



## Exampro GCSE Biology

B2.1 Cells  
Higher tier

Name:

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Class:

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Author:

Date:

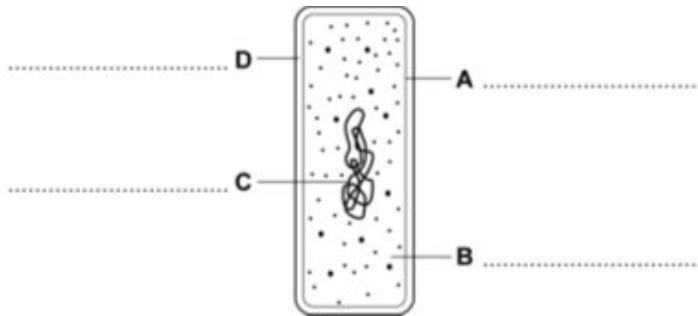
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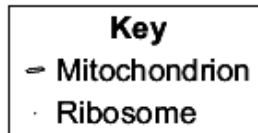
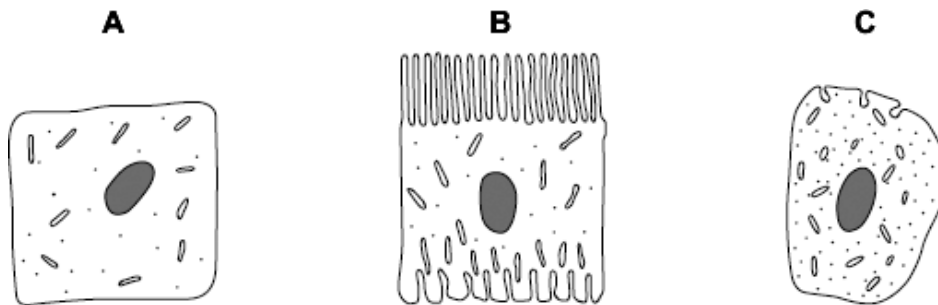
**Q1.** The diagram shows a bacterium.



On the drawing, name the structures labelled **A**, **B**, **C** and **D**.

**(Total 4 marks)**

**Q2.** Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to have adaptations to increase diffusion into or out of the cell?

Give **one** reason for your choice.

.....  
 .....

**(1)**

(b) (i) Cell **C** is found in the pancreas.

Name **one** useful substance produced by the pancreas.

.....

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for producing this substance.

.....

.....

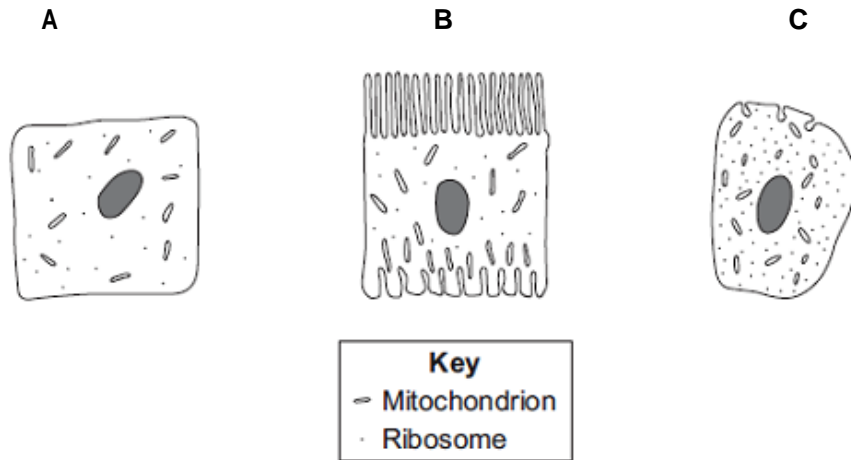
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(2)

(Total 4 marks)

**Q3.** Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to be best adapted to increase diffusion into or out of the cell?

Give **one** reason for your choice.

.....

.....

(1)

(b) (i) Cell **C** is found in the salivary glands.

Name the enzyme produced by the salivary glands.

.....

