Cell Biology part 18 AQA Combined Science

headstartscience.co.uk

Name: _____

Class: _____

Date: _____

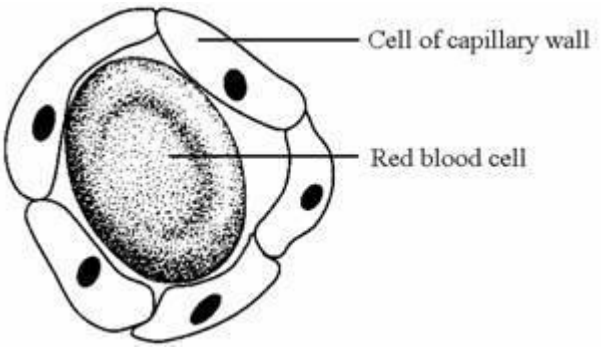
Time: **71 minutes**

Marks: **71 marks**

Comments:

Q1.

Capillaries are blood vessels in the body which join the arteries to the veins. They have walls which are one cell thick and so are able to exchange substances with the body cells.



(i) Name **two** substances that travel from the muscle cells to the blood in the capillaries.

1. _____

2. _____

(2)

(ii) Glucose is one substance that travels from the blood in the capillaries to the body cells. Explain how this happens.

_____

_____

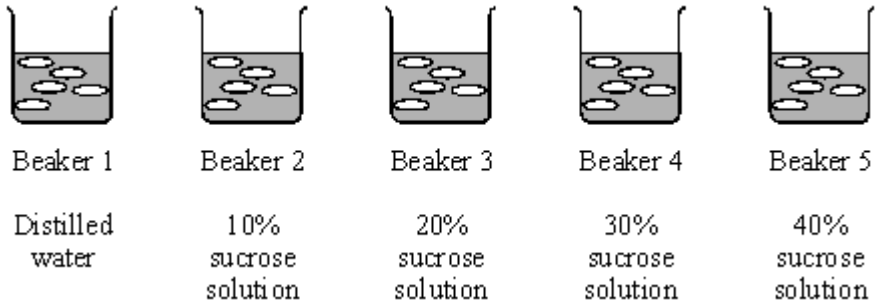
_____

(2)

(Total 4 marks)

Q2.

Some students set up an experiment using osmosis to find the concentration of sucrose solution in potato cell sap. They used discs of potato cut to the same size and weighing approximately 10 gms. The discs were put into each of five beakers.



(a) (i) After two hours they reweighed the discs after carefully blotting them first. Why did the students blot the potato before weighing it?

_____

_____

(1)

(ii) Their results are shown in the table below.

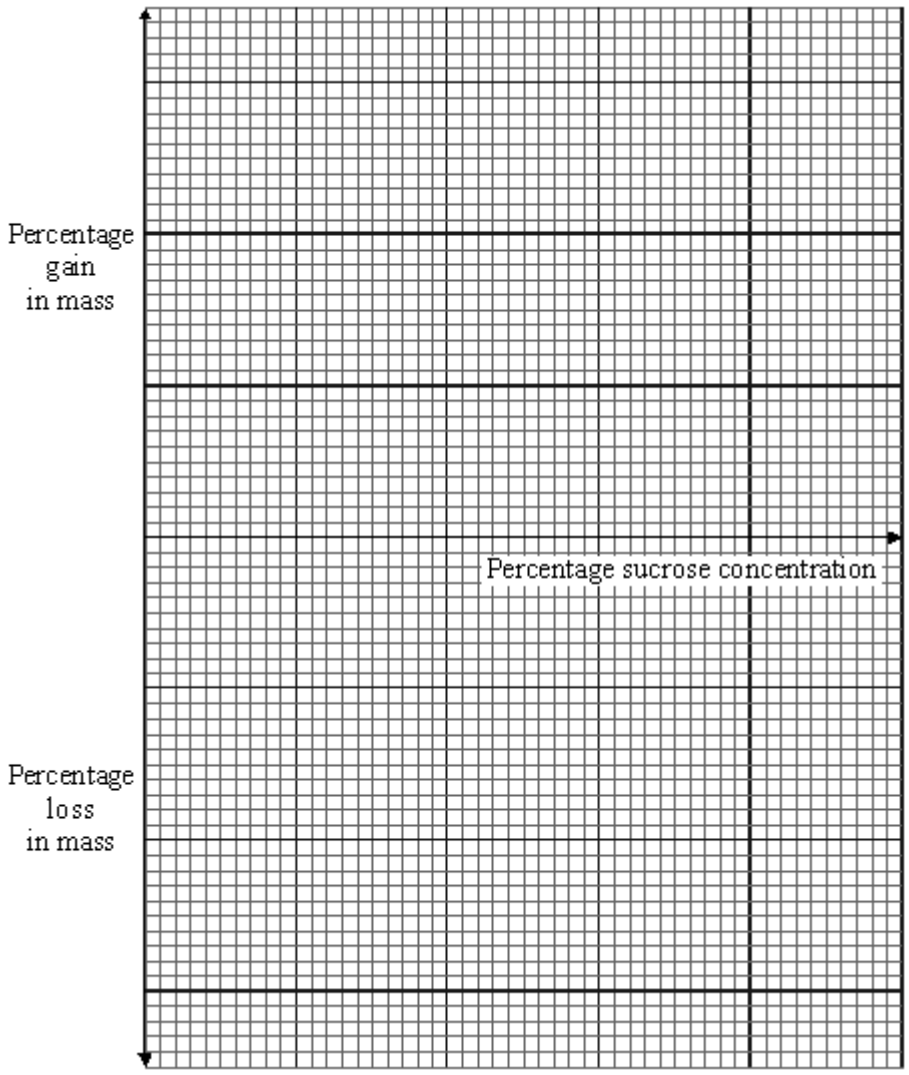
	Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
Final mass in g	13.0	12.2	9.0	7.9	7.3
Initial mass in g	10.0	10.6	10.0	10.1	10.4

