1.1 Spot the difference

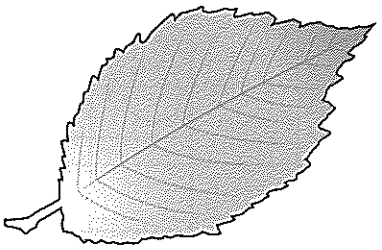
Science inquiry

Visual/Spatial Logical/Mathematical

Scientists need to be able to pick out the similarities and differences in what they see around them. These similarities and differences allow them to classify all sorts of things such as rocks, stars, chemicals and living organisms.

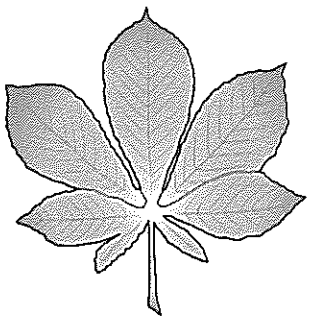
Compare the following pairs of organisms by **listing** their similarities and differences.

a



Similarities

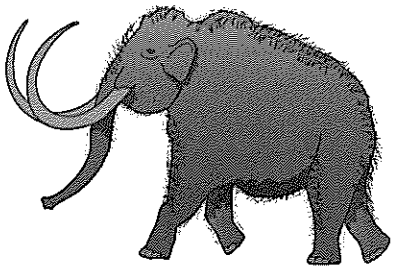
b



Differences

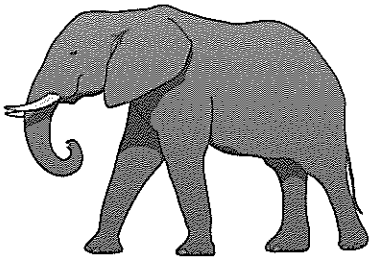
---

c



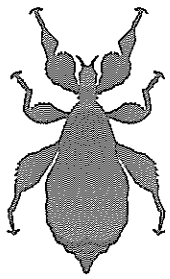
Similarities

d



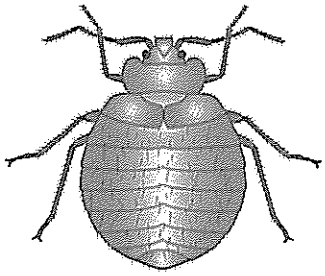
Differences

e



Similarities

f

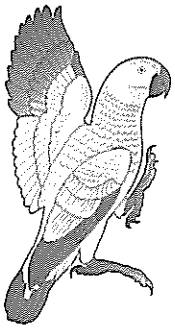


Differences

g

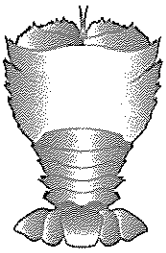
Similarities

h



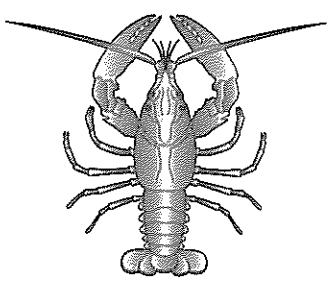
Differences

i



Similarities

j



Differences

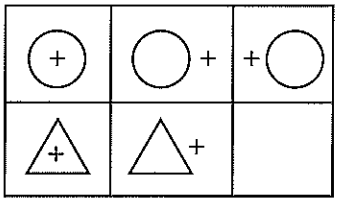
1.2 Patterns in observations

Science inquiry

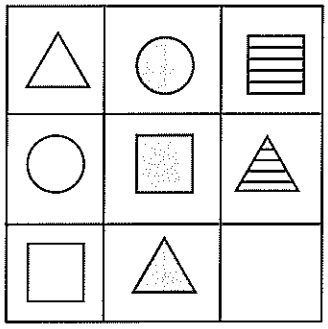
Visual/Spatial Logical/Mathematical

Scientists not only need to carefully observe the world around them but must also be able to recognise patterns in what they see. In each of the following, use the patterns to **predict** the final missing design.

