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5096/02

May/June 2009

2 hours

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO NOT WRITE IN ANY BARCODES.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

You are advised to spend no longer than 1 hour on Section A.

Section B

Answer **all** the questions, including questions 8, 9 and 10 **Either** or 10 **Or**.

Write your answers to questions 8, 9 and 10 in the spaces provided on the question paper.

Write an **E** (for Either) or an **O** (for Or) next to the number 10 in the grid below to indicate which question you have answered.

At the end of the examination fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use		
1		
2		
3		
4		
5		
6		
7		
Section A sub-total		
8		
9		
10		
Total		

This document consists of **21** printed pages and **3** blank pages.

Section A

Answer **all** the questions.

Write your answers in the spaces provided.

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- 1 (a) Substances cross cell membranes by one of three processes:

diffusion

osmosis

active transport

Identify which of these processes is being described in each of the examples below. The arrows show the direction of movement of molecules.

- (i) a dilute solution of glucose → water molecules → a concentrated solution of glucose

process

- (ii) a concentrated solution of glucose → glucose molecules → a dilute solution of glucose

process

- (iii) a dilute solution of glucose → glucose molecules → a concentrated solution of glucose

process

[3]

- (b) Active transport requires energy to be expended by the cell.

- (i) State which cellular process releases this energy.

- (ii) Name the cell structure in which this energy release occurs.

[2]

- (c) Oxygen uptake from the alveolus into the red blood cells occurs by diffusion.

State how the following features of the blood and the alveolus help to speed the process of oxygen uptake.

- (i) The wall of the alveolus is very thin.

..... [1]

- (ii) The red blood cell is rich in haemoglobin.

..... [1]

- (iii) The pulmonary capillaries are very narrow so that the blood flow is slow.

..... [1]

- (iv) The red blood cells are biconcave discs.

..... [1]

- (d) The diffusion of oxygen from the alveolus continues as long as there is a difference in concentration between the alveolus and the blood.

State how the following processes help to maintain that concentration difference.

inspiration

.....

circulation of the blood

..... [2]

- (e) Table 1.1 shows some of the differences between inspired and expired air.

Table 1.1

gas	concentration / parts per 100	
	inspired air	expired air
oxygen	20	16
carbon dioxide	0.04	4.0
nitrogen	79	79
rare gases	< 1	< 1

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- (i) Calculate the percentage efficiency of the lungs at absorbing oxygen. Show your working.

.....
..... [2]

- (ii) Calculate by how many times the concentration of carbon dioxide is greater in expired air than in inspired air.

..... [1]

- (iii) Suggest two **other** ways, not shown in Table 1.1, in which the expired air would differ from the inspired air.

1.

2. [2]

- (iv) The amount of nitrogen does not change in the expired air.

Explain why this is so.

.....
..... [1]

- (f) Carbon dioxide levels are rising in the atmosphere due partly to increasing industrialisation and combustion of fossil fuels.

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- (i) Explain how the clearance of large areas of forest also contributes to the rise in carbon dioxide in the atmosphere.

.....
.....
..... [2]

- (ii) State **one** likely effect of the rise in carbon dioxide levels on the climate.

..... [1]

[Total: 20]

- 2 Table 2.1 compares the compositions of 100 g samples of eight types of food, four from plant sources and four from animal sources.

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Table 2.1

food	water /g	energy /kJ	protein /g	carbo- hydrate/g	lipid /g	vitamin D /µg	vitamin C /µg	calcium /mg	fibre
cereals	10	1500	10.0	70.0	2.5	nil	nil	32	high
leafy vegetables	90	85	1.5	3.6	trace	nil	33	55	moderate
root vegetables	70	300	1.5	15.0	trace	nil	18	20	moderate
fruit	85	200	1.0	10.0	0.5	nil	25	20	moderate
meat	75	525	18.0	trace	6.0	trace	trace	9	nil
fish	75	510	17.0	trace	6.0	2.5	trace	25	nil
milk	87	300	3.0	5.0	4.5	0.1	4	115	nil
eggs	75	620	12.5	trace	11.0	2.0	trace	54	nil

1000µg = 1 mg

Using Table 2.1, answer the following questions.

- (a) Which substance is absent from all

(i) plant foods,

(ii) animal foods?

[2]

- (b) Explain why a diet rich in milk would prevent rickets better than a diet of cereals.

.....

.....

..... [3]

- (c) (i) State which plant food is easiest to store in rural areas lacking electricity.

.....

(ii) Explain your answer to (c)(i).

.....

[2]

- (d) Name the food which would best prevent scurvy. [1]

[Total: 8]

- 3 Fig. 3.1 shows an adult mosquito and an adult housefly.