(1)

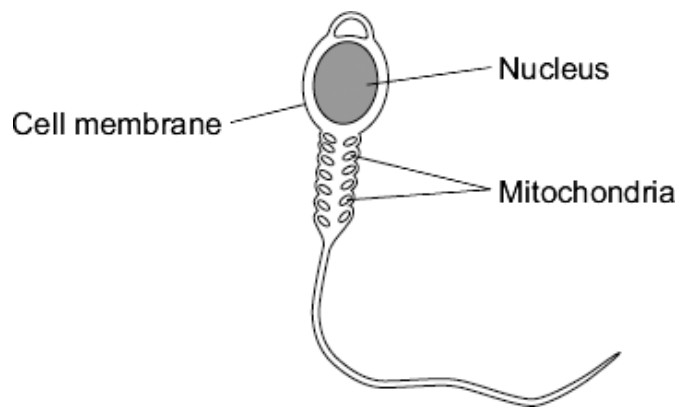
- (ii) Use information from the diagram to explain how cell **C** is adapted for producing this enzyme.

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.....  
.....

(2)  
(Total 4 marks)

**Q4.** Cells in the human body are specialised to carry out their particular function.

- (a) The diagram shows a sperm cell.



The sperm cell is adapted for travelling to, then fertilising, an egg.

- (i) How do the mitochondria help the sperm to carry out its function?

.....  
.....

(1)

- (ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

.....  
.....

(1)

(b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

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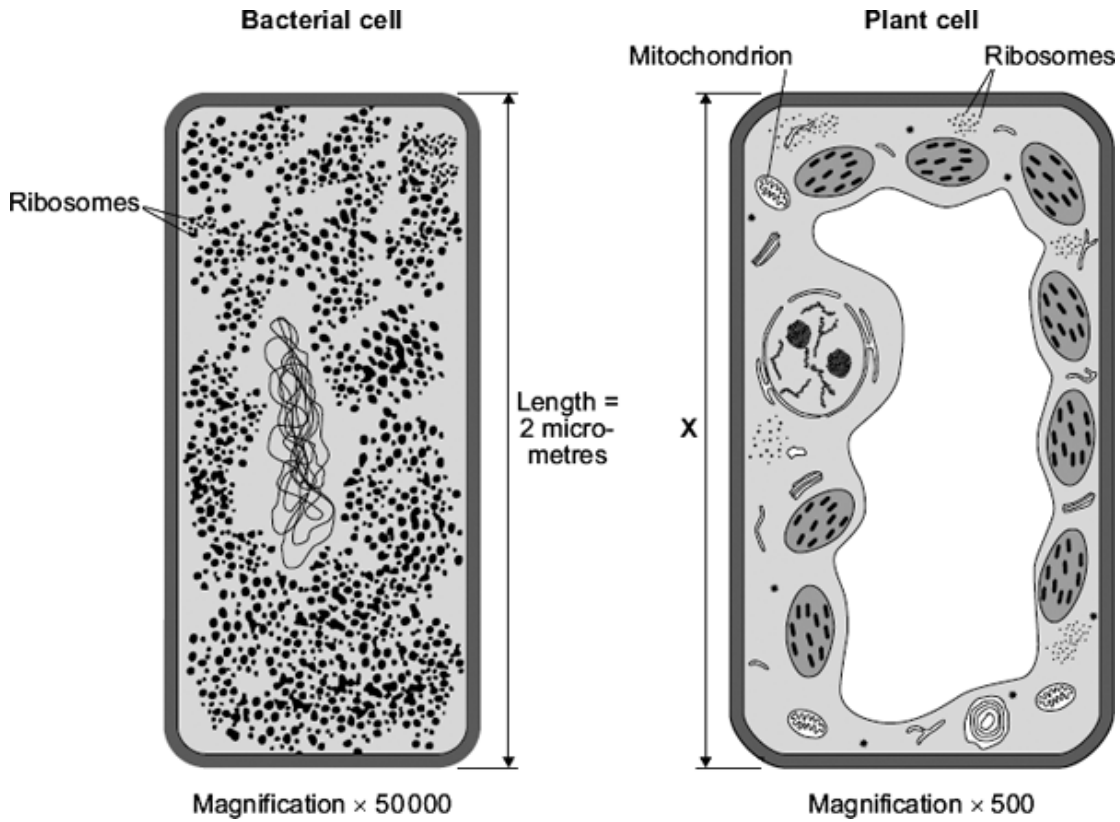
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(2)  
(Total 4 marks)

**Q5.** The diagram shows two cells, a bacterial cell and a plant cell.



(a) (i) Both the bacterial cell and the plant cell contain ribosomes.