The students calculated the % gain or loss in mass of potato. Complete this table of results for Beakers 2, 4 and 5.

Beaker 1	**Beaker 2**	**Beaker 3**	**Beaker 4**	**Beaker 5**
13 – 10.0 = 3.0 $\frac{3.0}{10.0} \times 100\% = 30\%$		9.0 – 10.0 = –1.0 $\frac{-1.0}{10.0} \times 100\%$ = –10%		
Gain in mass = 30%		Loss in mass = 10%		

(3)

(b) (i) Draw a graph of % Gain or Loss in mass against sucrose concentration.



(3)

(ii) Use the graph to find the concentration of potato cell sap.

Concentration of cell sap = _____ % sucrose solution

(1)

(iii) Explain in terms of osmosis how you chose this value.

_____

_____

_____

(2)

(Total 10 marks)

Q3.

(a) Put a tick (✓) in the correct boxes in the table below to show which of the parts given are present in the cells and organisms listed.

	CYTOPLASM	NUCLEUS	CELL WALL	GENES
Leaf mesophyll cell				
Sperm				

(2)

(b) (i) What is the main job of a leaf mesophyll cell?

_____

_____

(1)

(ii) Explain **one** way in which the structure of the leaf mesophyll cell helps it to carry out its job.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q4.

Read the extract.

Super-bug may hit the price of coffee

The coffee bean borer, a pest of the coffee crop, can be controlled by the pesticide endosulphan However, strains of the insect that are up to 100 times more resistant to the pesticide have emerged on the South Pacific island of New Caledonia.

For full resistance to be passed on to an offspring two copies of the new resistance allele should be inherited, one from each parent. There is much inbreeding with brother-sister matings happening in every generation, so it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.

If this resistance spreads from New Caledonia, it will mean the loss of a major control method. This will present a serious threat to the international coffee industry.

(a) Suggest how the allele for resistance to endosulfan may have arisen.

_____

_____

(1)

(b) (i) How would you expect the proportion of normal coffee bean borers on New Caledonia to change over the next few years?

_____

(ii) Explain why this change will take place.

_____

_____

_____

_____

_____

_____

(3)

(c) Explain why “it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.” (lines 6-8)