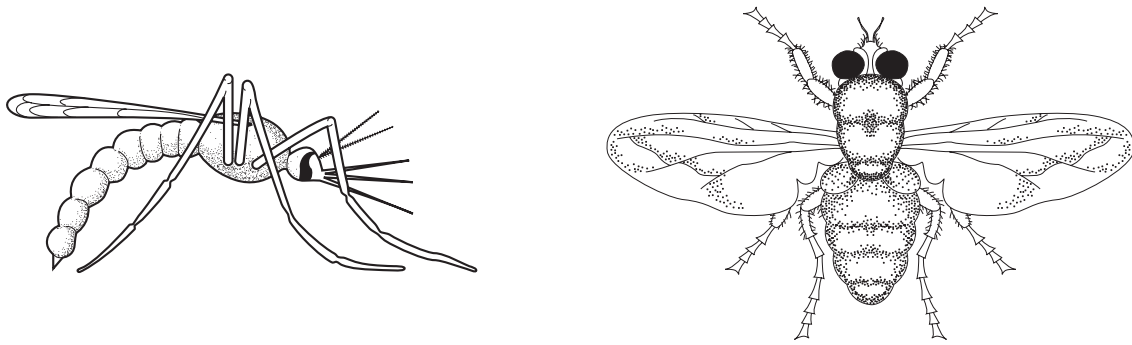


Fig. 3.1

- (a) List three features you can see in Fig. 3.1 that shows that both are **insects**.

1.
2.
3. [3]

- (b) The two insects shown in Fig. 3.1 spread disease to humans through their saliva. Explain how this is achieved in the

- (i) mosquito,
- (ii) housefly.

[2]

[Total: 5]

- 4 Table 4.1 shows the figures for water intake and loss for an adult in a temperate climate. The figure for urine has been left blank.

For
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Use

Table 4.1

intake / cm ³		water loss / cm ³	
drink:	1500	sweat:	500
food:	700	lungs:	400
metabolic water:	300	faeces:	100
		urine:	
total:	2500	total:	2500

- (a) Calculate the figure for urine and enter it in Table 4.1. [1]

- (b) State which water loss figures will increase during exercise.

.....
..... [2]

- (c) Name a bacterial disease which can seriously increase water loss in the faeces.

..... [1]

[Total: 4]