What is the function of a ribosome?

.....

.....

(1)

- (ii) The plant cell contains mitochondria but the bacterial cell does **not** contain mitochondria.

Give **one** other way in which the plant cell is different from the bacterial cell.

.....  
.....

(1)

- (b) (i) Both cells are drawn the same length, but the magnification of each cell is different.

The real length of the bacterial cell is 2 micrometres.

Calculate the real length, **X**, of the plant cell. Give your answer in micrometres.

Show clearly how you work out your answer.

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

**X** = ..... micrometres

(2)

- (ii) Most mitochondria are about 3 micrometres in length.

The plant cell contains mitochondria but the bacterial cell does **not** contain mitochondria.

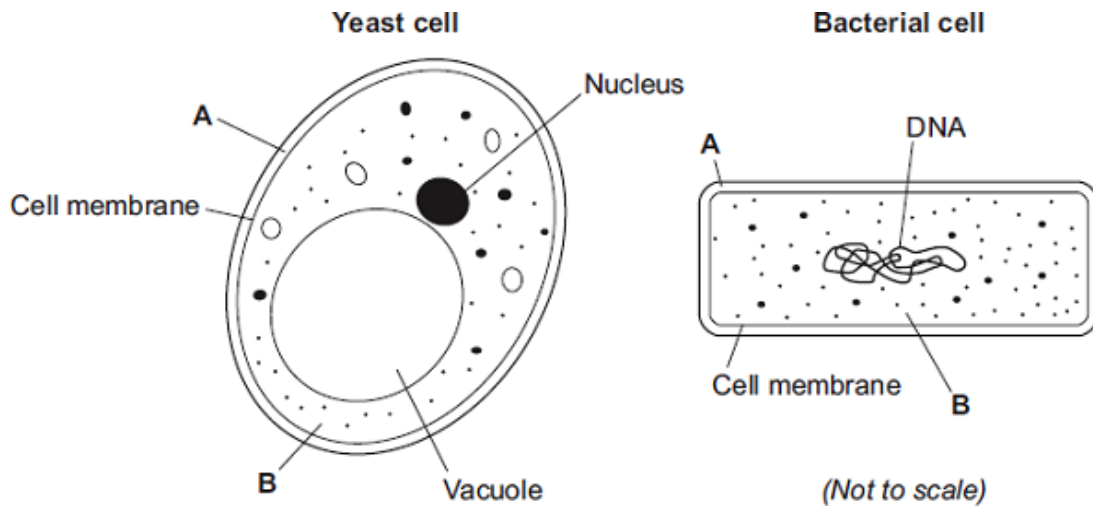
Use your answer to part (b)(i) and the information in the diagram to suggest why.

.....  
.....

(1)

(Total 5 marks)

**Q6.** (a) The diagrams show the structures of a yeast cell and a bacterial cell.



(i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

**A** .....

**B** .....

(2)

(ii) The yeast cell and the bacterial cell have different shapes and sizes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

