

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



**BIOLOGY (MODULAR) SPECIFICATION A
FOUNDATION TIER**

3413/F

Monday 7 June 2004 1.30 pm to 3.00 pm

F

In addition to this paper you will require:
a ruler.
You may use a calculator.

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

Time allowed: 1 hour 30 minutes

Instructions

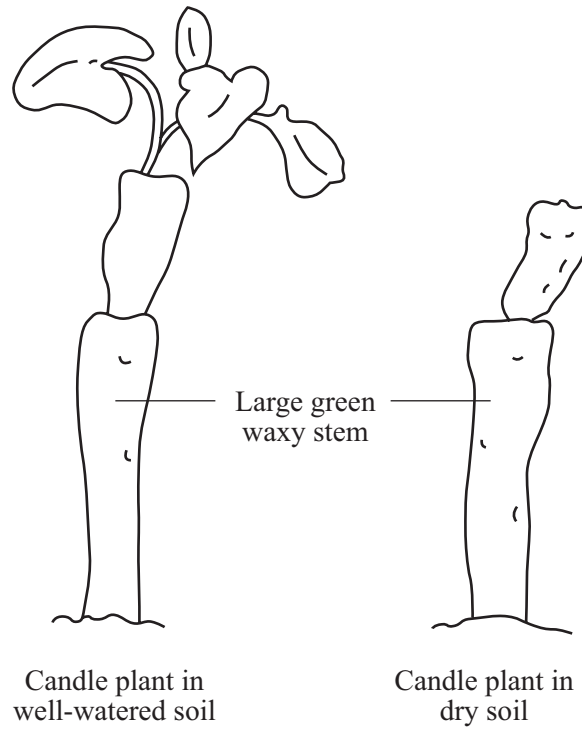
- Use blue or black ink or ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

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

- 1 The candle plant grows in the South African desert. When there is very little water this plant loses its leaves. The plant will grow new leaves when water is plentiful.



- (a) Explain why it is an advantage for the candle plant to have leaves when water is plentiful.

.....

.....

.....

(2 marks)

- (b) Explain why it is an advantage for the candle plant to lose its leaves in dry conditions.

.....

.....

(1 mark)

- (c) Using the information in the diagram, suggest **two** other ways in which the plant is adapted to growing in a desert.

1

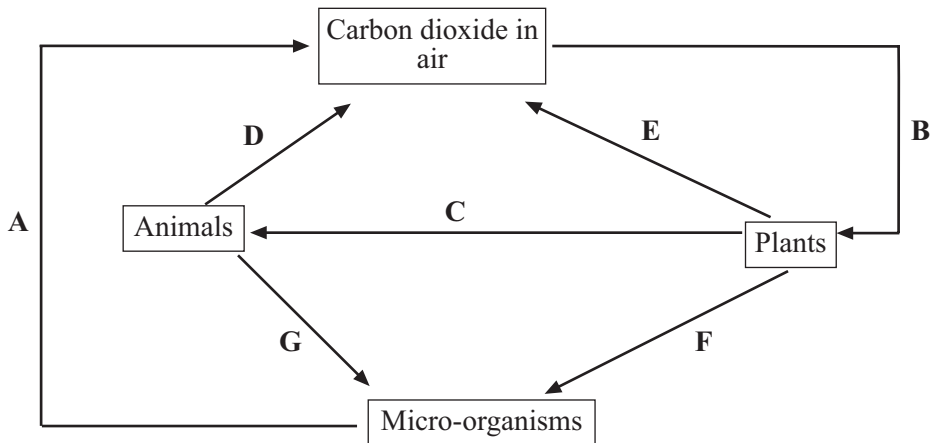
.....

2

.....

(2 marks)

2 The diagram shows a simplified carbon cycle.



(a) Which letter represents:

(i) photosynthesis;.....

(ii) feeding;.....

(iii) death and decay?

(3 marks)

(b) Give **two** letters which represent respiration.

..... and

(2 marks)

(c) Name **two** different substances that plants make using carbon dioxide from the air.