_____

_____

_____

_____

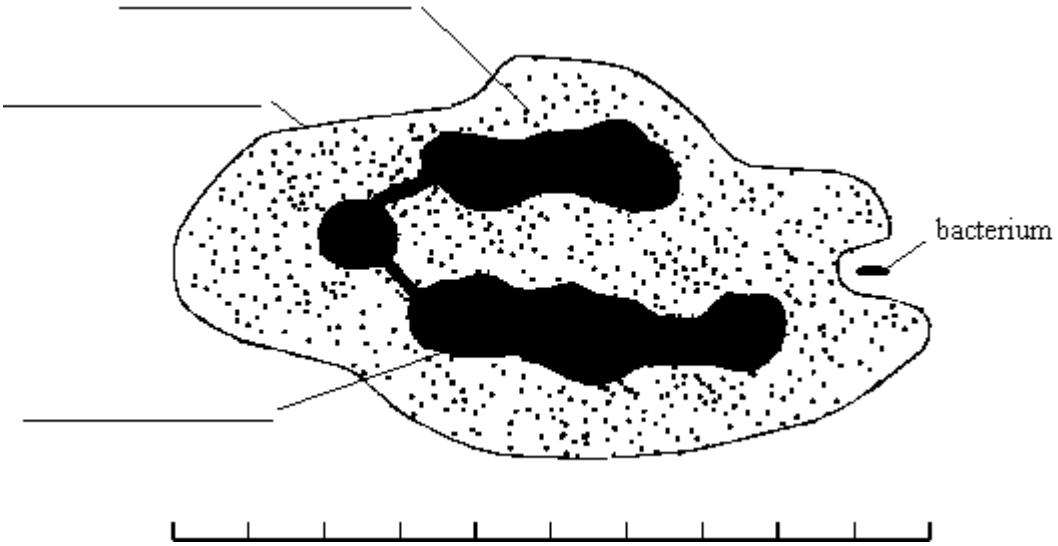
_____

(3)

(Total 7 marks)

Q5.

The drawing shows a white blood cell ingesting a bacterium.



(i) Use words from the list to label the parts of the white blood cell.

cell membrane **cell wall** **cytoplasm** **nucleus** **vacuole**

(3)

(ii) The scale shows that the white blood cell is 10 micrometres long.

How long is the bacterium? Show your working.

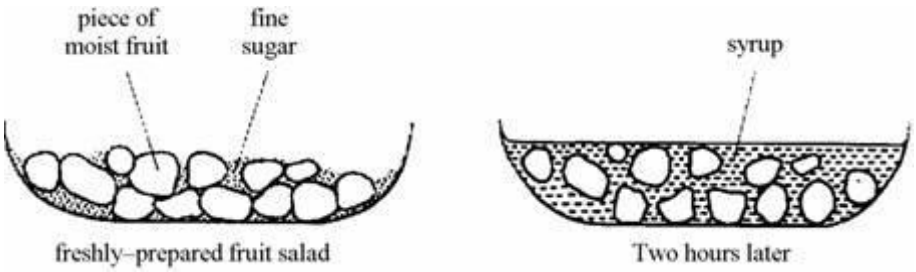
_____ micrometres

(2)

(Total 5 marks)

Q6.

A cook prepares a fresh fruit salad by cutting up a variety of fruits and placing them in a bowl with layers of sugar in between. After two hours the fruit is surrounded by syrup (concentrated sugar solution).



Explain, as fully as you can, why syrup (concentrated sugar solution) was produced after two hours.

_____

_____

_____

_____

_____

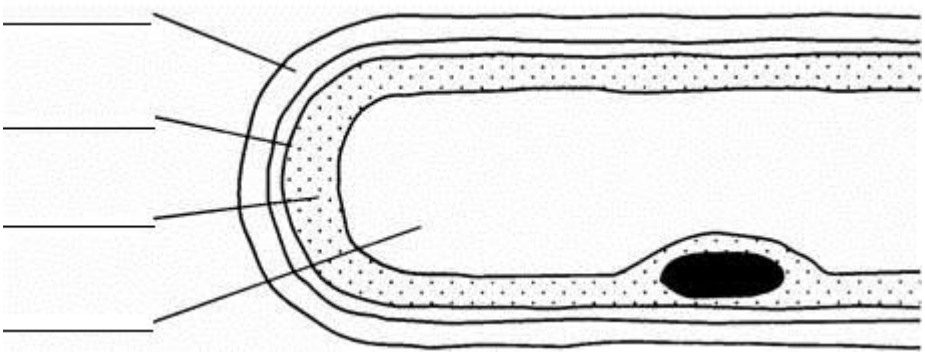
_____

_____

(Total 4 marks)

Q7.

The drawing shows part of a root hair cell.