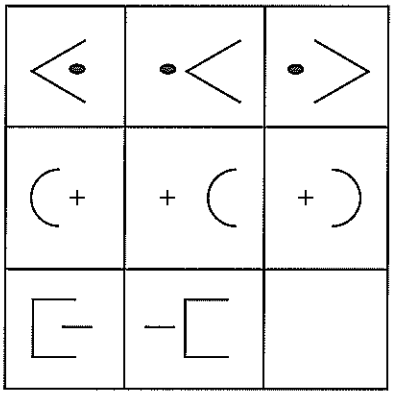
a



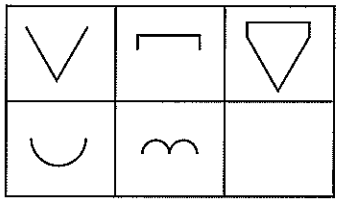
b



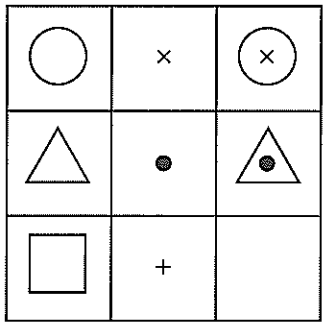
c



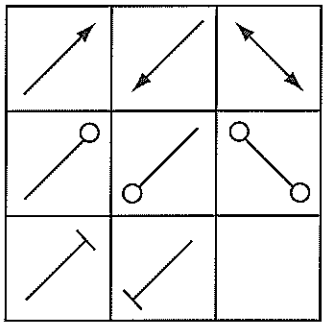
d



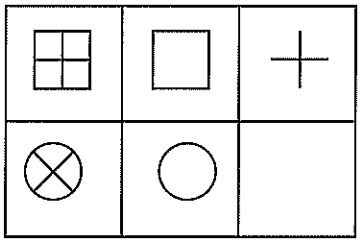
e



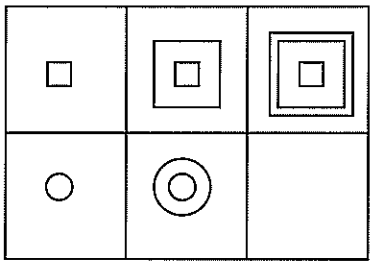
f



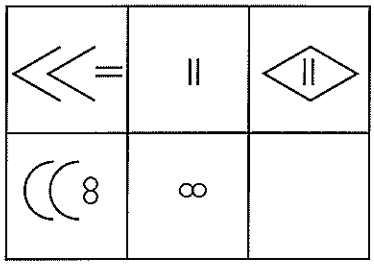
g



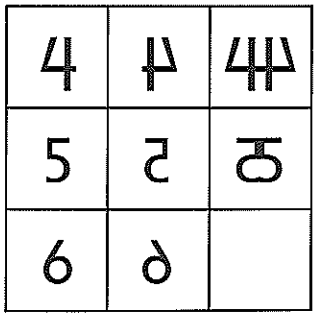
h



i



j

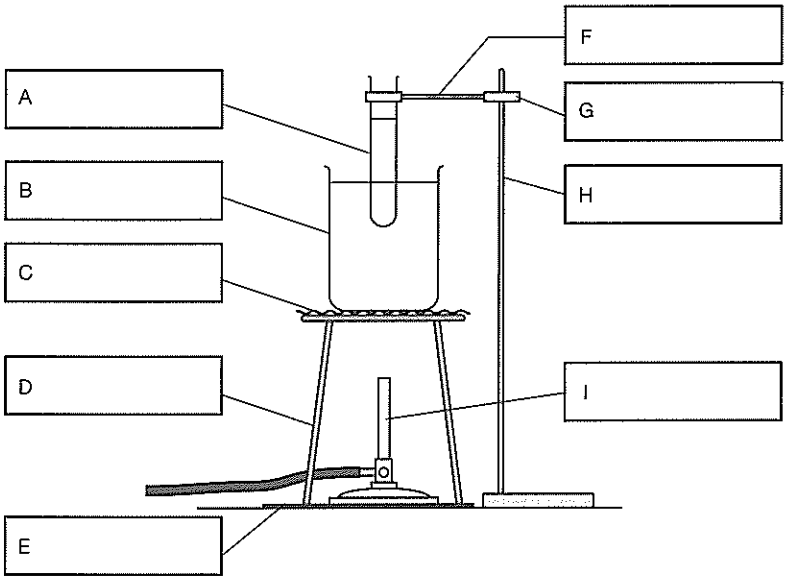


1.3 Equipment

Science understanding

Verbal/Linguistic **Visual/Spatial**

Scientists rarely draw realistic three-dimensional (3D) diagrams of the equipment they use. Instead, they draw simple two-dimensional (2D) diagrams showing each piece of equipment as a cross-section. One such diagram is shown below.