1

2

(2 marks)

7

TURN OVER FOR THE NEXT QUESTION

Turn over ►

INHERITANCE AND SELECTION

3 A student collected some sunflower seeds from a flower in her garden. The following year she planted the seeds and grew 20 new sunflower plants.



(a) Explain why the sunflower plants looked similar to one another.

.....
.....

(1 mark)

(b) The student noticed that the plants grew to different heights.

Suggest **two** reasons why the heights varied.

1

2

(2 marks)

- (c) She used the tallest plants as parents and collected the seeds from these plants. She hoped to grow even taller plants the following year.

Which of the following terms describes what she was doing?

Tick (✓) the correct box.

Cloning	
Genetic engineering	
Selective breeding	
Tissue culture	

(1 mark)

$\frac{\quad}{4}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

4 Sickle cell disease is caused by a gene that affects the red blood cells.

(a) How will the blood of a person with sickle cell disease be different from the blood of a person without this disease?

.....
.....

(1 mark)

(b) (i) Carriers of sickle cell disease are common in parts of Africa. These carriers are resistant to a certain disease.

Explain what is meant by a carrier of the sickle cell allele.

.....
.....

(1 mark)

(ii) Which disease are these carriers resistant to?

.....

(1 mark)

(c) Name the chemical of which genes are made.

.....

(1 mark)



5 (a) Complete the following sentences about the reproductive cycle by choosing the correct word from each box.

(i) A woman produces an egg every

- day
- week
- month
- 9 months

(ii) The eggs are produced in the

- ovary
- pituitary gland
- vagina
- womb

(iii) Chemicals which control the release of the eggs
are called.....

- amino acids
- enzymes
- hormones

(3 marks)

(b) The egg cell fuses with a sperm cell at fertilisation. The fertilised egg develops into a baby.

Give the name of this type of reproduction.

.....

(1 mark)

4

TURN OVER FOR THE NEXT QUESTION

Turn over ►

BIOLOGY IN ACTION

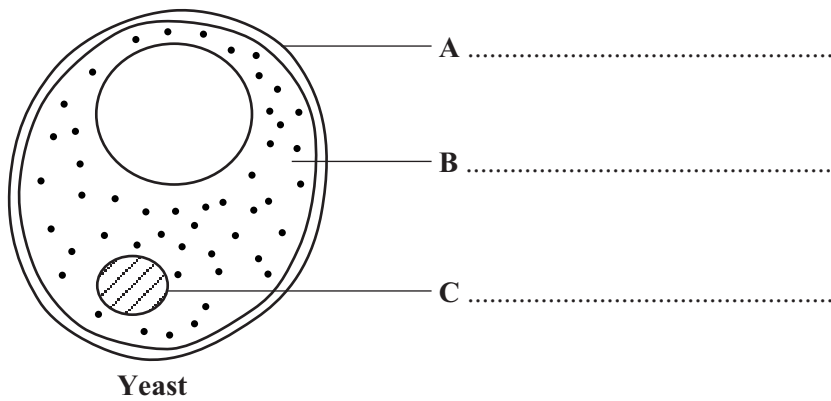
6 Yeast is a microbe used in the food and drink industry.

(a) Name **one** product made using yeast.

.....
(1 mark)

(b) Label the diagram by using words from the box.

capsule	cell wall	cytoplasm	DNA	nucleus
----------------	------------------	------------------	------------	----------------