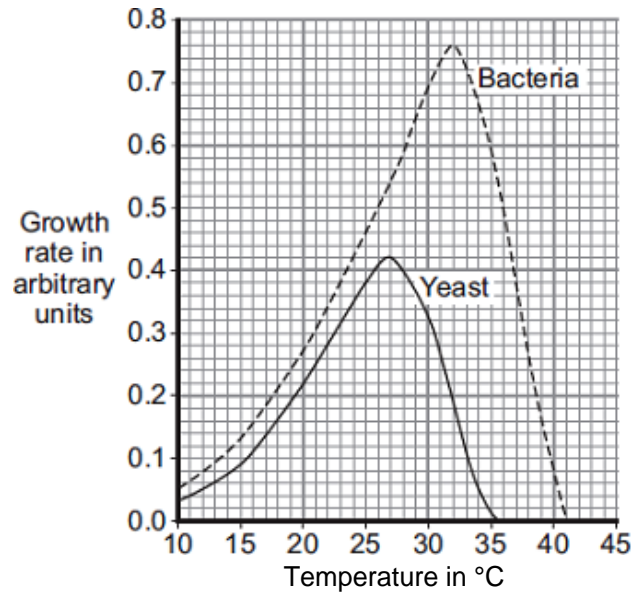
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(1)

- (b) Sourdough bread is light in texture and tastes slightly sour. The bread is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. The acid makes the bread taste sour.

The graph shows how the growth rates of the yeast and the bacteria change with temperature.



- (i) Sourdough bread rises fastest at 27°C.  
Use information from the graph to explain why.

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.....

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(2)

- (ii) The bread tastes most sour if it rises at 32°C.  
Use information from the graph to explain why.

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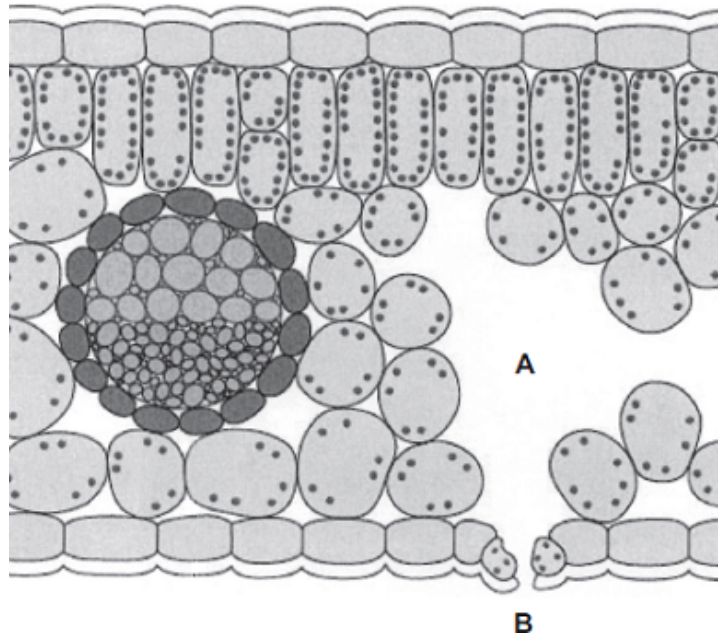
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(2)

(Total 7 marks)



**Q7.** The diagram shows a section through a plant leaf.



(a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	mesophyll	phloem	xylem
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..... and .....

(1)

(b) Gases *diffuse* between the leaf and the surrounding air.

(i) What is *diffusion*?

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

(2)

(ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

.....

(1)

**(Total 4 marks)**

**Q8. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

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Extra space .....

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**(Total 6 marks)**

**Q9.** Fresh milk is a mixture of compounds including lipid, protein and about 5% lactose sugar.

Lactose must be digested by the enzyme lactase, before the products can be absorbed.

Lactase can be added to fresh milk to pre-digest the lactose. This makes 'lactose-free' milk, which is suitable for people who do not produce enough lactase of their own.

A student investigated the effect of changing pH and temperature on the digestion of lactose in milk.

The results are shown in **Tables 1** and **2**.

**Table 1**  
Effect of pH

pH	Time taken to digest lactose in minutes
4.0	20
5.0	18
6.0	13
7.0	7
8.0	5
9.0	6

**Table 2**  
Effect of temperature

Temperature in °C	Time taken to digest lactose in minutes
25	20
30	14
35	11
40	6
45	29
50	No digestion

(a) The label on a carton of lactose-free milk states:

'Lactase is normally produced in the stomach of mammals.'

The results in **Table 1** suggest that this statement is **not** true.

Explain how.