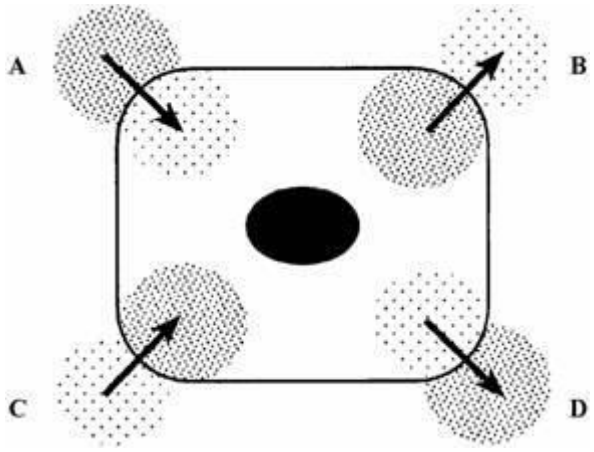


(a) Use words from the list to label the parts of the root hair cell.

cell membrane **cell wall** **cytoplasm** **nucleus** **vacuole**

(4)

(b) The diagram shows four ways in which molecules may move into and out of a cell. The dots show the concentration of molecules.



The cell is respiring aerobically.
Which arrow, **A**, **B**, **C** or **D** represents:

(i) movement of oxygen molecules; _____

(ii) movement of carbon dioxide molecules? _____

(2)

(c) Name the process by which these gases move into and out of the cell.

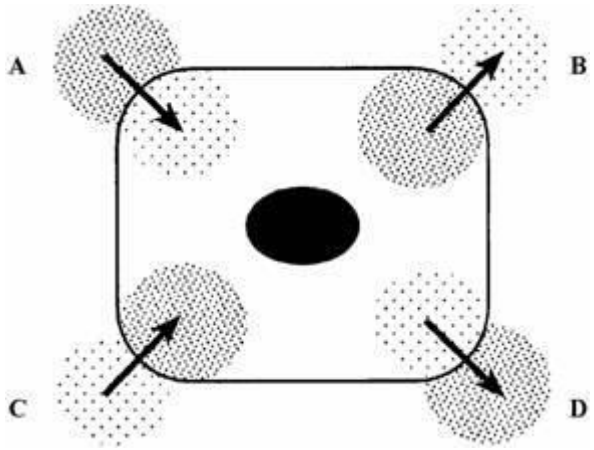
_____

(1)

(Total 7 marks)

Q8.

(a) The diagram shows four ways in which molecules may move into and out of a cell. The dots show the concentration of molecules.



The cell is respiring aerobically.
Which arrow, **A**, **B**, **C** or **D**, represents:

(i) movement of oxygen molecules; _____

(ii) movement of carbon dioxide molecules? _____

(2)

(b) Name the process by which these gases move into and out of the cell.

_____

(1)

(c) Which arrow, **A**, **B**, **C** or **D**, represents the active uptake of sugar molecules by the cell?

_____

Explain the reason for your answer.

_____

_____

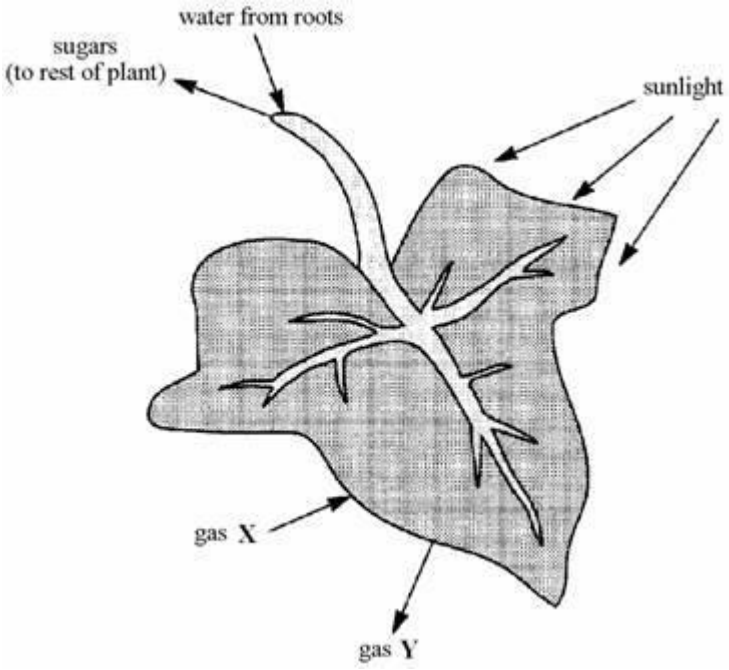
_____

(2)

(Total 5 marks)

Q9.

