

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

Leave blank

General Certificate of Secondary Education
June 2003



**SCIENCE: SINGLE AWARD (MODULAR)
FOUNDATION TIER**

3469/F

F

Monday 2 June 2003 1.30 pm to 3.00 pm

In addition to this paper you will require:

- the Data Sheet (enclosed);
- a ruler.

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

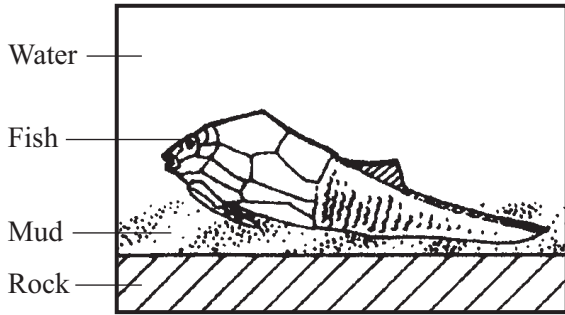
- The maximum mark for this paper is 90.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

ENVIRONMENT, INHERITANCE AND SELECTION

1 Fossils give us evidence for the theory of evolution.

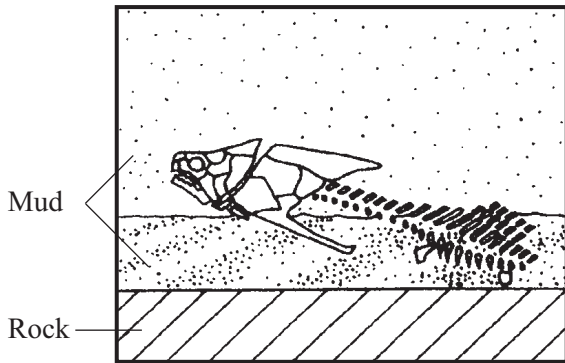
The diagrams show how a fish became a fossil.

(a) In the sentences below, cross out the **two** lines which are wrong in each box.



The fish died and became covered by

- ice
- mud
- rock

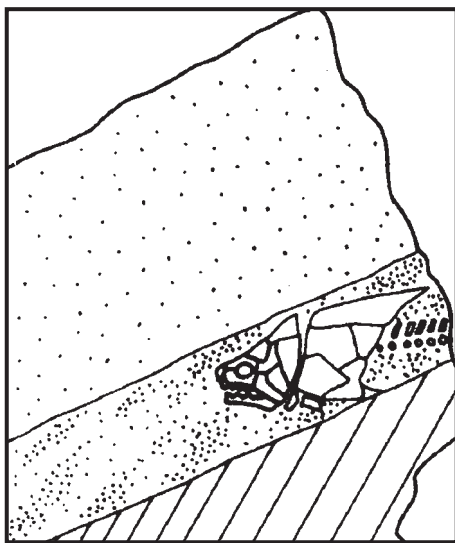


The organs of the fish

- decayed
- became extinct
- mutated

The only part of the fish then left was its

- brain
- heart
- skeleton



The mud surrounding the remains

of the fish turned into

- ice
- rock
- water

(4 marks)

(b) Give **one** way in which fossils provide evidence for the theory of evolution.

.....

.....

.....

(1 mark)

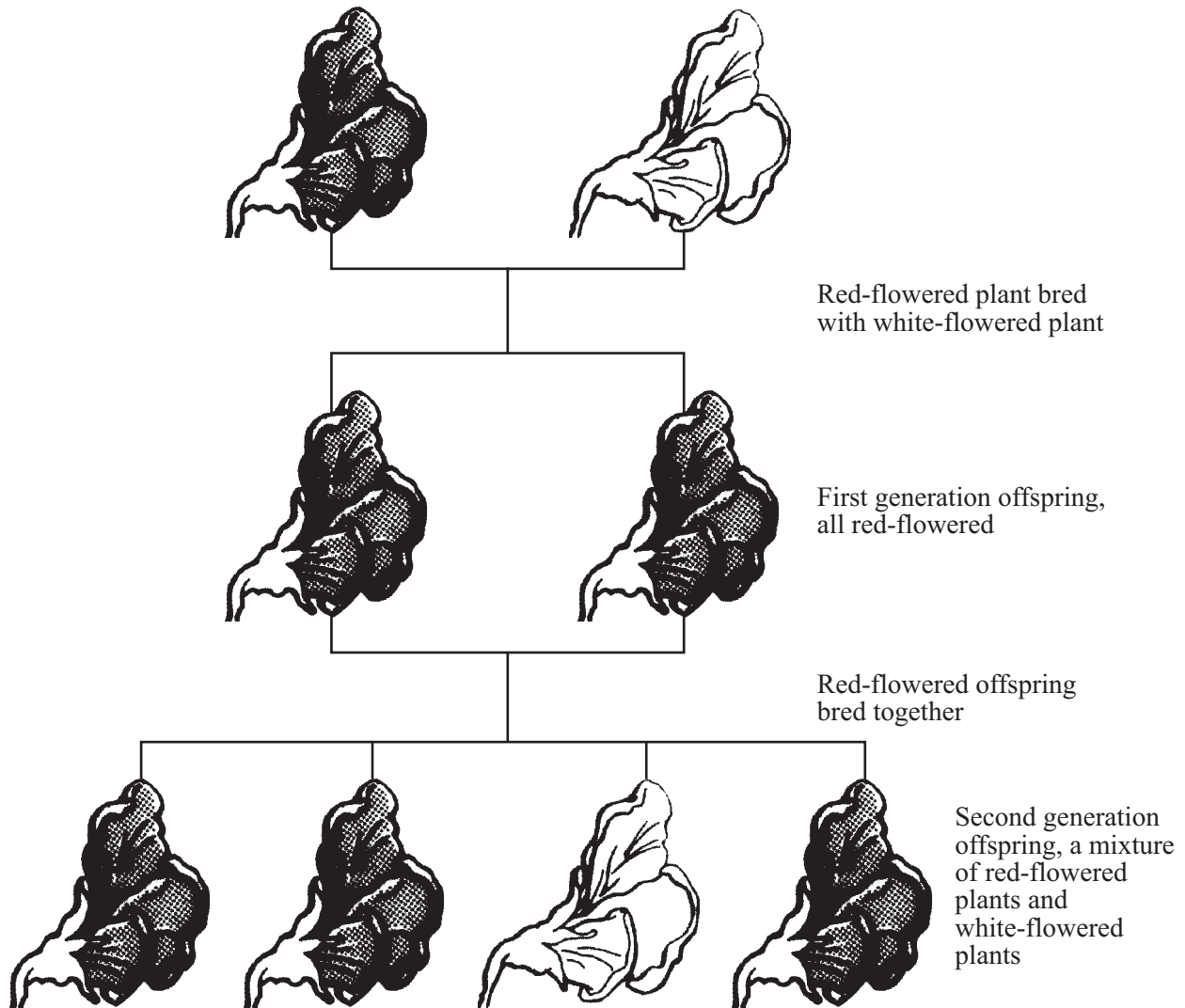
5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