.....

.....

.....

.....

(2)

(b) Explain, as fully as you can, the results shown in **Table 2** .

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

(3)

(c) Bile is produced in the liver and is released into the small intestine.

Bile helps the digestion of lipid in the milk.

Describe how.

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

(2)

(Total 7 marks)

**Q10.**

(a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.  
Neither of them has cystic fibrosis.  
Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3)

(b) Mr and Mrs Smith decided to visit a genetic counsellor who discussed embryo screening.

Read the information which they received from the genetic counsellor.

- Five eggs will be removed from Mrs Smith's ovary while she is under an anaesthetic.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be destroyed.

(i) Suggest why it is helpful to take five eggs from the ovary and not just one egg.

.....  
.....

(1)

(ii) Evaluate the use of embryo screening in this case.

Remember to give a conclusion to your evaluation.

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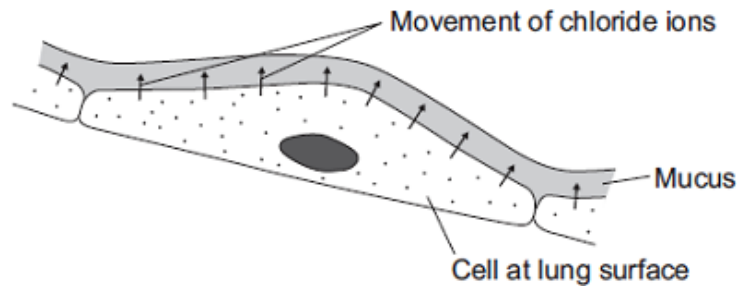
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(4)

(c) In someone who has cystic fibrosis the person's mucus becomes thick.

The diagram shows how, in a healthy person, cells at the lung surface move chloride ions into the mucus surrounding the air passages.



The movement of chloride ions causes water to pass out of the cells into the mucus.

Explain why.

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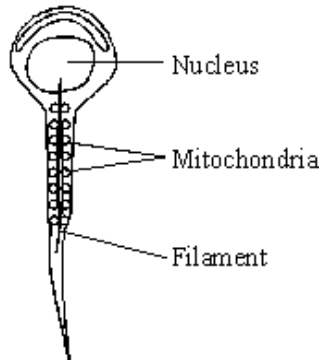
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(3)  
(Total 11 marks)

**Q11.** The diagram shows a human sperm. Inside the tail of the sperm is a filament mechanism that causes the side to side movement of the tail, which moves the sperm.



(a) Describe the function of the mitochondria and suggest a reason why they are arranged around the filament near the tail of the sperm.

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

(3)

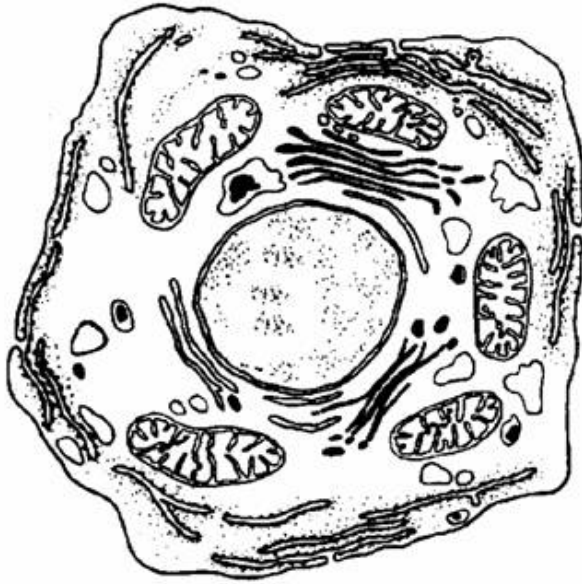
(b) Explain the significance of the nucleus in determining the characteristics of the offspring.