The diagram shows a plant leaf during photosynthesis.



(a) Name:

(i) gas **X**; _____

(ii) gas **Y**. _____

(2)

(b) Why is sunlight necessary for photosynthesis?

_____

_____

(1)

(c) Some of the sugars produced by photosynthesis are stored as starch in the roots. Explain, as fully as you can, why it is an advantage to the plant to store carbohydrate as starch rather than as sugar.

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q10.

(a) Balance the following equation for photosynthesis.

_____ CO_2 + _____ H_2O → $C_6H_{I2}O_6$ + _____ O_2

(1)

(b) Give **two** conditions necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide.

1. _____

2. _____

(2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how **each** of these kinds of cell assists photosynthesis.

Guard cells _____

_____

_____

_____

(2)

Palisade cells _____

_____

_____

_____

(2)

(d) Glucose is a product of photosynthesis. Give **three** uses which green plants make of glucose.

1. _____

2. _____

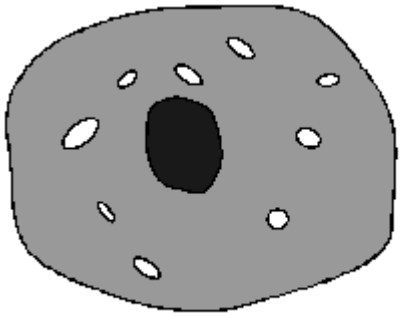
3. _____

(3)

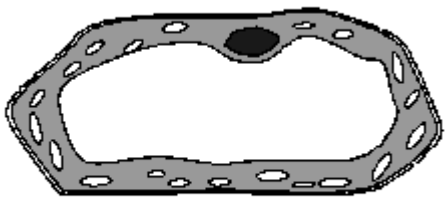
(Total 10 marks)

Q11.

The diagrams show a cheek cell from a human and a leaf cell from a plant.



Cheek cell



Leaf cell

(a) The two cells have a number of parts in common.

(i) On the cheek cell, label **three** of these parts which both cells have.

(3)

(ii) In the table, write the names of the **three** parts you have labelled above and describe the main function of each part.

Part	Function
_____	
_____	
_____	

(3)

(b) Blood contains white cells and red cells. State the function of each type of cell in the blood.

White cells _____

_____

Red cells _____

_____

(2)

(Total 8 marks)

Q1.

(i) any **two** from:

urea

carbon dioxide

water

lactic acid

2

(ii) higher concentration of glucose **or** more glucose in blood than cells

1

<u>diffuses</u> across

1

[4]

Q2.

(a) (i) change in weight was due to changes <u>in</u> potato
or osmosis **or** not due to outside liquid
ignore 'to make fair test'

1

(ii) beaker 2 = 15.1(%) gain
allow 15%

1

beaker 4 = 21.8(5) loss
***not** 21.7*
allow –22%
if no minus or no 'loss' check graph

1

beaker 5 = 29.8(%) loss
allow –30%

1

(b) (i) both axes correct values
and scales > ½ of each axis
ignore lack of minus signs on vertical axis

1

points correct
< ± ½ square
allow answers in (a)(ii)

1

line correct
allow curve of best fit which can miss 10, 15
***or** straight lines between points*

*do **not** allow <u>one</u> straight line or sketched line*
bar graph zero marks

1

(ii) point where line crosses axis (eg 15-16% sucrose)

allow point from candidate's graph (± 0.5%)

1

(iii) any **two** from:

looking for understanding that water in equilibrium

no change in mass

not **net** movement of water
or water entry and exit are equal

because sucrose solution same
concentration as cell sap **or** sucrose has
same water potential as cell contents

allow because the concentrations are the same (inside and out)

2

[10]

Q3.

(a) mesophyll / / / / (all correct) sperm / / x / (all correct)

for 1 mark each

2

(b) (i) absorbs light/to produce food/photosynthesis

(allow references to gaseous exchange)
for 1 mark

1

(ii) has chlorophyll/chloroplasts to absorb light/produce food

for 1 mark each
(if linked to gas exchange allow – moist surface/ dissolve gases)

2

[5]

Q4.