2 The diagrams show one of the experiments performed by a scientist called Mendel.

He bred sweet pea plants.



In the sentences below, cross out the **two** lines which are wrong in each box.

Mendel proposed that flower colour was controlled by inherited factors.

The first generation plants show that the red factor is

dominant
environmental
recessive

The second generation plants show that the white factor is

dominant
environmental
recessive

We now call inherited factors

chromosomes
gametes
genes

These factors are passed from generation to generation in

gametes
glands
organs

The red-flowered sweet pea plants did not all grow to the same height.

This was due to

dominant
environmental
recessive

factors.

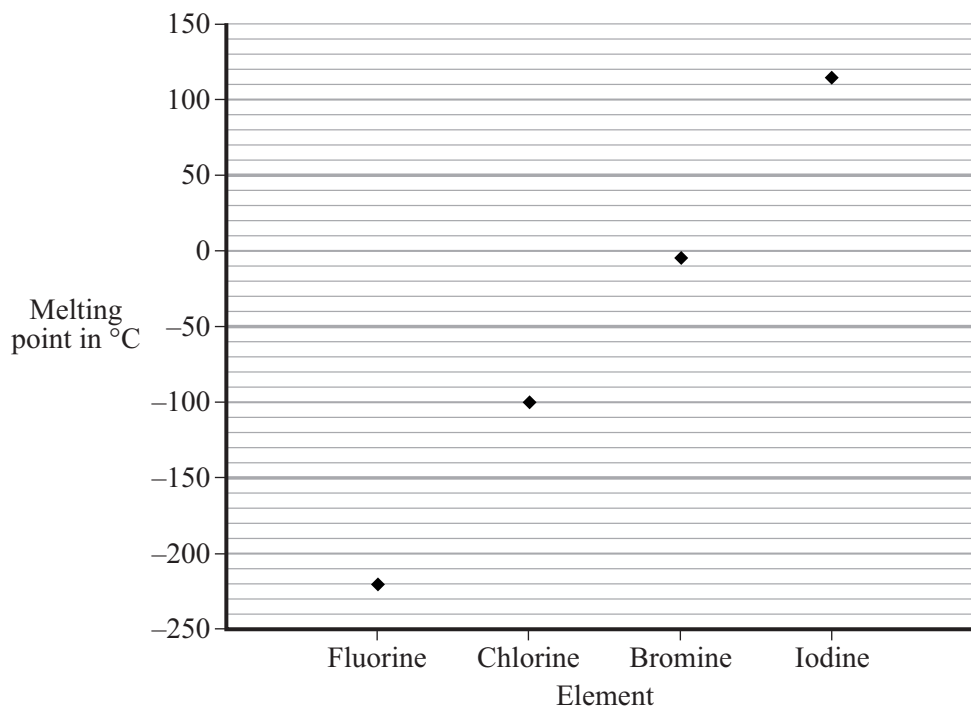
(5 marks)

5

Turn over ►

PATTERNS AND REACTIONS

- 3 The graph shows the melting point of four elements in Group 7 of the periodic table.



- (a) What is the melting point of fluorine?

.....
(1 mark)

- (b) Room temperature is 20 °C.

Which element is solid at room temperature?

.....
(1 mark)

- (c) Look at the periodic table on the Data Sheet.

Using data from the graph, describe the trend of melting points of the elements in Group 7.

.....
.....
.....
.....
(2 marks)

(d) The elements in Group 7 are non-metals.

Which **two** of the following are properties of non-metals?