5 Fig. 5.1 shows steps in an experiment to investigate the effect of light on photosynthesis.

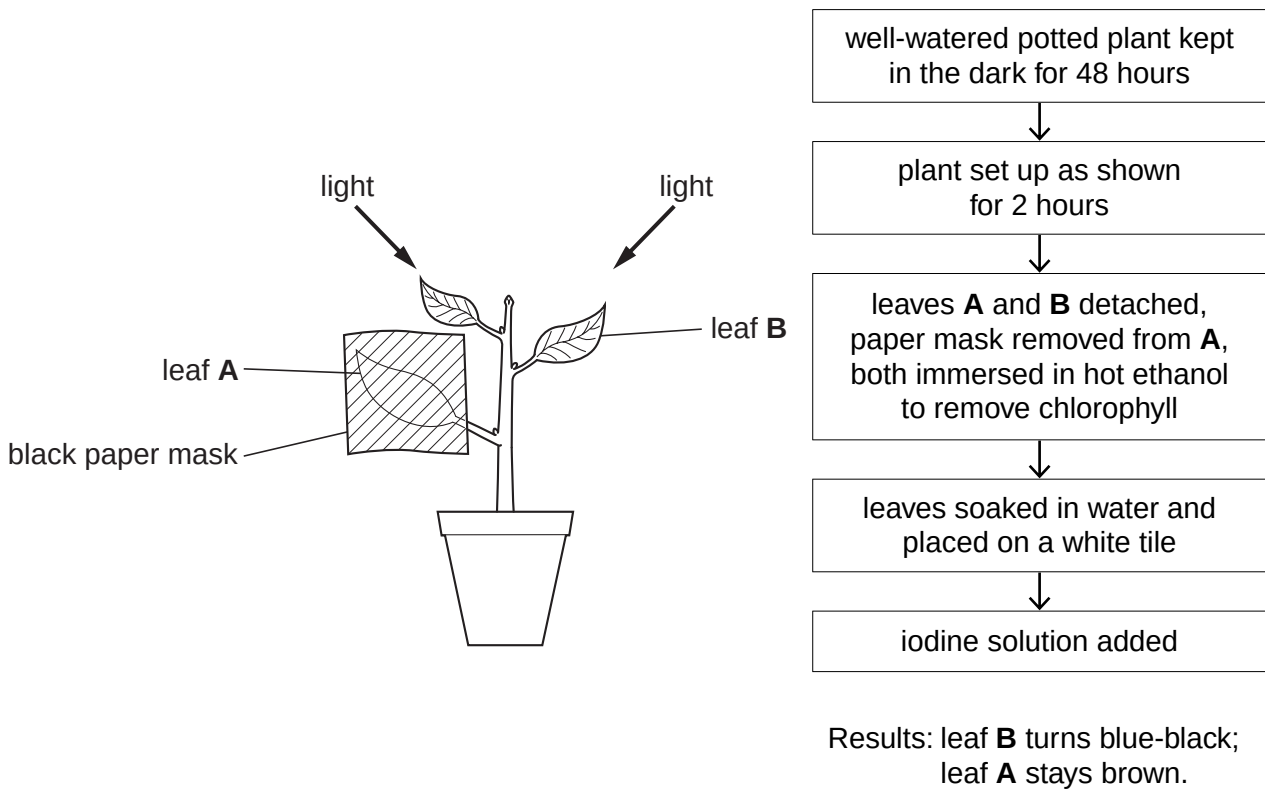


Fig. 5.1

(a) Explain why

- (i) the plant was placed in the dark for 48 hours, [1]
- (ii) a black paper mask was placed over leaf A, [1]
- (iii) the chlorophyll is removed from the leaf before adding the iodine solution, [1]
- (iv) the leaves are placed on a white tile. [1]

In another experiment, leaf **A** was partly covered with a black paper mask as shown in Fig. 5.2 and the experiment repeated.

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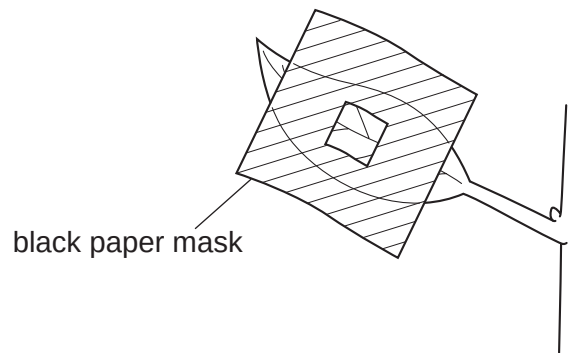


Fig. 5.2

- (b)** Draw on the leaf in Fig. 5.3 the resulting starch distribution that you would expect to see. [2]

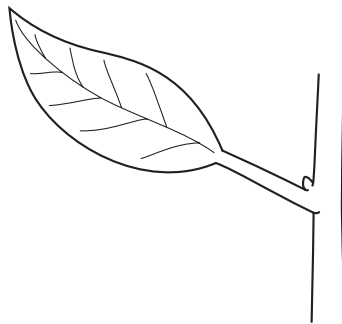


Fig. 5.3

[Total: 6]

- 6 Table 6.1 lists some diseases, their causative organisms and the means by which they are transmitted.

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Complete Table 6.1.

Table 6.1

disease	causative organism	means of transmission
	virus	airborne
gonorrhoea		intercourse
bilharzia		infected water
	bacteria	airborne
	fungus	contact
	virus	intercourse

[6]

[Total: 6]

- 7 Table 7.1 compares the amount of tooth decay in two groups of children, one group with fluoride added to their drinking water, the other group without fluoride.

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Use

Table 7.1

age/years	average number of decayed teeth	
	fluoride added	no fluoride added
8	1.2	2.0
9	1.8	2.6
10	2.4	3.4
11	3.0	4.0
12	4.0	5.6
13	5.6	6.8

The figures for the group with no fluoride added have been plotted onto the graph in Fig. 7.1.

- (a) Plot the figures for the group with **fluoride added** onto the graph in Fig. 7.1, join up the points and label the line. [3]