(a) mutation

for 1 mark

1

(b) fall,
idea that resistant beetles more likely to survive to breed,
∴ their offspring more likely to appear in the next generation

for 1 mark each

3

(c) inbreeding between resistant brothers and sister,
will produce some individuals with 2 copies of the resistance allele,

if 2 of these individuals breed all their offspring will be resistant

for 1 mark each

3

[7]

Q5.

(i) cytoplasm
(cell) membrane
nucleus

all correctly labelled
each for 1 mark

3

(ii) 0.5

gains 2 marks
(5/100 × 10 or ½ /1 gains 1 mark if 0.5 not given)

2

[5]

Q6.

ideas that
sugar has dissolved in moisture (on surface of fruit)
this solution more concentrated than solution inside fruit
osmosis / diffusion movement of water out of fruit
through partially permeable membrane (of fruit cells)

any four for 1 mark each

allow explanations in terms of concentrations of water molecules for full marks

[4]

Q7.

(a) (cell) wall
(cell) membrane
cytoplasm
vacuole

for 1 mark each

4

(b) (i) A

(ii) B

for 1 mark each

2

(c) diffusion (*reject* osmosis)

for 1 mark

1

[7]

Q8.

(a) (i) A

(ii) B

for 1 mark each

2

(b) diffusion

(reject osmosis)
for one mark

1

(c) C
because uptake against a concentration / diffusion gradient
(*reject* osmosis)
(if C not given, then idea of movement essential)

for 1 mark each

2

[5]

Q9.

(a) (i) carbon dioxide / CO_2 (*reject* CO)

(ii) oxygen / O_2 / O (water vapour neutral)

for 1 mark each

2

(b) (provides) energy

for one mark

1

(c) starch insoluble therefore water not taken in by osmosis
or
sugar is soluble / has small molecules may diffuse out therefore lost

*(*ignore *ref. to cells bursting)*

or
starch has large molecules
cannot diffuse therefore retained

for 1 mark each

3

[6]

Q10.

(a) 6 6 6

all required

accept a '6n 6 n n 6n' version of the balanced equation provided it is correct in every detail

1

(b) any **two** of

- (presence of) chlorophyll **or** (amount of) chloroplasts
  accept green leaves (or other green parts)
- (sufficient) light (intensity)

• (light) of **a** suitable wavelength

any light other than green light

do not credit Sun's energy or sunshine or Sun

2

(c) **guard cells**

any **two** of

* control by osmosis
* the movement of gases

*accept movement of carbon dioxide **or** oxygen **or** water vapour beware movement of CO_2 out*

accept a diagram or description

* through the stoma

2

palisade cells

any **two** of

* near the upper surface
* contain (a great) <u>many</u> **or** <u>more</u> chloroplasts
* (so) contain the most chlorophyll

2

(d) any three of

* for respiration
* conversion to (insoluble) starch

or to food store **or** to (other)carbohydrates
* (conversion to) sucrose **or** to food store **or** to (other) carbohydrates

or polysaccharides

*do not credit just to grow **or** live*

***or** survive*

accept conversion to food store

***or** to (other) carbohydrates once only*

* (conversion to) lipids **or** fats **or** oils
* (conversion to) amino acids **or** (plant) proteins **or** auxins **or** (plant) hormones **or** enzymes

3

[10]

Q11.

(a) (i) the three features correctly labelled on cheek cell (which are referred to in part (ii)

label lines should touch or end very close to part no marks if leaf cell labelled

nucleus

cytoplasm

cell membrane

mitochondrion

accept mitochondria or one of these could be labelled vacuole

3

(ii) any **three** from

feature	**function**
nucleus	controls cell
cytoplasm	where respiration occurs
	or reactions occurs
membrane	less water **or** chemicals
	in and **or** out
mitochondria	where energy released

*accept contains genetic material **or** genes **or** chromosomes **or** stores information*
do not credit the brain of the cell

*accept contains food **or** mitochondria*

accept surrounds the cell or lets some things in but not others
*do not credit keeps things out **or** protection*

ecf from leaf cell labelling
*accept chloroplasts make sugar **or** glucose*
accept vacuole contains sap
*accept if cell wall mis labelled on cheek cell, support **or** hold together*

3

(b) fight **or** ingest **or** kill bacteria **or** germs **or** viruses **or** microbes

accept produce antitoxins or antibodies fight disease (organisms)
do not credit fungus

1

(transport) oxygen **or** carry haemoglobin

*accept transport carbon dioxide **or** helps form scabs*

1

[8]