Place a tick (✓) in the box against each correct property.

Brittle (if solid)

Good conductor of heat

High boiling point

Poor conductor of electricity

(2 marks)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

4 Living cells are used to make beer and yoghurt.

(a) Complete each sentence by using the correct words from the box.

alcohol	fructose	lactic acid	milk sugar
oxygen	protein	starch	sugar

In beer-making, yeast converts into carbon dioxide and

In yoghurt-making, bacteria convert into
(4 marks)

(b) Describe the test for carbon dioxide.

.....
.....
.....
.....
(2 marks)



FORCES, WAVES AND RADIATION

- 5 List A gives the names of five different types of radiation.
List B gives uses of different types of radiation in a different order.
Draw a straight line from each type of radiation in List A to its use in List B.

List A Type of radiation

Microwaves

Gamma rays

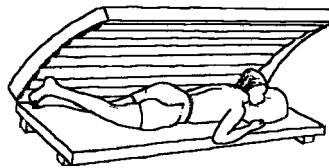
Infra red waves

Ultraviolet rays

X-rays

List B Use of radiation

In sun beds



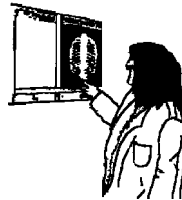
In radiant heaters



Sending information to satellites



Producing shadows of bones



Killing cancer cells

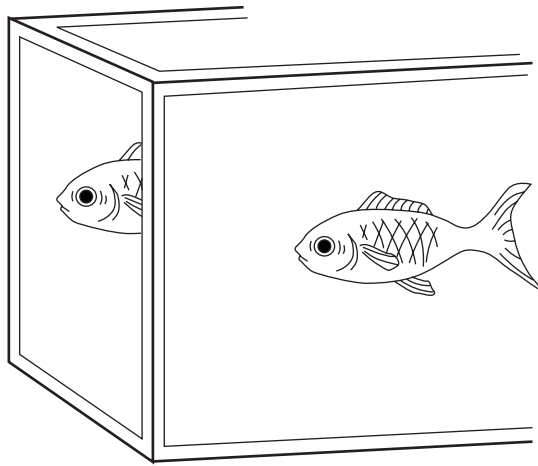


(4 marks)

4

Turn over ►

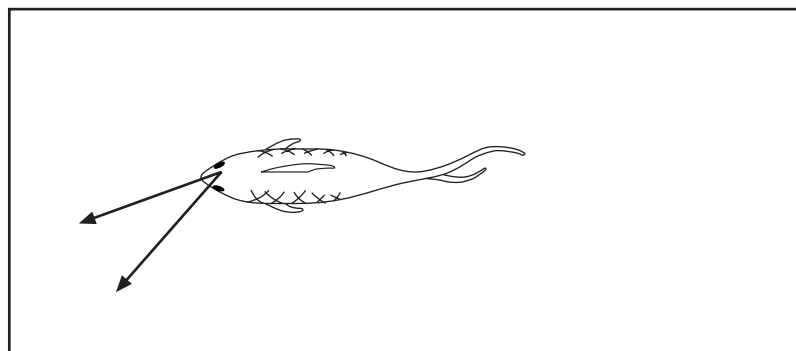
- 6 An aquarium contains only one fish. But if you look at the corner of the aquarium, there seem to be two fish.



The diagram below shows the top of the aquarium.

Two light waves have been drawn from the fish.

- (a) Complete the diagram to show how the light waves reach the eye.



(2 marks)

(b) Complete each sentence by using the correct words from the box.

colour	diffraction	longitudinal	reflection
refraction	speed	transverse	

When the light waves pass from glass into the air they change

This causes a change in direction called

Light waves are waves.

(3 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

7 In some areas of the U.K. people are worried because their houses are built on rocks that release radon.

Read the information about radon.

- It is a gas.
- It is formed by the breakdown of radium.
- It emits alpha radiation.
- Each radon atom has 86 protons.
- Each radon atom has 136 neutrons.

(a) (i) How many electrons has each atom of radon?

(ii) What is the mass (nucleon) number of radon?

(2 marks)

(b) Explain why it may be dangerous to live near rocks that release radon.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....
.....
.....
.....

(3 marks)

5

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

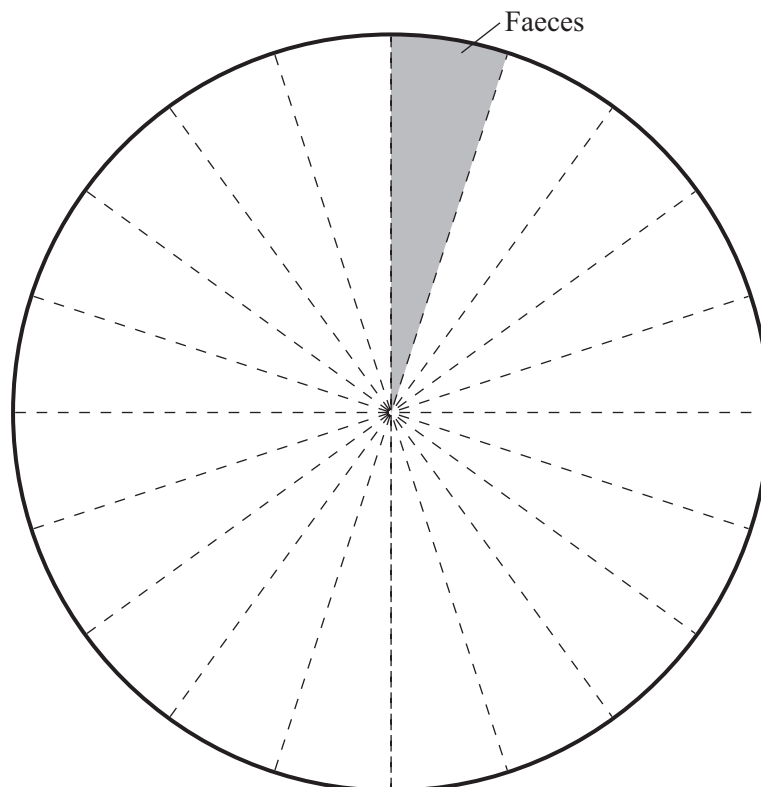
QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