A

B

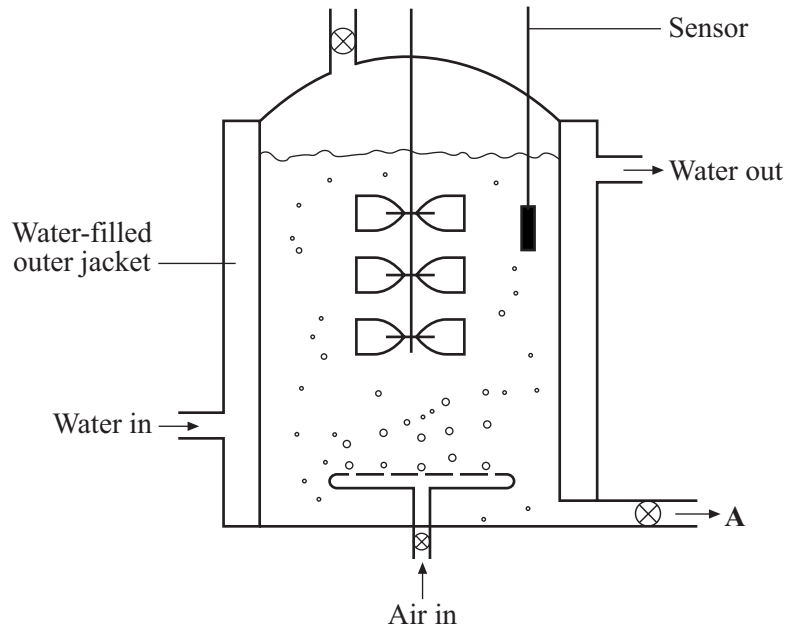
C

(3 marks)

(c) Give the letter of the structure which is **never** found in bacterial cells.

.....
(1 mark)

7 The fungus *Penicillium* can be grown in a fermenter such as the one shown.



(a) Explain why air is bubbled into the fermenter.

.....

 (2 marks)

(b) Explain why water is pumped into the outer part of the fermenter.

.....

 (2 marks)

(c) Sensors are used to monitor factors within the fermenter. Suggest **one** factor which may be monitored by the sensor.

.....
 (1 mark)

(d) Which useful substance will be removed at A?

.....
 (1 mark)

QUESTIONS FROM PREVIOUSLY TESTED MODULES

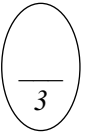
8 (a) (i) Complete the sentence about the way in which the mosquito feeds.

The mosquito has a sharp needle-shaped tube called a
which it uses to pierce the skin and to feed on
(2 marks)

(ii) As the mosquito feeds, it pumps saliva down the tube.

Explain how this helps the feeding process.

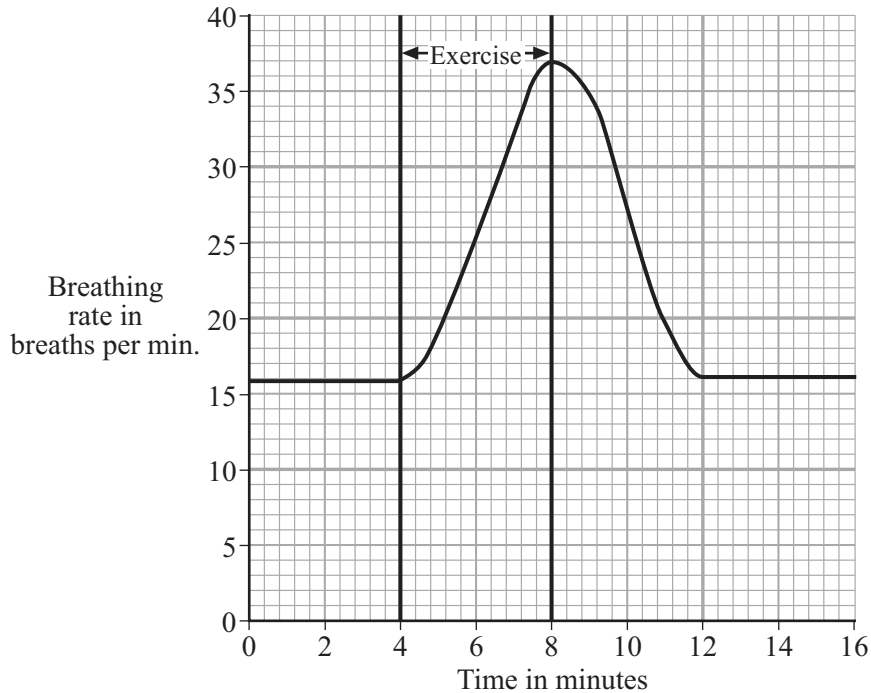
.....
.....
(1 mark)



9 A student was investigating the effect of exercise on his breathing rate.

He rested for four minutes, exercised for four minutes and then rested. He measured his breathing rate every 30 seconds during the investigation.

