles small enough to pass through these holes.

4. <u>Diffusion Experiments</u>

(a) <u>Diffusion in Gases</u>

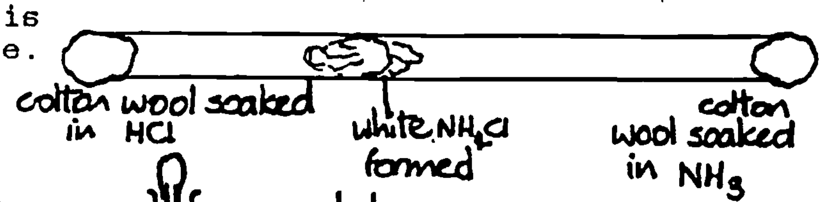
(1) <u>Nitrogen dioxide and air</u>

When gas jars are set up as shown, the rate of diffusion is the same in each case.



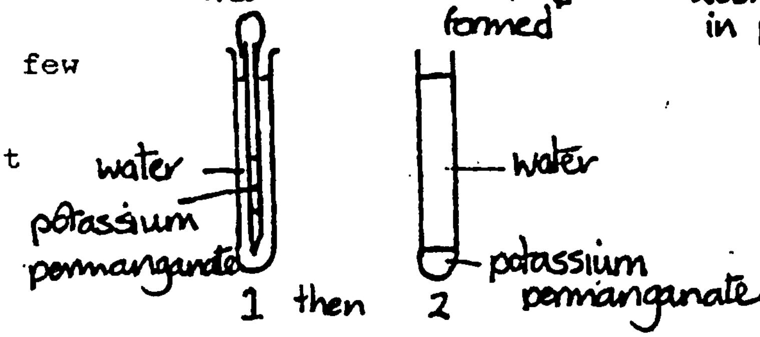
(2) <u>Hydrochloric acid and ammonia</u>

The gases diffuse at different rates NH_4Cl is formed at the interface.



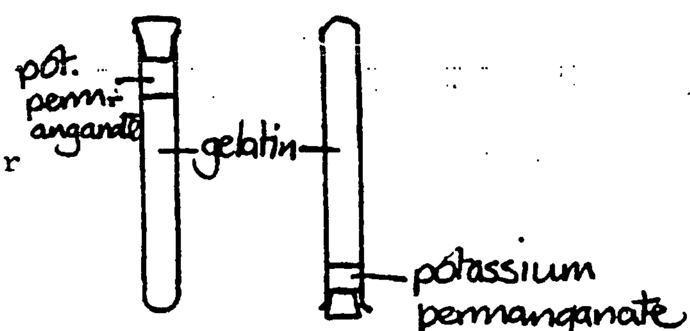
(b) <u>Diffusion in Liquids</u>

Use a syringe to put a few drops of potassium permanganate solution at the bottom of a test tube of water. Allow to stand and observe.



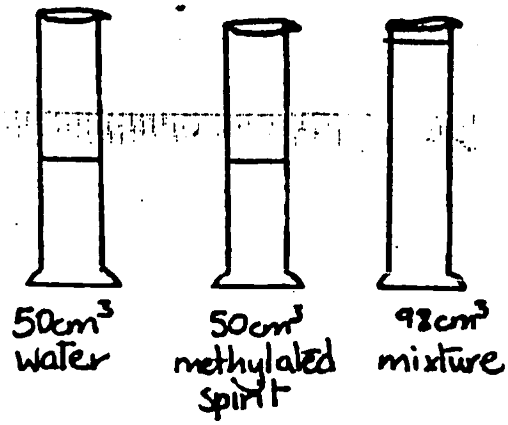
(c) <u>Diffusion in Solids</u>

Pour some gelatin solution into two test tubes. When the gelatin has cooled and set, put a crystal of potassium permanganate on top of the jelly and stopper the tubes. Leave one the right way up and the other upside down for about 1 week.



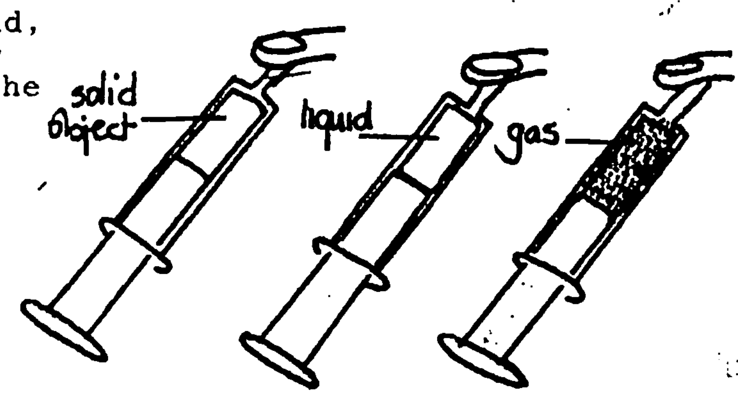
Mixing Methylated Spirit and Water

This experiment is detailed in Starting Science 1. If the volume of methylated spirit is poured in carefully on top of the water, very little mixing will occur. When the cylinder is shaken, the liquids mix and the total volume decreases. The reason for this can clearly be seen if equal volumes of dried rice and dried peas are mixed.