tripod
Bunsen burner
beaker
conical flask
test-tube
filter paper
retort stand
bosshead
funnel
clamp
bench mat
gauze mat

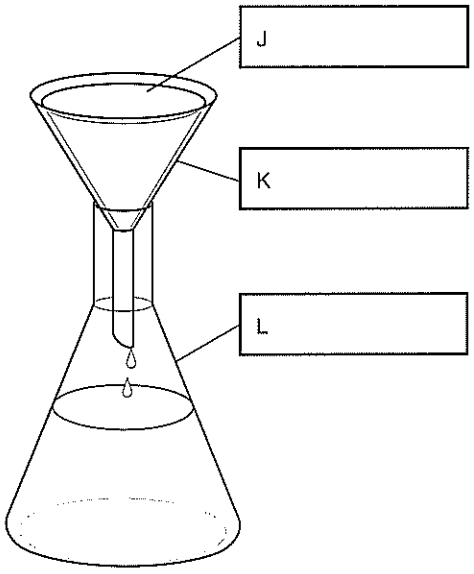
1 **Use** words from the box to label all the pieces of equipment shown above.

2 **Propose** what this arrangement of equipment might be used for.

_____

_____

3 Below is another experiment, this time drawn in a realistic 3D manner. **Use** words from the box to label all the pieces of equipment, and then **construct** a 2D diagram of this set-up in the space provided.



1.4 Can you follow instructions?

Science inquiry

Verbal/Linguistic

To complete this activity you need to follow the instructions given below as quickly as you can.

Instructions

1 Don't do anything until you have carefully read every instruction.

2 Write your full name in capitals. _____

3 Circle your surname.

4 **Name** the capital city of Australia. _____

5 Fold over one of the top corners of this page.

6 **State** how many kangaroos are on the $1 coin. _____

7 Complete the following diagram to **construct** a hexagon (six sides).

8 **Specify** which Australian coin has a platypus on it. _____

9 **Construct** a diagram of a smiley face in the bottom right corner of this page.

10 **Name** Australia's current Prime Minister. _____

11 **Calculate** the answer to 345 + 289 + 365. _____

12 **State** today's date. _____

13 **Specify** the value of the Australian banknote that is red in colour. _____

14 **Construct** a diagram of the letter E but back-to-front, so that it appears as if it is reflected in a mirror. _____

15 Arrange the following numbers in order from smallest to biggest: 21, 8, 64, 19, 3.

_____

16 **Construct** a diagram of a square in the bottom left corner of this page.

17 Write the number 8 in the square.

18 **Calculate** the answer to $1 \times 2 \times 3 \times 4 \times 5$. _____

19 **Name** the Australian state that is also an island. _____

20 Ignore all the above instructions except Instructions 1, 2 and this one.

1.5 Mega quantities

Science inquiry

Bodily/Kinaesthetic **Visual/Spatial** **Logical/Mathematical**

Scientists use metric units to measure quantities. The basic units scientists use are metre (m), gram (g) and litre (L). However, sometimes these units are too small to measure extremely large quantities. Likewise, at other times these units are too large to measure really small quantities. This is when unit prefixes such as kilo (k), mega (M), giga (G), centi (c), milli (m), micro (μ) and nano (n) are used.

Mega (symbol M) is the prefix for a million. For example, 1 megalitre (ML) of water is the same as 1 million litres and 1 megatonne (Mt) represents 1 million tonnes. The prefix mega can be attached to anything. For example, 1 megapeople would represent 1 million people and so Australia has a population of around 20 megapeople. Likewise, you would be rich if you won 1 megadollar ($1 M).

The following three tasks will give you some idea of how big a million or a mega is.

Task 1: A million letters

1 For this task, you need a novel. Estimate how many pages will contain 1 000 000 letters.

Estimate = _____ pages.

2 Once you've made your estimate, turn to a page in the novel that is all text with no pictures. Don't pick the first or last page of a chapter because they usually aren't a full page. Count the number of letters in the first, second and third lines on the page. Record your results in the table on the next page.