The results are shown in the graph.



(a) What was the student's breathing rate at rest?

.....breaths per minute. (1 mark)

(b) How long did it take for his breathing rate to return to normal after he had exercised?

.....minutes. (1 mark)

(c) The student's breathing rate increased during the exercise. How did this affect the exchange of oxygen and carbon dioxide?

Oxygen

Carbon dioxide

(2 marks)

(d) His heart will pump faster as he exercises. How does this help his muscles to produce more energy for contraction?

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)

(e) Name the process used by muscle cells to release energy when oxygen is in short supply.

.....

(1 mark)

8

TURN OVER FOR THE NEXT QUESTION

Turn over ►

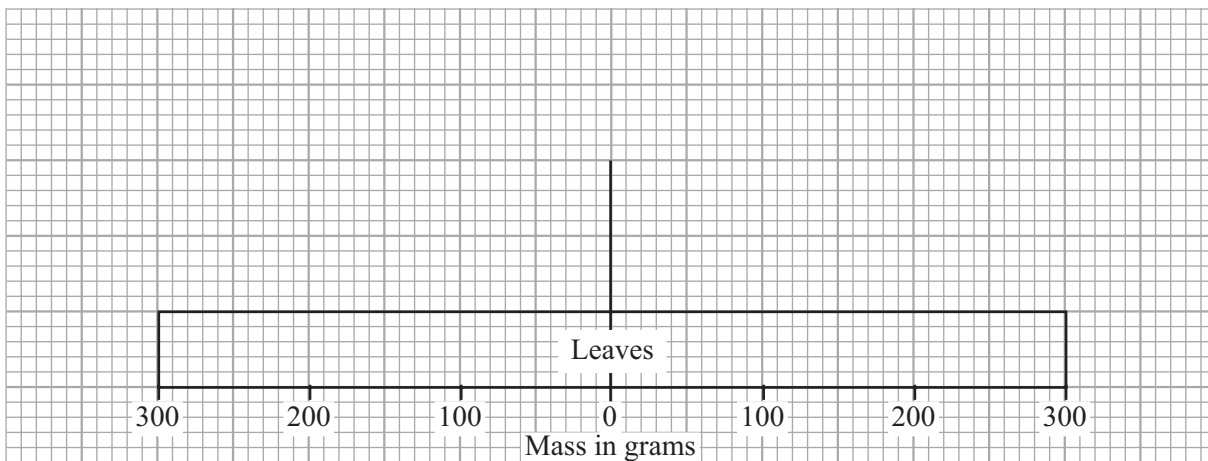
ENVIRONMENT

- 10** A group of students examined a sample of leaf litter from an area of oak woodland. They weighed the leaves. They captured and identified all the animals that they could find in the leaf litter. They then divided the animals into two feeding types, those which feed on leaves and those which feed on small animals. They weighed each sample.

The results are shown in the table.

Sample	Mass in grams
Leaves	600
Animals feeding on leaves	80
Animals feeding on small animals	20

- (a) Complete the pyramid of biomass for these results.



(2 marks)

- (b) What fraction of biomass in the leaf litter is transferred to the animals which feed on it?

.....
(1 mark)

(c) (i) Much of the biomass transferred to the small animals is used in respiration.

Why does respiration make the biomass decrease?

.....
.....

(1 mark)

(ii) Give **two** ways in which the animals might use the energy released in respiration.

1

2

(2 marks)

(d) Give **two** other reasons why the biomass in the leaves might not be transferred to the animals.

1

2

(2 marks)

8

11 A gardener bought a compost bin to produce compost from his grass cuttings as they decayed. After six months, there was little sign of decay.

Describe and explain **two** ways in which he could speed up decay.