- 8 The table shows how much water is lost in different ways from a student's body.

Way in which water is lost	Percentage of total
Breath	15
Faeces	5
Sweat	50
Urine	30

- (a) Complete the pie chart.

One part has been done for you. Remember to label the pie chart.



(3 marks)

(b) The table is about waste products which are removed from the student's body.

Complete the table by using the correct words from the box.

amino acids	breath	circulation	digestion	fatty acids
glucose	respiration	sweat	urine	

Waste product	How it is produced	How it leaves the body
carbon dioxide	by	in
urea	from	in

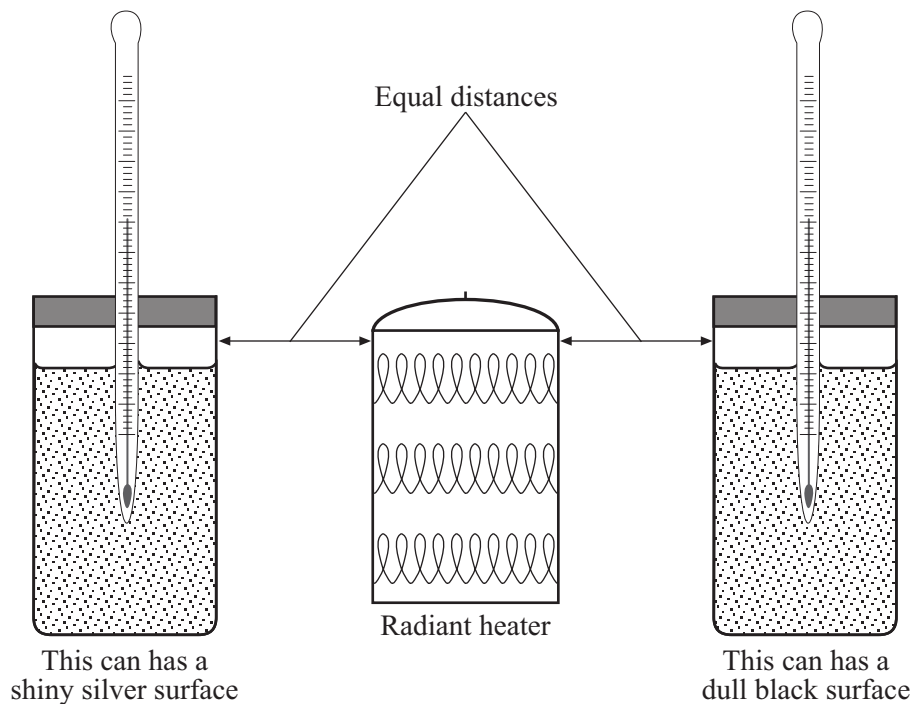
(4 marks)

7

TURN OVER FOR THE NEXT QUESTION

Turn over ►

9 A student did two experiments on radiation. The apparatus he used is shown in the diagram.



Experiment 1

- The student put the same volume of cold water into the two cans.
- He then switched on the heater.
- Ten minutes later the water in the can with the dull black surface was much hotter than the water in the other can.

Experiment 2

- The student filled both cans with boiling water.
- This time he left the heater off.
- Ten minutes later the water in the can with the dull black surface was much cooler than the water in the other can.

Use words from the box to complete the sentences.

absorber conductor emitter reflector

Experiment 1 shows that the dull black surface is a good of radiation and that the shiny silver surface is a good of radiation.

Experiment 2 shows that the dull black surface is a good of radiation.

(3 marks)

3

10 Crude oil is separated into fractions by fractional distillation.

The table gives information about some of the fractions.

Fraction	Boiling point range in °C	Number of carbon atoms per molecule
Gas	Below 20	1 – 4
Petrol	20 – 100	5 – 10
Paraffin	100 – 250	11 – 15
Diesel	250 – 350	16 – 20
Lubricant	350 – 500	21 – 35
Bitumen	Above 500	Above 35

- (a) What is the relationship between the boiling point of a fraction and the number of carbon atoms in its molecules?

.....
.....

(1 mark)

- (b) Give **one** further difference, other than boiling point, between diesel and paraffin that also depends on the number of carbon atoms in their molecules.

.....
.....

(1 mark)

- (c) All the fractions contain hydrocarbons.

Name the **two** elements in a hydrocarbon.