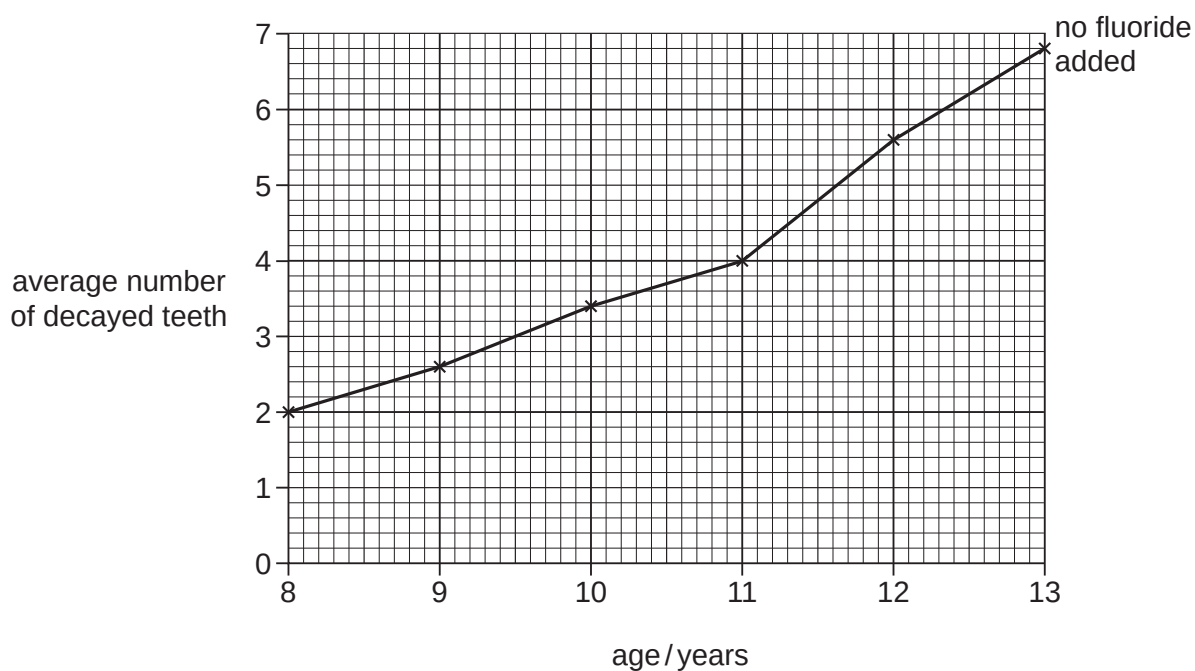


Fig. 7.1

- (b) Describe what the graph shows about the effect of adding fluoride to drinking water on tooth decay.

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Use

.....

.....

..... [2]

- (c) State which part of the tooth is affected by fluoride. [1]

[Total: 6]

Section B

Answer all the questions, including questions 8, 9 and 10 **Either** or 10 **Or**.

Write your answers in the spaces provided.

For
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Use

- 8 (a) Construct a table to show the **differences** between nervous and hormonal control systems.

[8]

[7]

[Total: 15]

- [8]

[7]

[Turn over
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10 Either

- (a) Distinguish between the terms **gene** and **chromosome**.

.....

.....

.....

.....

.....

..... [4]

- (b) Fig. 10.1 shows the inheritance of cystic fibrosis in two families related by marriage. Cystic fibrosis is caused by a recessive allele.

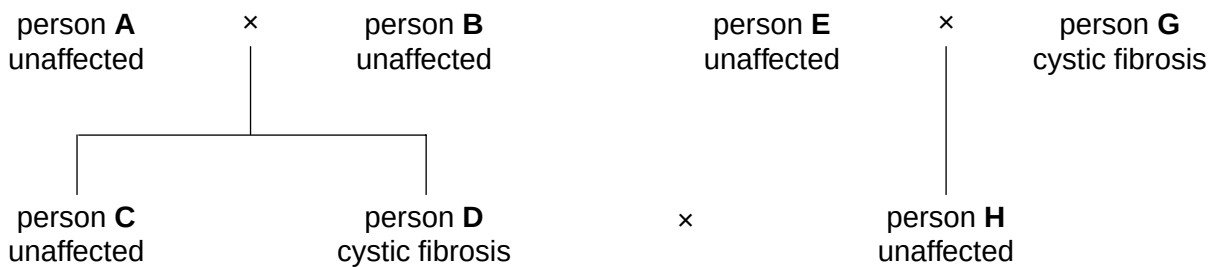


Fig. 10.1

Using the letters **F** and **f** to represent the alleles, show by genetic diagrams

- (i) how **A** and **B**, while unaffected themselves, can produce children with cystic fibrosis and children who are unaffected,

[3]

[3]

[5]

[Total: 15]

(a) Distinguish between the terms **mitosis** and **meiosis**.

[4

person J × person K
 albino | normal pigment

person L × person M
normal pigment | normal pigment

person **N**
normal pigment

person **O**
normal pigment

A pedigree chart showing a cross between two individuals. A horizontal line at the top represents the mating pair. Two vertical lines descend from this horizontal line to two separate points, representing the offspring. The left point is labeled 'person Q' and 'albino'. The right point is labeled 'person R' and 'normal pigment'.

Fig. 10.2

Using the letters **P** and **p** to represent the alleles, state the genotype of the following persons:

J

L

M

N

R

[6]

[5]

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