Organisation part 5

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Name: _____

Class: _____

Date: _____

Time: **85 minutes**

Marks: **79 marks**

Comments:

Q1.

This question is about plant transport systems.

(a) Describe how water is transported from the soil to the atmosphere through a plant.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) Dissolved sugars are moved through a plant in phloem tissue.

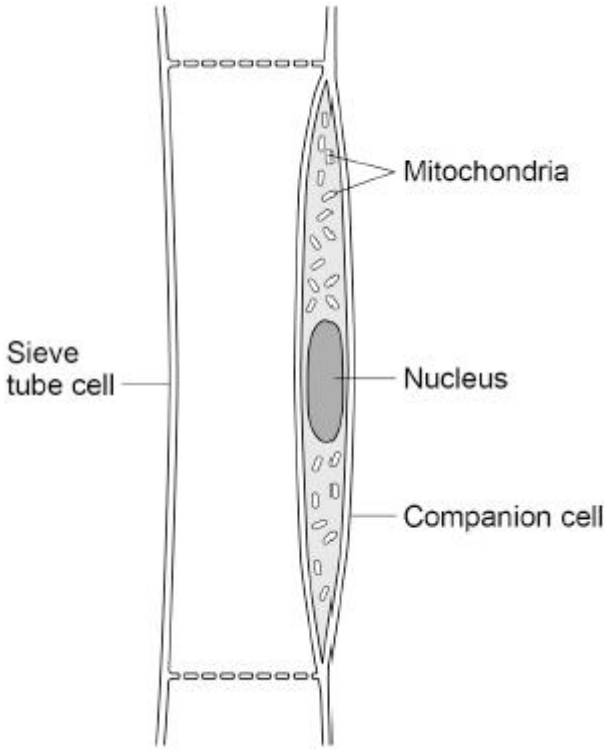
What is the name of the process that moves dissolved sugars through phloem tissue?

_____

(1)

Phloem tissue is made of sieve tube cells and companion cells.

The figure below shows a section of phloem tissue.



(c) Explain **one** way **sieve tube cells** are specialised for their function.

Use the figure above.

(2)

(d) What does the structure of the companion cells suggest about the process that moves dissolved sugars through the phloem tissue?

Give a reason for your answer.

Use the figure above.

(2)

(e) Describe why it is important that dissolved sugars are moved both upwards **and** downwards in a plant.

_____

_____

_____

_____

_____

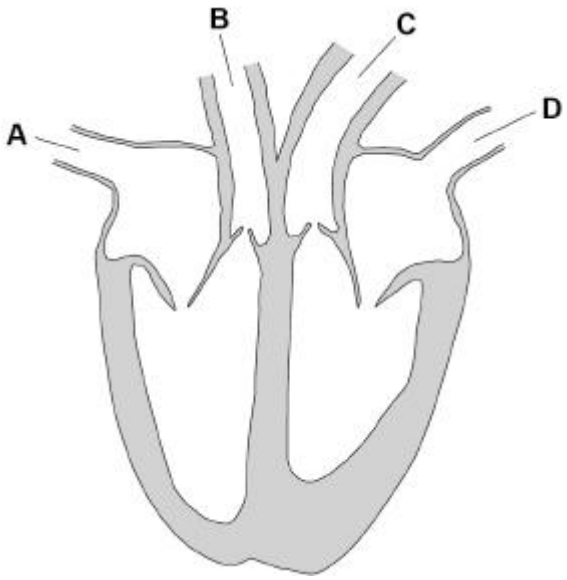
_____

(3)

(Total 12 marks)

Q2.

The figure below shows the human heart.



(a) Which blood vessel transports blood with the highest oxygen concentration **into** the heart?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Blood pressure is a measure of the force of the blood against the walls of the blood vessels.

Which blood vessel transports blood at the highest pressure?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) What is the correct order for blood flowing through the heart to the lungs?

Tick (✓) **one** box.

left atrium → left ventricle → pulmonary artery ☐

left atrium → left ventricle → pulmonary vein ☐

right atrium → right ventricle → pulmonary artery ☐

right atrium → right ventricle → pulmonary vein ☐

(1)

Every year thousands of people in the UK have heart attacks.

A heart attack is caused when the heart muscle cells do **not** get enough oxygen, causing the cells to die.

(d) Statins and stents are two treatments used to reduce the risk of someone having a heart attack.

Evaluate the use of statins compared with the use of a stent to reduce the risk of a heart attack.

(6)

(e) Many people who survive a heart attack get out of breath easily when they exercise gently.

Explain why heart attack survivors get out of breath easily.

(4)

Scientists have developed patches of beating heart cells to repair damaged heart tissue.

The patches are placed onto areas of the heart where cells have died. New cells grow to replace the dead cells.

The patches are made using a person's own cells that are converted into stem cells.

(f) Explain why stem cells are used to make the patches.

(2)

(g) The scientists could have used human embryonic stem cells to make the patches.

Give **two** advantages of using stem cells made from the person's own cells, rather than using embryonic stem cells.

1 _____

_____

2 _____

_____

(2)

(Total 17 marks)

Q3.

Being overweight can affect the health and life expectancy of a person.

(a) What is **one** lifestyle change a person could make to help them lose body mass?

Tick (✓) **one** box.

Drink more alcohol	☐
Eat less fatty food	☐
Stop smoking	☐

(1)

(b) Exercise has many health benefits.

Give **two** health benefits of regular exercise.