..... and

(1 mark)

3

Turn over ►

ENVIRONMENT, INHERITANCE AND SELECTION

11 The monthly cycle of women is controlled by hormones.

(a) Name the **two** glands that secrete these hormones.

1

2

(2 marks)

(b) Describe **two** ways in which fertility in women can be controlled by giving hormones.

1

.....

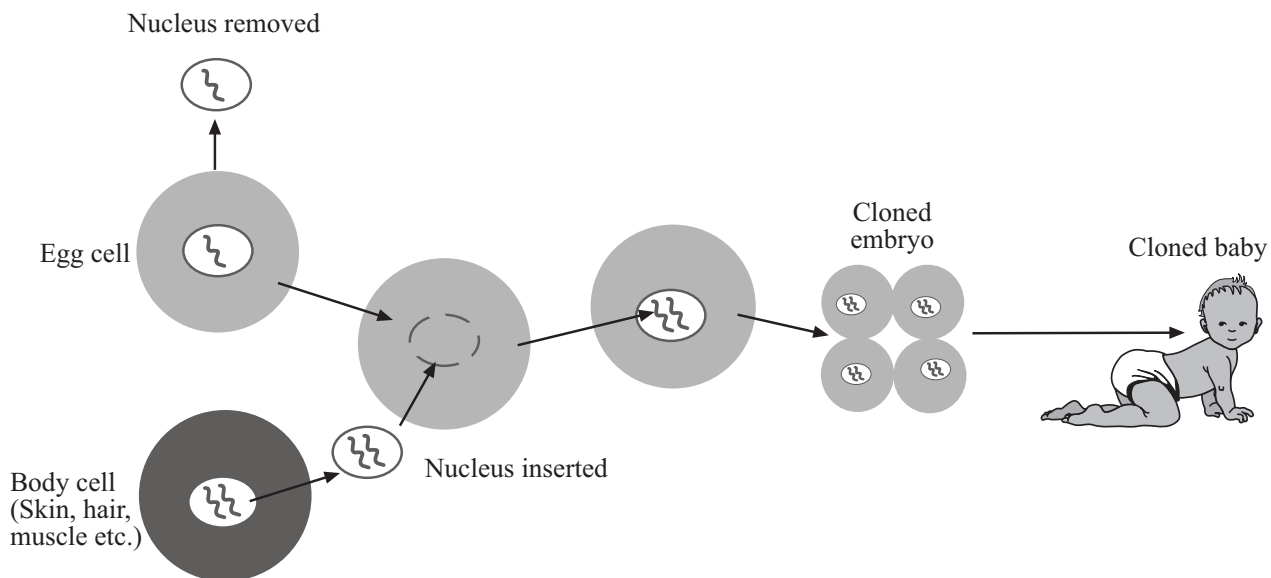
2

.....

(2 marks)

4

12 It is now possible to clone humans. The diagram shows one way in which this can be done.



(a) What type of reproduction is this?

.....
(1 mark)

(b) Will the baby have the characteristics of the egg cell or the body cell?

.....

Explain the reason for your answer.

.....
.....
.....
.....
.....

(2 marks)

(c) The procedure in the diagram could be used to produce several cloned embryos.

Suggest how this might be done.

.....
.....

(1 mark)

13 The concentration of carbon dioxide in the Earth's atmosphere is rising.

(a) Explain, as fully as you can, why this is happening.

.....

.....

.....

.....

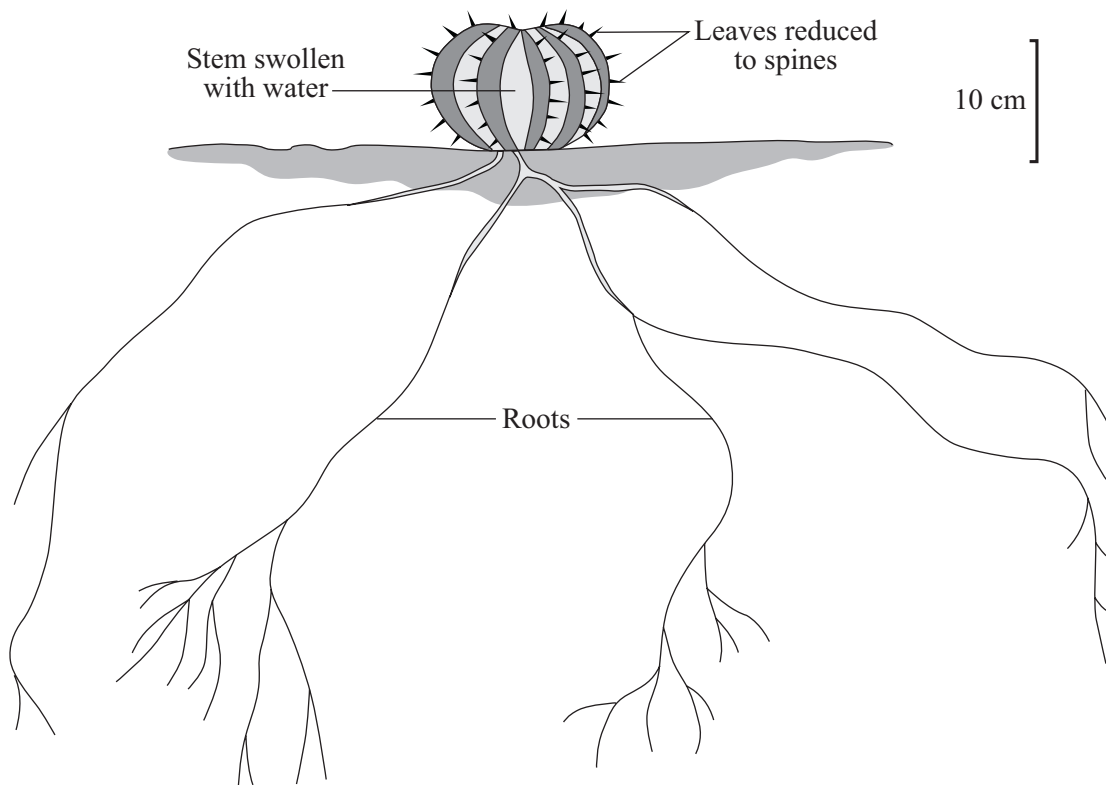
.....