What he could do to speed up decay	Explanation
1	
2	

(4 marks)

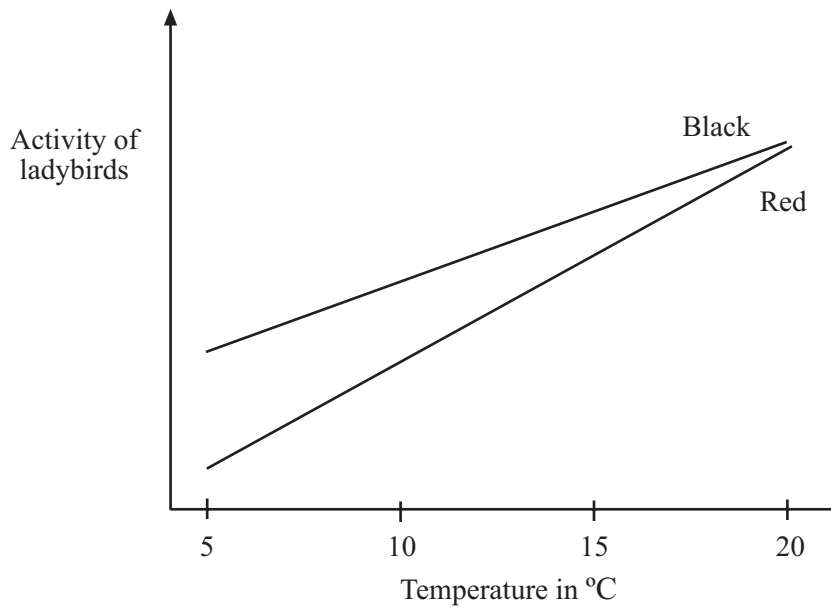
4

Turn over ►

INHERITANCE AND SELECTION

- 12 There are two kinds of ladybird, red with black spots and black with red spots. The black form is more common in the north of Britain, where it is colder. The difference in the two forms is due to a difference in their genes.

Scientists think that temperature affects the distribution of the two forms of ladybird in Britain. They measured the activity of the two types of ladybird at different temperatures. The result of the investigation is shown in the graph.



- (a) Describe how temperature affects the activity of both forms of ladybird.

.....

.....

.....

.....

(3 marks)

- (b) In another investigation, equal numbers of black and red ladybirds were introduced into a habitat with an average temperature of 5 °C.

What would happen to the proportion of black and red ladybirds in the population over several generations? Explain your answer.

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.

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

(4 marks)

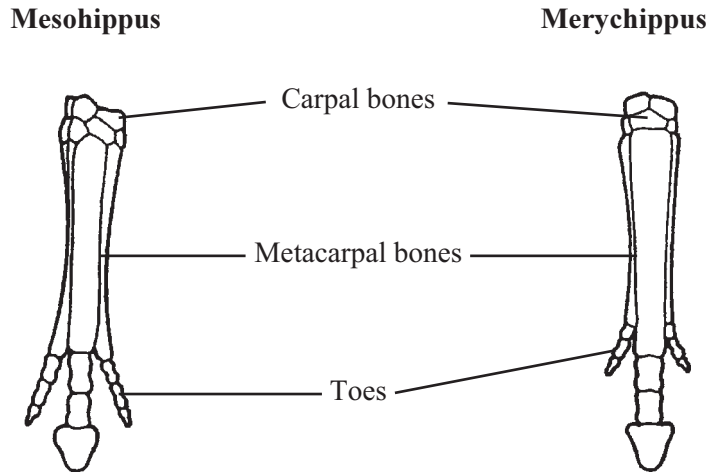


TURN OVER FOR THE NEXT QUESTION

Turn over ►

13 Mesohippus and Merychippus are ancestors of the modern horse. Mesohippus lived about 38 million years ago and Merychippus lived about 26 million years ago.

The diagrams show the arrangement of some of the bones in the front leg of each animal.



Source: ROLAND SOPER, NIGEL P. O. GREEN, G. WILFRED STOUT, DENNIS J. TAYLOR
Biological Science 2, (Cambridge University Press), 1990

(a) Describe **two** ways in which the arrangement of these bones is different.

1

2

(2 marks)

(b) How do scientists find out about the structure of animals that lived so long ago?

