1. What is the scientific method?

The scientific method underpins what we do in all aspects of science. You need to understand it in order to design and run scientific experiements well. 1.1

Cloze activity

Fill in the gaps to complete this description of the scientific method. The answers are in the word search on the next page.

The (a)_____ _____ is a way of observing the world around us or conducting an experiment to collect information. The scientific method helps us to acquire ((b)_____) new knowledge or to (c)_____ our understanding of scientific (d)_____ and principles.

Any experiment designed using the scientific method must be (e)_____ This means that any other (f)_____ should be able to repeat the experiment in exactly the same way to produce the same (g)_____ As more scientists that carry out the (h)_____ and get the same results, it is more likely that the results are true and (i)_____

The results of any scientific experiment need to be carefully (j)_____ and written down ((k)_____) so that other scientists can see exactly how the scientist who carried out the experiment has come to their (l)_____

The scientific method is used to test an idea ((m)_____) or a theory. Scientists do not always get the results that they expect when they (n)_____ an experiment. Unexpected results are not (o)_____; it just means the scientist's idea or theory about what is (p)_____ in the experiment needs to be improved.

Word search

1.2

Find the missing words from the cloze activity in this word search. They may run horizontally, vertically or diagonally, and forwards or backwards.

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

2. Features of a well-designed experiment

Aim/purpose

2.1

Every experiment must have an aim or a purpose – a reason for doing it. This is what you are trying to investigate. The aim of all scientific experiments is to test a scientific theory or to investigate a natural phenomenon.

A good way to write an aim is to start: "The aim of this experiment is to ..."

Write a brief aim for each of the following experiments.

1. Experiment one: Use different types of detergent to blow bubbles.

   The aim of this experiment is to ...

2. Experiment two: Use different fertilisers on similar plants.

   The aim of this experiment is to ...

3. Experiment three: Hold your nose while eating different foods.

   The aim of this experiment is to ...

4. Experiment four: Use the front and back of a spoon as a mirror.

   The aim of this experiment is to ...

5. Experiment five: Put a strong magnet in different types of cereal.

   The aim of this experiment is to ...

Introducing variables

2.2

Variables are things in an experiment that can change or be controlled. There are three types of variables:

(a) an **independent** variable– what you change; that is, the variable you are testing, which should be the only thing you change in an experiment

(b) a **dependent** variable – what you measure; that is, the variable that changes depending on the value of the independent variable

(c) a **controlled** variable – what you keep the same so that you can be sure any change to the dependent variable is caused by changes to the independent variable. If you do not keep these other variables the same, you won't know which variable has affected your results!

For each of the following experiments identify the independent variable, the dependent variable and three controlled variables (although there may be more than three, you only need to identify a selection).

1. Experiment one: You are to investigate the amount of bacteria that grows on four different surfaces.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

_____

_____

2. Experiment two: You are to investigate how the number of balls released in a Newton's cradle affects how many balls will swing.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

_____

_____

3. Experiment three: You are to investigate what happens when you shine a light through various prisms of different shapes.

(a) Independent variable: _____

(b) Dependent variable: _____

(c) Three controlled variables: _____

_____

_____

Suggested answers

1.1 Cloze activity

(a) scientific method
(b) gain
(c) test
(d) theories
(e) reproducible
(f) scientist
(g) results
(h) experiment
(i) correct
(j) measured
(k) documented
(l) conclusion
(m) hypothesis
(n) conduct
(o) wrong
(p) happening

1.2 Word search

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

2.1 Aim/purpose

1. The aim of this experiment is to see which type of detergent makes the biggest bubbles (by increasing the surface tension of the water the most).
2. The aim of this experiment is to see which type of fertiliser makes plants grow best.
3. The aim of this experiment is to see if your sense of smell affects your sense of taste.
4. The aim of this experiment is to see how different curved surfaces affect the reflection of light.
5. The aim of this experiment is to see which type of cereal contains the most iron.

2.2 Introducing variables

1. (a) The four types of growth surface
   (b) The amount of bacterial growth (mm)
   (c) *Any three of the following (check other answers with your teacher):* Incubation temperature, amount of nutrient jelly, initial sample size, period of incubation.
2. (a) The number of balls released
   (b) The number of balls that swing out
   (c) *Any three of the following (check other answers with your teacher):* The mass of the balls, the force used to release the balls, the length of the string in the cradle, the height from which the balls are released.
3. (a) The shapes of the prisms
   (b) What happens to light
   (c) *Any three of the following (check other answers with your teacher):* The light source used, the angle of the light entering the prism, the distance of the light source from the prism, the intensity of the light source used.