3 Find the average number of letters in one line by adding your three numbers and dividing by 3.

$$\text{Average letters per line} = \frac{\text{line 1} + \text{line 2} + \text{line 3}}{3}$$

4 Count how many lines there are on one page and then find the average number of letters on 1 page.

Average letters per page = average letters per line × number of lines on 1 page

5 Calculate how many pages would be equivalent to 1 000 000 letters by dividing 1 000 000 by the average number of letters on one page.

$$\text{Number of pages} = \frac{1\,000\,000}{\text{average per page}}$$

6 Place all your results in the following table.

Letters on line 1	
Letters on line 2	
Letters on line 3	
Average letters in 1 line	
Lines on 1 page	
Average number of letters on 1 page	
Number of pages that make up 1 000 000 letters	

7 **Compare** your estimate with the number of pages calculated above.

_____

Task 2: A million heartbeats

8 Estimate how long it would take for your heart to beat 1 000 000 times.

Estimate = _____ minutes, hours or days

9 **Construct** a method showing how you could calculate how many days it would take for your heart to beat 1 000 000 times (the table below might give you some ideas how this could be done). Write your method below.

_____

_____

_____

_____

_____

10 Carry out your method, recording all the results in the following table.

Average beats per minute	
Beats per hour	
Beats per day	
Days taken for 1 000 000 beats	

11 **Compare** your estimate with the number of days calculated in the table above.

_____

_____

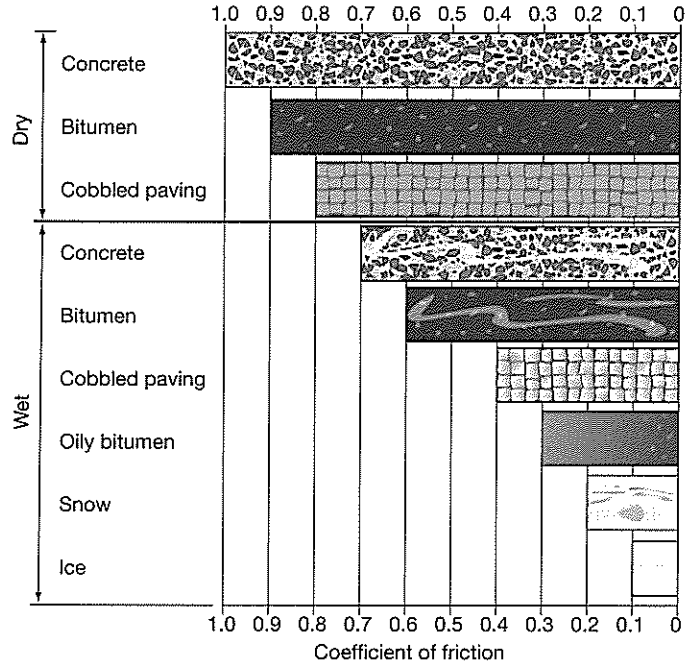
1.6 Analysing graphs

Science inquiry

Visual/Spatial Logical/Mathematical

Friction

Friction is the force that causes your bike to slow down and is the force that stops a car at the traffic lights. For a bike or a car, friction depends on the type of tyres and the type of surface you are travelling on. Some surfaces are extremely smooth and have low friction while others are very rough and have a lot of friction. The coefficient of friction measures how rough a surface is. This bar graph shows the coefficients of friction for different types of road surfaces.



1 **Use** the bar graph to rank the different surfaces in order from the surface that provides the most friction to the surface that provides the least.

_____

2 **Identify** the surface on which it would be:

(a) easiest to stop _____

(b) most difficult to stop _____

3 **Identify** which surface would produce the biggest skids. **Justify** your choice.

_____

4 Friction also allows you to get moving. Without it, your bike wheel would just spin on the spot. **Identify** the surface on which it would be:

(a) easiest to get moving _____

(b) most difficult to get moving _____

5 **Compare** the coefficients of friction of the following road surfaces.

(a) Dry bitumen, wet bitumen and oily bitumen _____

(b) Snow and ice _____

(c) Dry concrete and ice _____

(d) Dry concrete and wet concrete _____

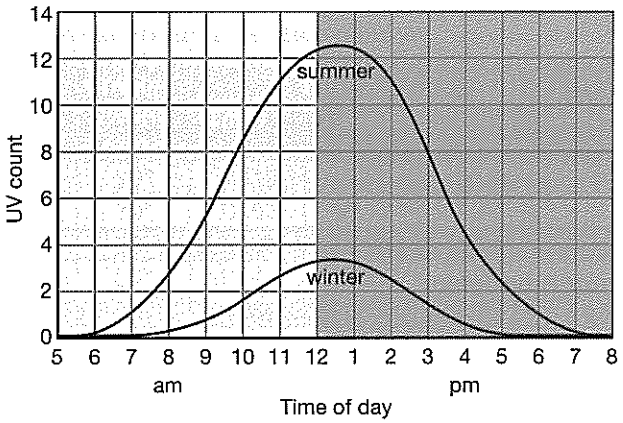
(e) Dry cobbled paving and wet cobbled paving _____

6 **Propose** what material roads should be made from.