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

(2)

(Total 5 marks)

**Q12.** The drawing shows an animal cell, seen at a very high magnification using an electron microscope.



(a) (i) Label a mitochondrion [plural = mitochondria]. (1)

(ii) What happens in the mitochondria?  
..... (1)

(b) (i) Name and label the structure where you would find chromosomes. (1)

(ii) What are chromosomes made of?  
..... (1)

(c) What controls the rate of chemical reactions in the cytoplasm?  
..... (1)

**(Total 5 marks)**



<b>M1.</b>	A – cell membrane	1	
	B– cytoplasm	1	
	C– genes / genetic material / chromosome	1	
	D – cell wall	1	[4]

**M2.** (a) B

*no mark for “B”, alone*

large(r) surface / area **or** large(r) membrane  
*accept reference to microvilli*  
*accept reasonable descriptions of the surface*  
*do **not** accept wall / cell wall*  
*ignore villi / hairs / cilia*

1

(b) (i) any **one** from:

- insulin / hormone  
*if named hormone / enzyme must be correct for pancreas*
- enzyme / named enzyme

1

(ii) many ribosomes

1

(ribosomes) produce protein  
*accept insulin / hormone / enzyme named is (made of) protein*

**or**

allow many mitochondria (1)

provide energy to build protein **or** to make protein (1)  
*accept ATP for energy*

1

[4]

**M3. (a) B**

*no mark for "B" alone, the mark is for B and the explanation.*

large(r) surface / area **or** large(r) membrane

*accept reference to microvilli*

*ignore villi / hairs / cilia*

*accept reasonable descriptions of the surface eg folded membrane / surface*

*do **not** accept wall / cell wall*

1

(b) (i) any **one** from:

- (salivary) amylase
- carbohydrase

1

(ii) many ribosomes

*do **not** mix routes. If both routes given award marks for the greater.*

1

ribosomes produce protein

*accept amylase / enzyme / carbohydrase is made of protein*

**or**

(allow)

many mitochondria (1)

mitochondria provide energy to build / make protein (1)

*accept ATP instead of energy*

1

[4]

**M4. (a) (i) release energy**

*allow provide / supply / give energy*

*do **not** accept produce / create / generate / make energy*

*do **not** allow release energy for respiration*

1

(ii) contain half the (number of) chromosomes **or** contains one set of chromosomes **or** contains 23 chromosomes

*allow genetic information / DNA / genes / alleles instead of chromosomes*

*accept haploid*

1

(b) any two from:

- (stem cells) are unspecialised / undifferentiated  
*allow description eg 'no particular job'*
- are able to become differentiated  
**or** can form other types of cell / tissue / organ
- stem cells can / able to divide / multiply

2

[4]

**M5.** (a) (i) makes / produces / synthesises protein / enzyme

1

(ii) plant cell has nucleus / vacuole / chloroplasts / chlorophyll  
**or** plant cell is much larger

*'It' = plant cell*

*allow correct reference to DNA or chromosomes*

*allow plant cell has fewer ribosomes*

*allow cellulose (cell wall)*

1

(b) (i) 200

*correct answer with or without working gains 2 marks*

*if answer incorrect, allow 1 mark for  $\frac{2 \times 50,000}{500}$  **or**  $\frac{100,000}{500}$   
**or** 100*

2

(ii) bacterial cell is too small / bacterial cell about same size as a  
mitochondrion / 'no room'

*ignore references to respiration*

1

[5]

**M6.** (a) (i) A = (cell) wall

*ignore cellulose*

1

B = cytoplasm

1

(ii) any **one** from:  
*accept has DNA instead of a nucleus, but not just has DNA*

- bacterial cell / it has no nucleus  
*allow no mitochondria*
- DNA free in cytoplasm  
*ignore size*
- has no vacuole / no vesicles  
*ignore strands of DNA*

1

(b) (i) yeast grows best / better / well **or** optimum temperature for yeast / more yeast present

*allow yeast works best / better / well*

1

(yeast) makes CO<sub>2</sub> **or** respire / respiration

*allow fermentation*

1

(ii) bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium

*ignore microorganisms / microbes*

*allow works / respire best / better / well*

1

(bacterium) makes (lactic) acid

*do **not** allow wrong acid*

1

[7]