.....

(1 mark)

(c) Suggest how scientists would know that Mesohippus lived 12 million years before Merychippus.

.....

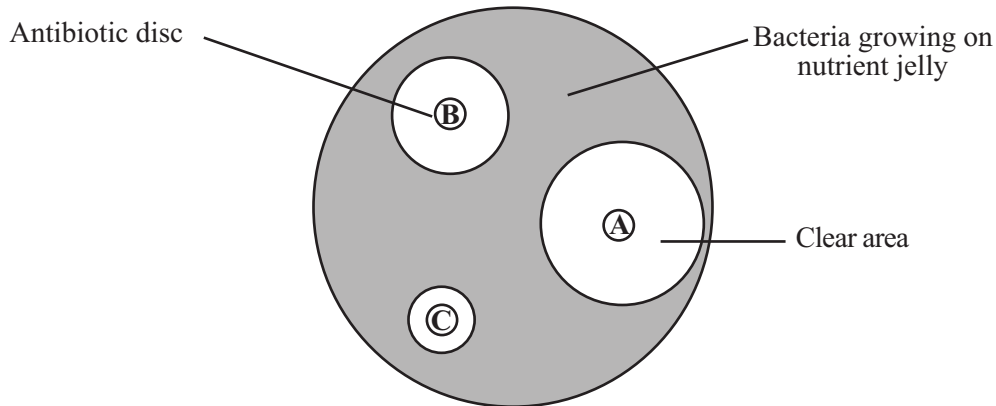
(1 mark)

BIOLOGY IN ACTION

- 14** A student did an experiment to compare the effect of three different antibiotics on the bacterium, *E. coli*.

He spread bacteria over the surface of a petri dish which contained sterile nutrient jelly. He then soaked filter paper discs in three different antibiotics and placed them on the surface of the jelly.

The diagram shows the appearance of the dish after 3 days.



- (a) Give the letter of the antibiotic which is the most effective against this bacterium.

.....
(1 mark)

- (b) Explain why there are clear areas around the antibiotic discs.

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

- (c) Explain why antibiotics cannot be used to treat diseases caused by viruses.

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

15 Read the following extracts.

The extracts have been removed due to third-party copyright constraints.

The three extracts gave the following information:

Government trying to avoid major public health emergency - falling public confidence in MMR vaccine.

Blair accuses critics of scaremongering.

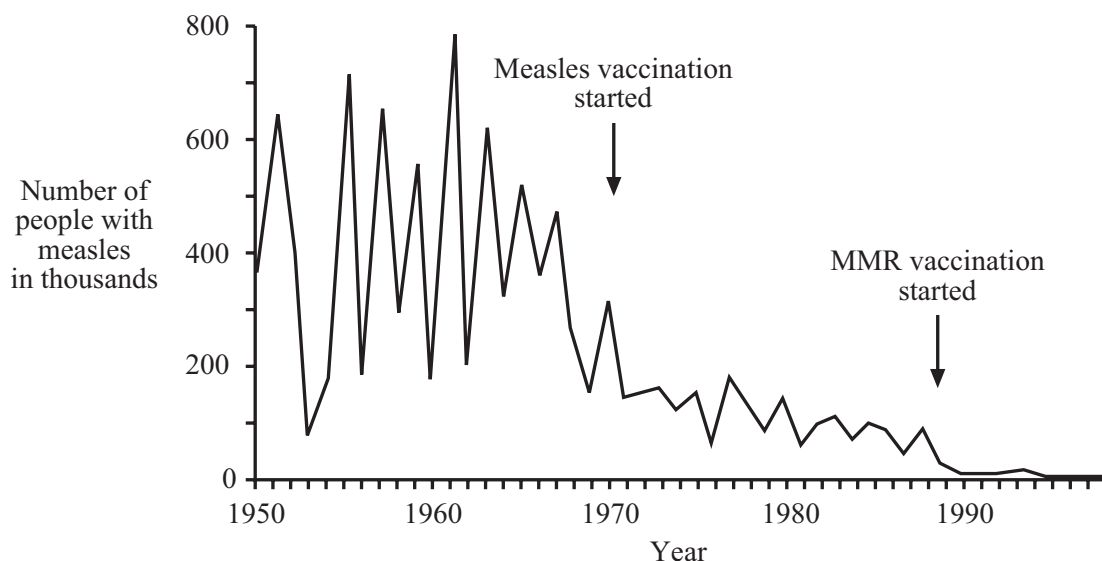
Medical bodies issue statement backing safety of vaccine.