_____

UV counts

Ultraviolet (UV) radiation from the Sun is known to cause skin cancers. The amount of



UV radiation falling on Australia depends on the time of year and the time of day. This variation is shown as the UV count in the following line graph.

7 **Use** the line graph to state the UV count for:

(a) maximum UV radiation in summer _____

(b) maximum UV radiation in winter _____

8 Any exposure to UV radiation can be dangerous but exposure to UV counts of 6 or above puts you at a much higher risk. **State** the times of the day at which the UV count is 6 or above in:

(a) January _____ **(b)** July _____

9 **Propose** why the UV counts in January are higher than those in July.

_____

10 **State** the times at which the UV count is zero in:

(a) summer _____ **(b)** winter _____

11 **Propose** why the UV count drops to zero much later in summer than in winter.

_____

1.7 Planning your own experiment

Science inquiry

Verbal/Linguistic Logical/Mathematical

Imagine that you have been given the task of finding what influences the time it takes for a parachute to drop.

1 **List** as many variables as you can think of that *might* influence the drop time of a parachute.

2 **Identify** the variable that you think will have the biggest influence on a parachute's drop time.

3 Imagine that you now need to carry out an experiment that tests this variable. Before you start, **construct**:

(a) an aim or purpose for your experiment

(b) a hypothesis for your experiment

(c) a list of materials and equipment you will need

(d) a step-by-step method or procedure of how you will carry out your experiment. (Remember that you should only change the variable you are testing.) Your method should give enough detail so that another Year 8 student would be able to carry out your experiment without needing to guess anything.

1.8 Investigating the pendulum

Science inquiry, Science as a human endeavour

Visual/Spatial **Logical/Mathematical**

Refer to the Science as a Human Endeavour on pages 30 and 31 of your student book to answer the following questions. A pendulum is a mass on the end of a string, cable, chain or bar that repeatedly swings back and forth.

1 **Recall** definitions by matching each of the following terms with their correct description by joining them with a line.

(a) Bob	The number of swings a mass completes every second
(b) Period	The unit used to measure frequency
(c) Frequency	The time it takes for a mass to swing back and forth once
(d) Hertz	The swinging mass of a pendulum

Nathan was investigating the variables that affected how a pendulum swung. The results he obtained in one experiment are shown below.

Mass (g)	String length (cm)	Angle swung from	Time for 10 swings (s)				Period = average time for one swing (s)
			Time 1	Time 2	Time 3	Average	
150	20	30°	9.12	8.95	9.08		
150	40	30°	12.53	13.12	12.74		
150	60	30°	16.30	16.03	15.25		
150	80	30°	18.41	18.84	18.38		
150	100	30°	19.89	20.11	20.87		

2 From these results, **identify** his:

(a) independent variable (the variable that Nathan decided to alter in his experiment)

_____

(b) controlled variables (the variables that Nathan kept the same throughout the experiment)

_____

(c) dependent variable (the variable that changed naturally as Nathan changed other variables in his experiment)

_____

3 **Calculate** Nathan's missing values to complete his results table.

4 **Propose** a reason why Nathan measured 10 swings each time and not just one swing.