.....

(3 marks)

(b) The rise in carbon dioxide concentration may cause more of the Earth's surface to become desert.

The drawing shows a plant that is adapted to life in a hot, dry desert.



Suggest **two** ways in which the structure of the plant helps it to survive in a hot, dry desert.

- 1
-
- 2
-

(2 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

PATTERNS AND REACTIONS

14 Use the periodic table on the Data Sheet to answer these questions.

The table below gives the electronic structures of four elements, **W**, **X**, **Y** and **Z**.

Element	Electronic structure
W	2,5
X	2,7
Y	2,8,8
Z	2,8,8,1

(a) Which element **W**, **X**, **Y** or **Z**:

- (i) is a Group 0 gas?
- (ii) is nitrogen?
- (iii) is a Group 7 gas?
- (iv) reacts violently with water?

(3 marks)

(b) Which **two** Groups of the periodic table do **not** contain any non-metals?

.....

(1 mark)

4

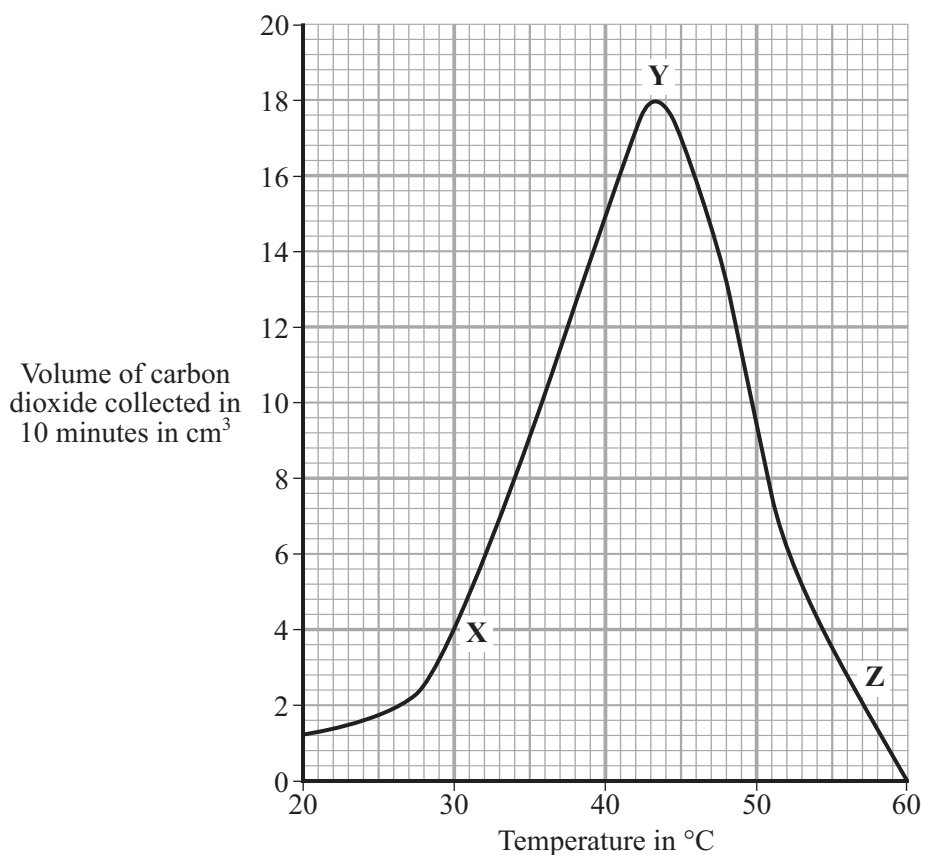
NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

15 Fermentation of sugar by yeast produces carbon dioxide.

The graph shows the effect of temperature on the production of carbon dioxide by fermentation.



- (a) By how much did the volume of carbon dioxide collected change when the temperature was raised from 30 °C to 40 °C?

.....cm³
(1 mark)

- (b) Complete the sentences to explain the shape of the curve between X and Y.

Raising the temperature the speed of the reacting particles.

These particles collide more and more

(3 marks)

- (c) The rate of the reaction decreases between **Y** and **Z**.

Suggest **one** reason for this.

.....
.....