6. Compression of Solids, Liquids and Gases

Set up 3 syringes containing a solid, (eg stopper) liquid and gas. Allow students to put their finger over the nozzle and attempt to push down the plunger.



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D	N	A	I	N	W	O	R	B
I	A	B	D	A	L	T	O	N
U	I	F	E	T	C	D	E	O
Q	C	R	U	O	P	A	V	R
I	E	D	I	M	H	G	F	I
L	C	A	B	S	O	L	I	D
M	O	L	E	C	U	L	E	S

1. Can flow and take shape of container.
2. It keeps its shape.
3. Melts at $1539^{\circ}C$.
4. Melts at $0^{\circ}C$.
5. Gas given off by a liquid.
6. Very, very small particles.
7. Small particles made up from atoms.
8. Scientist who helped develop ideas about atoms.
9. Motion of larger particles in collision with molecules.

Distribution of Active Volcanoes

The table below shows the number of active volcanoes in the regions of the world listed.

Region	Iceland	Asia	Africa	Australia	North America	South America
No. of Volcanoes	14	5	12	0	13	22

Region	Far East	Europe	Central America & Caribbean
No. of Volcanoes	30	10	11

(1) Draw a bar graph to illustrate the results (no. of volcanoes on y-axis).

(2) (a) Which region has the greatest number of active volcanoes?
(b) Which region has the least number of volcanoes?

(3) The active volcanoes are nearly all found on the edges of the continents. Why do you think this should be so?

(4) Iceland is a small island in the middle of the Atlantic Ocean which has many volcanoes on it. Do you think there will be any other volcanoes in this area? Where must they be?

(5) There are many other volcanoes in the world besides the ones listed, but they are <u>extinct</u>, what does this mean?

Beach Erosion

In many cases, beaches along coastlines protect agricultural lands, houses, and roads from the destructive effects of the sea.

Peter became concerned about this when he noticed that sand was being removed from the beach near his home in lorries, and that the sea seemed to be washing further up the shore. He made observations over a period of months by measuring the distance of the high tide mark from a coconut palm further up shore. His results are shown in the table below.

Month	0	1	2	3	4	5	6	7	8	9	10	11	12
Distance of high tide from the palm tree (cm)	128	120	111	104	96	85	79	71	64	54	47	38	30

(1) Plot a line graph of months (x-axis) against the distance of the high tide from the palm tree.

(2) During which month was the erosion greatest?

(3) From the graph, estimate the average rate of erosion per month.

(4) (a) How many more months will it be before the sea reaches the palm tree?
(b) What will happen to the palm tree when the sea reaches it?
(c) How do you think this may affect the rate of erosion?

(5) How can the rate of erosion be slowed down?

Oil Consumption

The following table shows the total oil consumption (in millions of barrels per day of crude oil) by the United States, Canada and Europe, between 1970 and 1980. The uses of the oil have been split into categories as shown:

Year	1970	1972	1974	1976	1978	1980
Electricity Generation	2	2.2	2.6	3.2	3.6	4
Industrial	8	8.2	8.6	9.3	10.2	11
Homes, Shops, Offices	6	6.5	7	7.5	8.5	10
Transport	14	15	16	17.5	19	22

(1) Plot a line graph of the amount of oil used (y-axis) against the year. Plot all four sets of points on the one graph. Remember to label the line graphs clearly.

(2) Which of the four categories shows the greatest increase in oil consumption?

(3) From the graph, predict
(a) how much oil would be used per day for transport in 1975?
(b) How much would be used for electricity generation in 1971.

Soil Analysis

In an attempt to determine the most suitable site for an experimental farm, some scientists collected soil samples from different areas and analysed them for sand, humus and clay. Their results are shown below:

	Sand (%)	Humus (%)	Clay (%)
Soil A	85	10	5
Soil B	45	40	15
Soil C	25	30	45

(1) Plot a bar graph showing the three (3) soils and components on the x-axis, and the percentage of each component in each soil on the y-axis.

(2) Which soil will hold most water?