_____

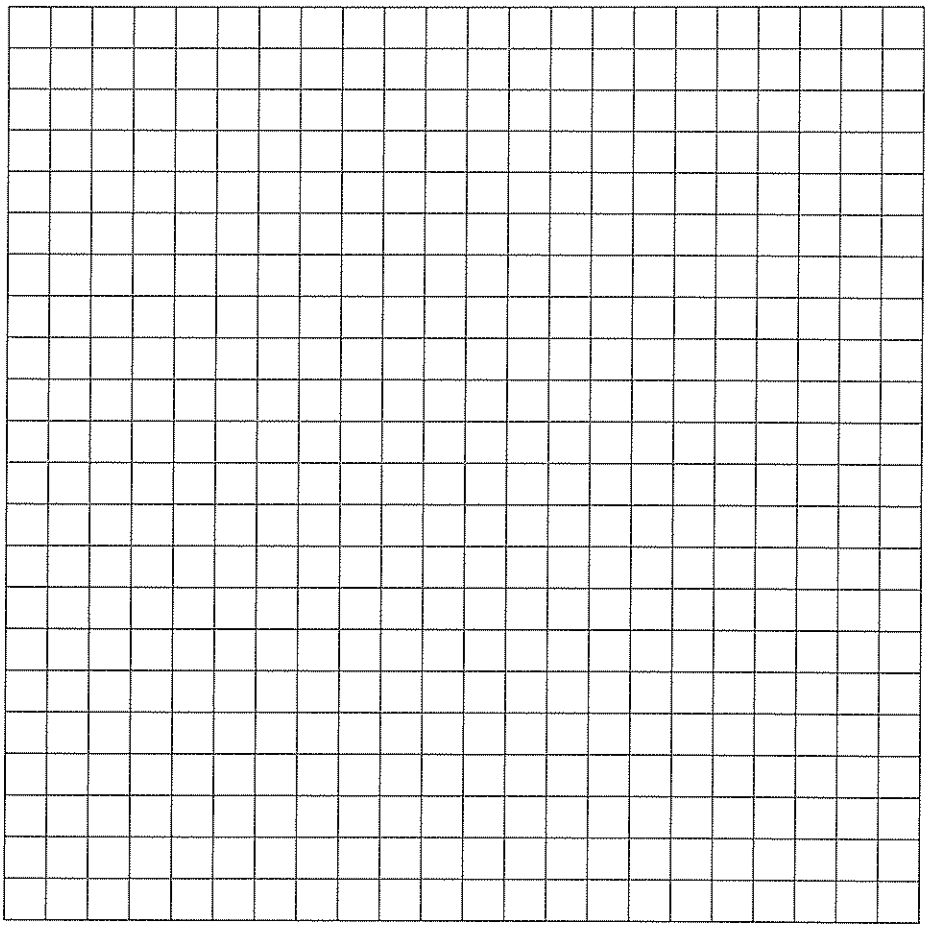
_____

5 Nathan measured each set of swings three times and then took an average. **Explain** the advantage of this.

_____

_____

6 On the graph axes below, **construct** a line graph showing period versus length for Nathan's experiment.



7 From the following sentences, **identify** the best conclusion to Nathan's experiment.

A The length of a pendulum does not affect the period of a pendulum.

B If the length of a pendulum doubles, then its period also doubles.

C As the length of the pendulum increases, its period increases at an increasing rate (i.e. it keeps on increasing and increasing).

D As the length of the pendulum increases, its period increases but at a lesser rate than before (i.e. it flattens out).

_____

1.9 Literacy review

Science understanding

Verbal/Linguistic

Use the clues below to **identify** the missing words.

1 The mean. Add up all the good values and divide by how many there are.

A _ _ _ _ _ _

2 The method for an experiment P _ _ _ _ _ _ _ _

3 A type of error caused by looking at a measurement from a slight angle

P _ _ _ _ _ _ _

4 An observation made using numbers Q _ _ _ _ _ _ _ _ _ _ _

5 An observation that has no numbers but uses a description or diagram

Q _ _ _ _ _ _ _ _ _ _

6 A resource list is sometimes called this B _ _ _ _ _ _ _ _ _ _ _

7 The purpose of an experiment A _ _

8 Logical extension of a graph E _ _ _ _ _ _ _ _ _ _ _

9 An educated guess about what might happen H _ _ _ _ _ _ _ _ _

10 A boy's name but also the swinging mass at the end of a pendulum B _ _

11 The number of swings a pendulum makes in a second

F _ _ _ _ _ _ _ _

12 A factor that might influence what happens in an experiment

V _ _ _ _ _ _ _

13 A short summary of what was found out in an experiment

C _ _ _ _ _ _ _ _ _

14 The last part of the address of a webpage D _ _ _ _ _

15 Data that you collect yourself in an experiment F _ _ _ _ _ _ _ _

16 Altering an electronic scale so that it reads zero T _ _ _

17 Often confused with errors. Can be avoided with care M _ _ _ _ _ _ _

18 Slight changes in measurements that occur naturally, regardless of how careful you are

E _ _ _ _ _

19 Measurements and observations about something D _ _ _

20 Something that swings back and forth, used to control timing of grandfather clocks and metronomes

P _ _ _ _ _ _ _

1.9

Once you have identified the missing words, find and highlight them in the wordfind below.

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