(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

FORCES, WAVES AND RADIATION

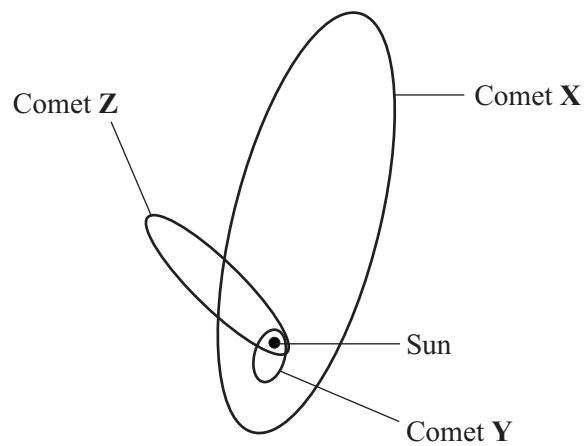
- 16 (a) Complete the sentence about the orbits of planets.

The orbits of planets are shaped, with the at the centre.
(2 marks)

- (b) The table gives the time taken for three different comets to orbit the Sun.

Comet	Time taken to orbit the Sun in years
Encke	3.5
Nenjmin	18
Tempel-tuttle	30

The diagram shows the orbits of the three comets.



Use information from the table to identify the three comets.

X

Y

Z

(2 marks)

(c) Some scientists are searching for extra-terrestrial intelligence (SETI).

Describe how they are doing this.

.....

.....

.....

.....

(2 marks)

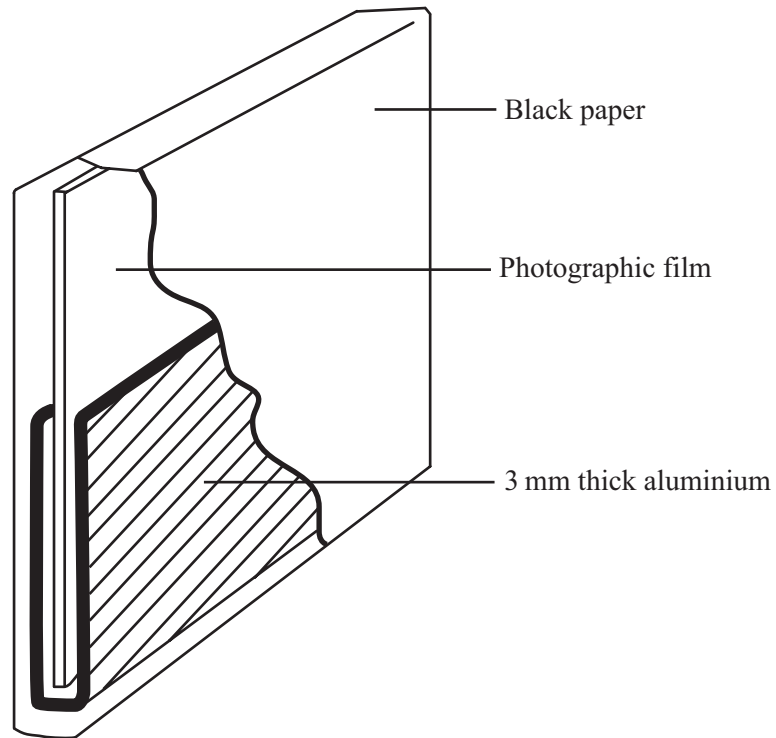
6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

17 The diagram shows a badge worn by a worker at a nuclear power station.

Part of the outer black paper has been removed so that you can see the inside of the badge.



Scientists examined the worker's badge at the end of a day's work.

They found that the top part of the badge had been affected by radiation, but the bottom half had not.

What type of radiation had the worker been exposed to? Explain the reasons for your answer.

.....

.....

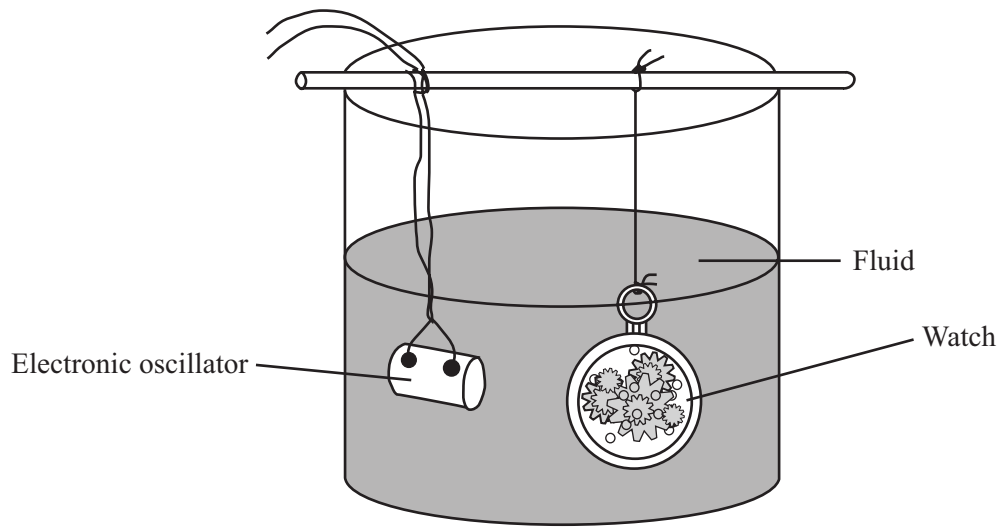
.....