(3) Which soil will contain least plant food?

(4) Which soil will become most easily waterlogged during the rainy season?

(5) Which soil would be best for growing crops on?

1. Looking at Rocks

A good way to begin this section may be to get each pupil to bring a rock or stone into school. A number of questions can then be asked and discussion and teaching points can be developed.

eg (a) How old is it?
(b) How did it get where it was found?
(c) What colour is it (obtain a fresn surface if possible to examine)?
(d) What is its density (determine volume by water displacement)?
(e) Is it hard (how can this be measured)?
(f) Does it crack easily?

2. Identifying Limestone

Limestone is composed of the chemical, calcium carbonate, which reacts with hydrochloric acid to give carbon dioxide. Calcium carbonate containing rocks can be found in Grenada.

NB It is perhaps also worth investigating sand samples for magnetic properties. Black sand (found, for example, at Black Bay, near Gouyave) is known to be ferromagnetic.

3. Extracting Metals from their Ores

The chemistry behind this process is given a more fuller treatment in the CXC course. However attention should be given at this stage to the presence of metal ores and the historical uses of different metals and how this may be related to their case of extraction.

The extraction of copper from copper (II) oxide can be used to demonstrate this process. Heating black copper (II) oxide with carbon results in the production of red copper metal.

Relate this experiment to the "accidental" extraction of copper from copper containing containing rocks around a fire.

4. Refining "Crude Oil"

Artificial crude oil can be made in the laboratory using a mixture of petrol, paraffin, diesel, lubricating oil, and engine oil. This mixture can then be used to illustrate a simplified form of fractional distillation. This procedure is outlined in Starting Science Book 2 (p. 60).

5. Soil Tests

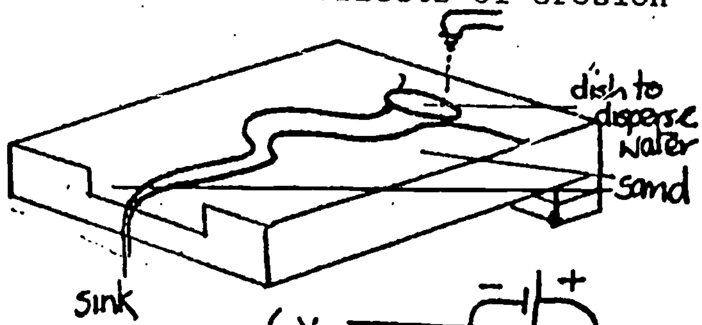
The differences in the properties of soils can be shown by carrying out simple tests on soils from different areas. These tests include:

(a) water content
(b) air content
(c) acidity

Methods are outlined in Starting Science Book 2 (p.63).

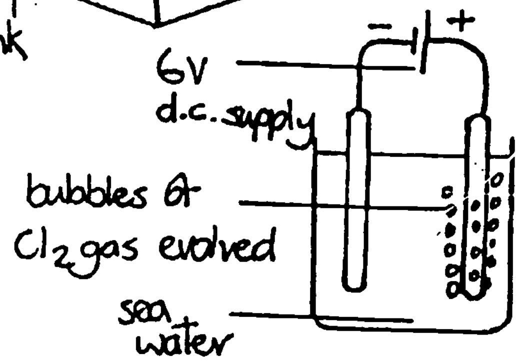
6. Soil Erosion

An inclined tray may be used to illustrate the effects of erosion by water as well as precautions which may be taken to prevent this. A stiff cardboard box can be used if no suitable tray is available. Trace a path in the sand with your finger tip before beginning.



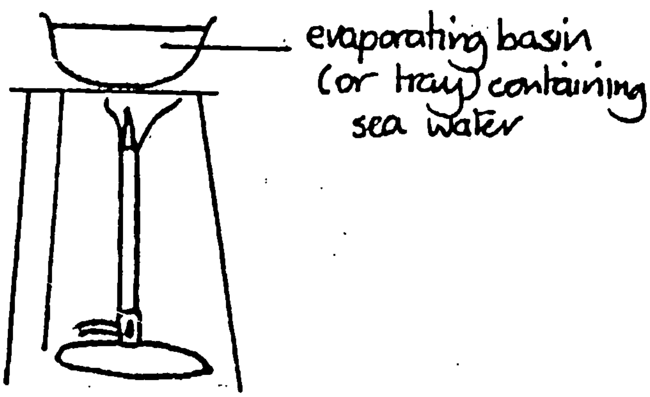
Electrolysis of Sea Water

This simple experiment will illustrate the principle used in the commercial extraction of chlorine from sea water.



Evaporation of Sea Water

This process is used commercially in the West Indies. Fresh water can be used as a comparison.