**M7.** (a) xylem **and** phloem

*either order*

*allow words ringed in box*

*allow mis-spelling if unambiguous*

1

(b) (i) movement / spreading out of particles / molecules / ions / atoms

*ignore names of substances / 'gases'*

1

from high to low concentration

*accept down concentration gradient*

*ignore 'along' / 'across' gradient*

*ignore 'with' gradient*

1

(ii) oxygen / water (vapour)

*allow O<sub>2</sub> / O<sub>2</sub>*

*ignore O<sup>2</sup> / O*

*allow H<sub>2</sub>O / H<sub>2</sub>O*

*ignore H<sup>o</sup>O*

1

[4]

**M8.** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1 – 2 marks)**

An example is given of a named substance

**or**

a process

**or**

there is an idea of why diffusion is important eg definition.

**Level 2 (3 – 4 marks)**

At least one example of a substance is given

**and**

correctly linked to a process in either animals or plants.

**Level 3 (5 – 6 marks)**

There is a description of a process occurring in either animals or plants that is correctly linked to a substance

**and**

a process occurring in the other type of organism that is correctly linked to a substance.

**examples of points made in the response**

**Importance of diffusion:**

- to take in substances for use in cell processes
- products from cell processes removed

**Examples of processes and substances:**

- for gas exchange / respiration: O<sub>2</sub> in / CO<sub>2</sub> out
- for gas exchange / photosynthesis: CO<sub>2</sub> in / O<sub>2</sub> out
- food molecules absorbed: glucose, amino acids, etc
- water absorption in the large intestine
- water lost from leaves / transpiration
- water absorption by roots
- mineral ions absorbed by roots

***extra information***

***Description of processes might include:***

- *movement of particles / molecules / ions*
- *through a partially permeable membrane*
- *(movement of substance) down a concentration gradient*
- *osmosis: turgor / support / stomatal movements*

- M9.** (a) stomach is acidic / has low pH  
*allow any pH below 7*  
*ignore stomach is not alkaline*

1

lactase works best / well in alkali / high pH / neutral / non-acidic conditions  
*allow any pH of 7 and above*  
*accept works slowly in acid conditions*  
*allow figures from table with a **comparison***  
*ignore reference to temperature*

1

- (b) any **three** from:

- (below 40(°C)) increase in temperature increases rate / speed of reaction
- reference to molecules moving faster / colliding faster / harder / more collisions
- enzyme optimum / works best at 40°C  
*allow value(s) in range 36 – 44*  
*ignore body temperature unless qualified*
- high temperatures (above 40°C) / 45°C / 50°C enzyme denatured  
*allow synonyms for denaturation, but do **not** allow 'killed'*  
*denaturation at high and low temperature does **not** gain this mark*  
*ignore references to time / pH*

3

- (c) any **two** from:

- acid neutralised or conditions made neutral / alkali  
*accept bile is alkaline*
- (allow) emulsification / greater surface area (of lipid / fat)  
*allow description of emulsification eg fat broken down / broken up*  
*into droplets*  
*do **not** accept idea of chemical breakdown*
- lipase / enzymes (in small intestine) work more effectively / better  
*allow better for enzymes*  
*ignore reference to other named enzymes*

2

[7]

- M10.** (a) both parents **Aa**  
*accept other upper and lower case letter without key **or** symbols*  
*with a key*  
*allow as gametes shown in Punnett square*

1

**aa** in offspring correctly derived from parents

**or**

**aa** correctly derived from the parents given

*ignore other offspring / gametes*

*for this mark parents do not have to be correct*

1

offspring **aa** identified as having cystic fibrosis

*may be the only offspring shown **or** circled / highlighted / described*

1

(b) (i) any **one** from:

*accept converse if clear, eg if you (only) took one it might have cystic fibrosis / might not be fertilised*

- (more) sure / greater chance of healthy / non-cystic fibrosis egg / embryo / child  
*accept some may have the allele*  
*reference to 'suitable / good embryo' is insufficient*
- greater chance of fertilisation

1

(ii) **advantages**

***to gain 3 marks both advantage(s) and disadvantage(s) must be given***

max 3

any **two** from:

*ignore references to abortion unless qualified by later screening*

- greater / certain chance of having child / embryo without cystic fibrosis / healthy
- child with cystic fibrosis difficult / expensive to bring up
- cystic fibrosis (gene / allele) not passed on to future generations

### **disadvantages**

any **two** from:

- operation dangers / named eg infection  
*ignore risk unqualified*
- ethical or religious issues linked with killing embryos  
*accept wrong / cruel to embryos accept right to life argument*  
*ignore embryos are destroyed*
- (high) cost of procedure
- possible damage to embryo (during testing for cystic fibrosis / operation)

### **plus**

### **conclusion**

a statement that implies a qualified value judgement

eg it is right because the child will (probably) not have cystic fibrosis even though it is expensive

**or**

eg it is wrong because embryos are killed despite a greater chance of having a healthy baby

**note:** *the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage is made*  
*do **not** award the mark if the conclusion only states that advantages outweigh the disadvantages*



(c) any **three** from:

- osmosis / diffusion  
*do **not** accept movement of ions / solution by osmosis / diffusion*
- more concentrated solution outside cell / in mucus  
*assume concentration is concentration of solute unless answer indicates otherwise or accept correct description of 'water concentration'*
- water moves from dilute to more concentrated solution  
*allow correct references to movement of water in relation to concentration gradient*
- partially permeable membrane (of cell)  
*allow semi / selectively permeable*

3

[11]

**M11.** (a) **award one mark for each key idea**

energy released **or** energy transferred **or** respiration

*allow provides **or** gives*

*do **not** allow produces **or** makes*

3

near to the site of movement **or**  
energy available quickly **or** more  
energy

*accept allows more mitochondria to fit in*

(mitochondria) packed (around  
filament) **or** efficient arrangement **or**  
spiral arrangement

(b) contains chromosomes **or** genes **or**  
DNA

***not** genetic material*

1

(which) contribute half (the genes) to  
the fetus **or** offspring

*23 chromosomes **or** half the genes*

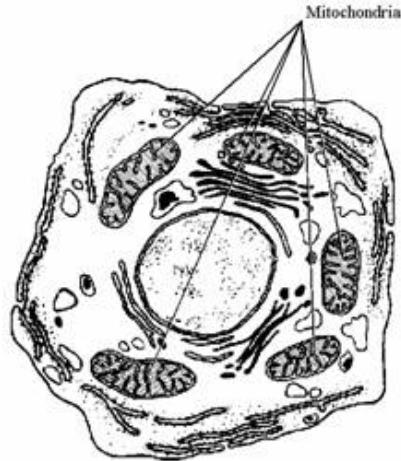
***or** reference to X,Y chromosome determining sex (if the notion of  
halfness is there)*

*nucleus contains half genes for the offspring = 2 marks*

1

[5]

M12. (a) (i)



award 1 mark for any of the mitochondria correctly labelled if a number are labelled and one is incorrect award 0 marks

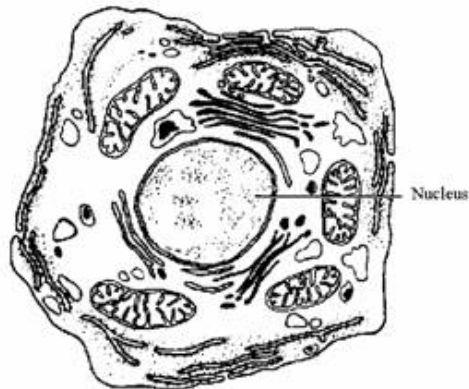
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- (ii) respiration **or** the release **or** transfer of energy **or** it contains the enzymes for respiration

do **not** accept energy produced

1

- (b) (i) nucleus (named and correctly labelled)



arrow **or** line must touch **or** go inside the nuclear membrane

1

- (ii) DNA **or** genes **or** nucleic acids  
accept protein **or** histones **or** nucleotides **or** ATGC

1

- (c) enzymes **or** nucleus

do not accept factors that affect the rate rather than control it eg pH **or** temperature

1

[5]