.....

(2 marks)



18 The diagram shows how ultrasonic waves can be used to clean a watch.



Suggest how this method cleans the watch.

.....

.....

.....

.....

(2 marks)

2

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

19 The table shows the composition of blood entering and leaving the lungs.

Gas	Concentration in arbitrary units	
	Blood entering lungs	Blood leaving lungs
Oxygen	40	100
Carbon dioxide	46	40

(a) Describe, in as much detail as you can, the changes that take place in the composition of blood as it passes through the lungs.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) Which part of the blood:

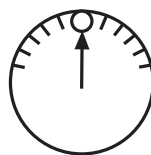
(i) transports most carbon dioxide;

(ii) transports most oxygen?

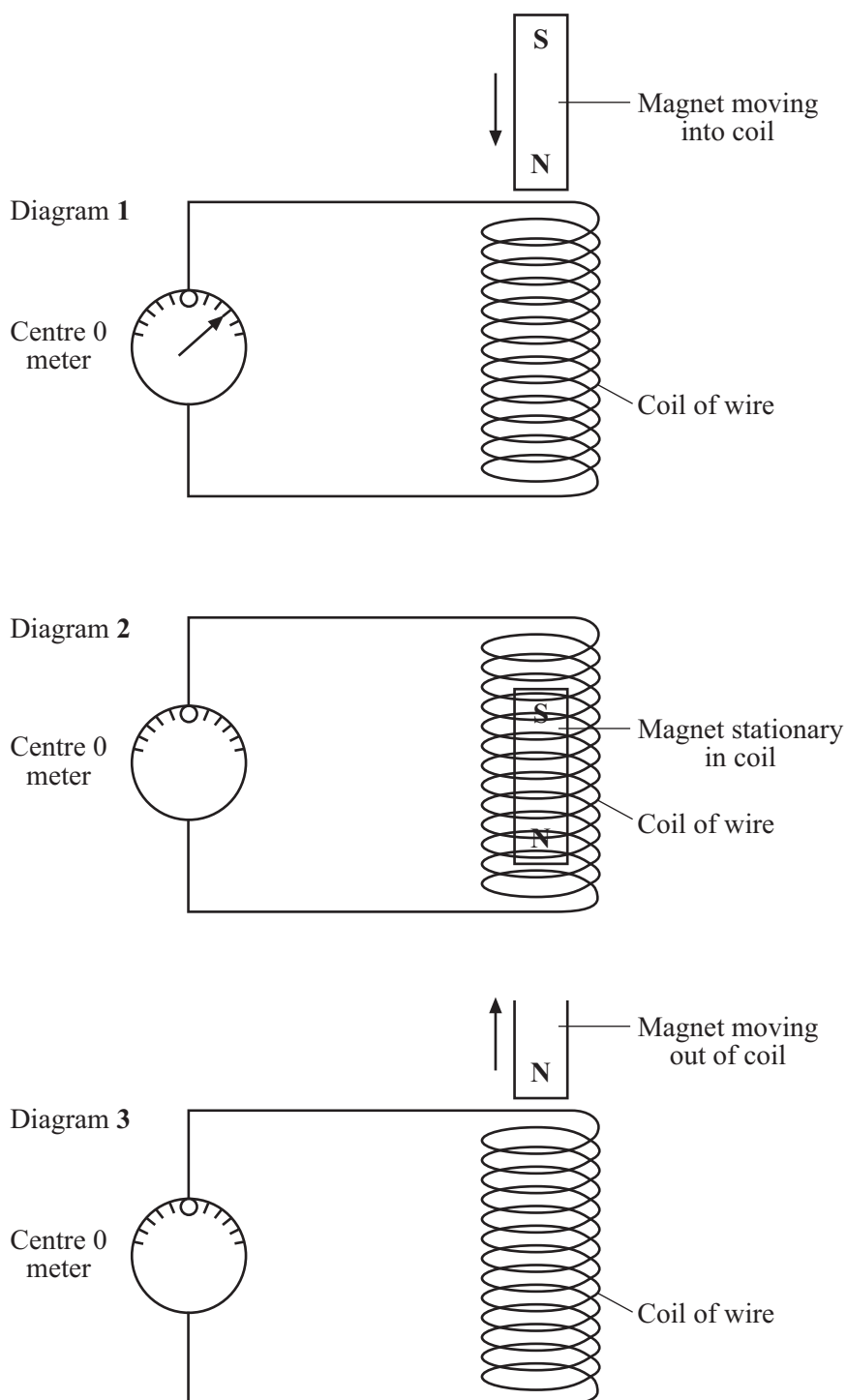
(2 marks)

- 20
- Diagram 1 shows a magnet being moved into a coil.
 - Diagram 2 shows a magnet stationary in a coil.
 - Diagram 3 shows a magnet being moved out of a coil.

The meter looks like this when no current is flowing.



- (a) The position of the meter pointer has been drawn on diagram 1.
Draw the positions of the meter pointer on diagrams 2 and 3.



(2 marks)

Turn over ►

(b) Bicycle dynamos generate electricity by rotating a magnet inside a coil of wire.

Give **two** ways of increasing the voltage produced by this kind of generator.

1

2

(2 marks)



END OF QUESTIONS