The Earth, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7

A	G	F	S	E	T	A	C	I	L	I	S	O
O	C	X	E	F	A	U	L	T	S	A	E	R
N	O	I	T	A	L	L	I	T	S	I	D	E
B	A	C	D	E	S	U	O	E	N	G	I	F
V	L	O	A	M	D	A	V	A	I	K	M	C
W	U	C	I	H	P	R	O	N	A	T	E	M
T	A	E	R	O	S	I	O	N	J	I	N	H
S	M	M	E	S	T	K	L	S	L	A	T	E
U	G	E	R	R	S	U	N	U	H	M	A	Q
R	A	N	O	C	H	A	L	K	N	N	R	P
C	M	T	C	F	O	S	S	I	L	S	Y	O

1. The middle of the earth.
2. The least dense layer of the earth.
3. A rock which is easily split.
4. A rock which frizzes if acid is dropped on it.
5. Hot liquid rock under th ground.
6. Hot liquid rock from a volcano.
7. Type of rock that solidifies from liquid.
8. Volcanic regions are found along __________.
9. The wearing away of rock or soil.
10. Rock formed from settled particles.
11. Rock changed by either pressure or heat.
12. Remains of ancient life forms.
13. Ground, roasted clay and limestone.
14. Rocks which contain alot of silicon.
15. Iron as it is found in the earth.
16. Solid fossil fuel
17. Crude oil is purified by this process.
18. Rotting dead plant material.
19. Lots of humus, some clay, some sand.

ANSWERS TO WORD SEARCHES: YEAR 1

1. Being a Scientist, 1.1, 1.2, 1.3

1. senses
2. thermometer
3. stop watch
4. millimetre
5. second
6. temperature
7. mass
8. volume
9. filtration
10. Fleming
11. minute
12. metre

2. Looking at Living Things, 2.1

1. organism
2. animal
3. reproduction
4. mammary
5. rodents
6. mucus
7. habitat

3. Solvents and Solutions, 5.1, 5.2, 5.3, 5.4, 5.5

1. water
2. evaporation
3. condensation
4. ice
5. steam
6. boiling point
7. melting point
8. expands
9. salt
10. precipitation
11. irrigation
12. solvent
13. saturated
14. suspension
15. paraffin
16. chlorine

4. Energy 3.1, 3.2, 3.3

1. chemical
2. atomic
3. kinetic
4. light
5. dynamo
6. sun
7. joules
8. hydroelectricity
9. solar
10. electric motor

5. Electricity 7.1, 7.2, 7.3

1. polythene
2. electrons
3. Van de Graaff
4. electric current
5. ampere
6. ammeter
7. switch
8. conductor
9. insulator
10. copper
11. voltage
12. volt
13. mercury
14. lead-acid

6. Gases of Air, 8.1, 8.2

1. atmosphere
2. air
3. nitrogen
4. oxygen
5. carbon dioxide
6. noble gas
7. helium
8. Argon
9. fractional
10. oxide
11. fuel
12. sulphur dioxide
13. carbon monoxide

ANSWERS TO WORD SEARCHES - YEAR 2

1. Cells and Reproduction, 6.1

1. cell
2. microscope
3. nucleus
4. cytoplasm
5. cell wall
6. vacuole
7. chlorophyl
8. amoeba
9. binary

2. Looking at Living Things 2.2 and The Gases in Air, 8.3, 8.4, 8.5

1. invertibrates
2. vertibrates
3. fish
4. mammals
5. respiration
6. oxygen
7. water
8. carbon dioxide
9. lungs
10. diaphragm
11. alveoli
12. iodine
13. photosynthesis
14. light
15. Brazil
16. primary
17. secondary

3. Cells and Reproduction, 6.2, 6.3

1. sperm
2. egg
3. testes
4. ovaries
5. external
6. chromosomes
7. ovulation
8. cord
9. foetus
10. gene

4. Heat on the Move 9.1, 9.2, 9.3, 9.4

1. conduction
2. insulator
3. copper
4. convection
5. themal
6. monsoon
7. radiation
8. hypothemia
9. solar

5. Building Blocks, 4.1, 4.2

1. liquid
2. solid
3. iron
4. ice
5. vapour
6. atoms
7. molecules
8. Dalton
9. Brownian

6. The Earth, 12.1 - 12.7

1. core
2. crust
3. slate
4. chalk
5. magma
6. lava
7. igneous
8. faults
9. erosion
10. sedimentary
11. metamorphic
12. fossils
13. cement
14. silicates
15. ore
16. coal
17. distillation
18. humus
19. loam

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