Number of cases of measles in first seven weeks of 2002 equalled total for last year. Most in South London.

Parents shunning jab because of fears that it is linked to autism and bowel disease.

Fears about side-effects caused vaccination rates to fall to a record low.

The graph shows the change in the number of cases of measles in England and Wales between 1950 and 1998.



Source: Office for National Statistics and Department of Health. Crown copyright material is reproduced with permission of the Controller of HMSO and the Queen's Printer for Scotland.

- (a) Suggest reasons why some parents in South London refused to have their children vaccinated against measles in 2002.

.....

(2 marks)

- (b) Parents can get information from sources such as newspapers or the internet. Why should they not rely totally on such information?

.....

(1 mark)

- (c) Suggest how scientists might show whether there is a link between the MMR vaccination and autism.

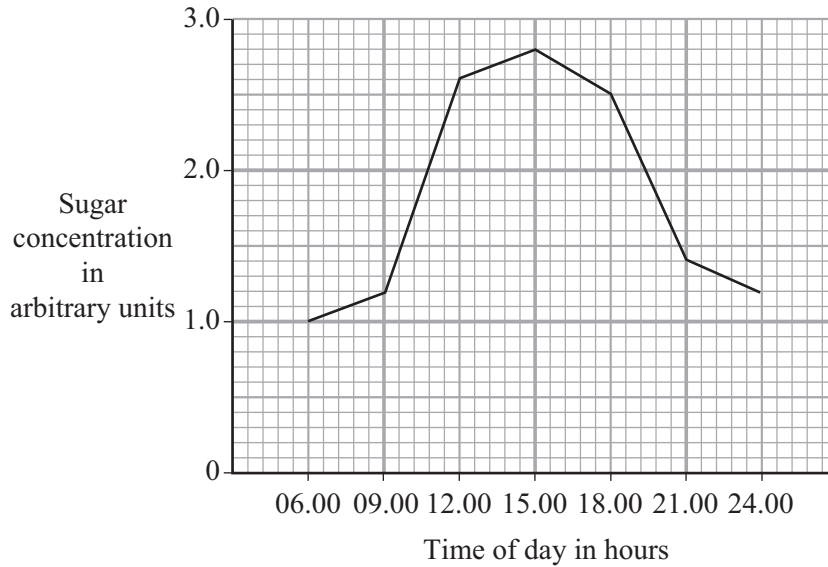
.....

(2 marks)

Turn over ▶

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

16 The graph shows how the concentration of sugar in the leaves of a plant varies during a summer's day.



(a) Give the time when the sugar concentration is the highest.

.....
(1 mark)

(b) Plants use some of this sugar for respiration. How will the plant use the sugar **not** used in respiration?

.....
.....
(1 mark)

(c) In which 3 hour period does the sugar concentration in the leaves of this plant increase the fastest?

.....
(1 mark)

(d) Give **two** reasons why the concentration of sugar increases fastest during this period.

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

17 The table shows the amounts of some substances filtered and excreted by the kidneys each day.

Substance	Mass filtered by the kidneys each day in grams	Mass excreted in the urine each day in grams
Sodium ions	600	3
Glucose	180	0
Urea	50	30

(a) What is the mass of sodium ions reabsorbed into the bloodstream each day?

..... g. (1 mark)

(b) What is the percentage of urea excreted each day?

.....

 % (2 marks)

(c) In which organ of the body is urea made?

.....
(1 mark)

(d) What change to the diet might result in an increase in the urea content of the urine? Explain your answer.

.....

(2 marks)

END OF QUESTIONS

6

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