Do **not** refer to losing body mass in your answer.

1. _____

_____

2. _____

_____

(2)

During exercise, breathing rate increases to provide more oxygen for aerobic respiration.

(c) What is the equation for aerobic respiration?

Tick (✓) **one** box.

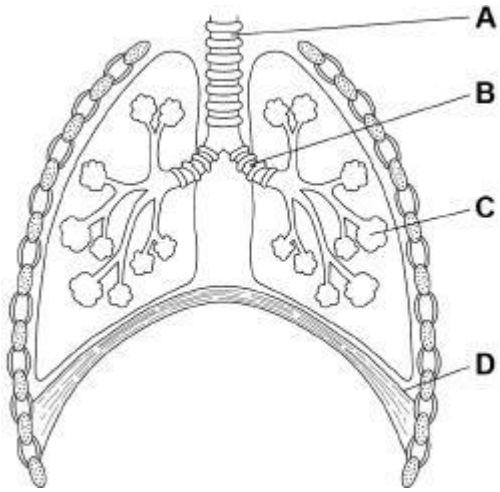
carbon dioxide + water → glucose + oxygen ☐

glucose + oxygen → carbon dioxide + water ☐

oxygen + water → glucose + carbon dioxide ☐

(1)

(d) The diagram below shows the human breathing system.



Where does gas exchange take place?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

A scientist investigated the effect of exercise on the breathing rate of four people.

This is the method used.

1. Measure the resting breathing rate.
2. Exercise for 10 minutes.
3. Measure the breathing rate as soon as exercise stops.
4. Record the time taken for the breathing rate to return to the resting rate.

The table below shows the results.

Person	Resting breathing rate in breaths per minute	Breathing rate after exercise in breaths per minute	Increase in breathing rate in breaths per minute	Time for breathing rate to return to resting rate in minutes
A	12	45	33	5.5
B	10	28	18	4.0
C	11	35	24	6.5
D	13	52	39	10.0

(e) The scientist concluded that person **B** was the fittest.

Give **two** reasons that support the scientist's conclusion.

Use the table above.

1. _____

_____

2. _____

_____

(2)

(f) Suggest **two** reasons why the scientist's conclusion may **not** be valid.

1. _____

_____

2. _____

_____

(2)

(g) Give **two** changes that happen in the body during aerobic exercise.

Do **not** refer to increased breathing rate in your answer.

1. _____

_____

2. _____

_____

(2)

(h) Muscles respire anaerobically during vigorous exercise.

Complete the sentences.

Choose answers from the box.

amino acids	**carbon dioxide**	**glucose**
lactic acid	**oxygen**	

Muscles respire anaerobically if they do not have enough _____.

Anaerobic respiration of glucose produces _____.

(2)

(Total 13 marks)

Q4.

Water is lost from the leaves of plants through pores called stomata.

(a) What is the loss of water from a leaf called?

Tick (✓) **one** box.

Osmosis	☐
Respiration	☐
Transpiration	☐

(1)

(b) Which cells control the size of stomata?

Tick (✓) **one** box.

Guard cells ☐

Phloem cells ☐

Xylem cells ☐

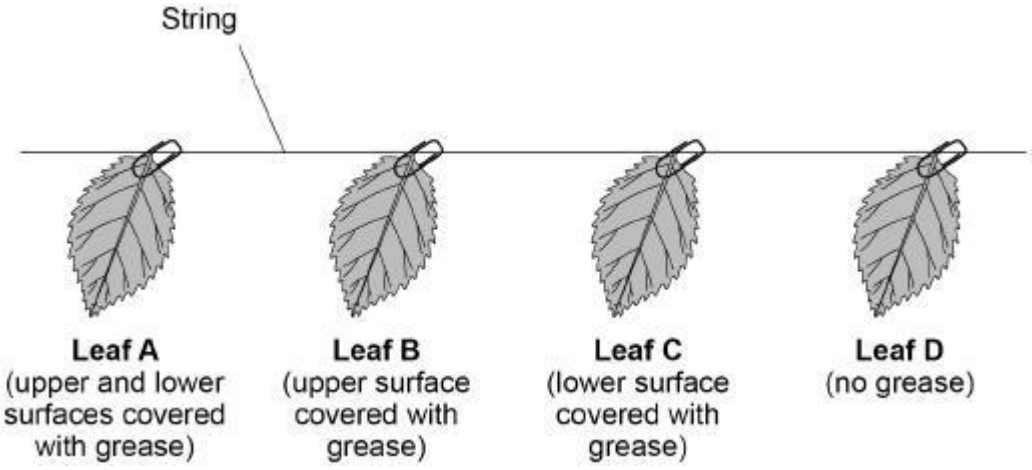
(1)

A student investigated the water loss when different surfaces of leaves were covered in grease.

The grease blocks the stomata.

This is the method used.

1. Remove four similar leaves from one plant.
2. Put grease on different surfaces of the leaves as shown in the diagram below.
3. Record the mass of each leaf and attach the four leaves to a string.
4. After 24 hours record the mass of each leaf again.



The table below shows the results.

Leaf	Surfaces covered with grease	Mass of leaf at start in grams	Mass of leaf after 24 hours in grams	Loss in mass after 24 hours in grams
A	Upper and lower	2.01	1.97	**X**
B	Only upper	2.00	1.87	0.13
C	Only lower	2.01	1.96	0.05
D	None	1.98	1.83	0.15

(c) Calculate value **X** in the table above.

Value **X** = _____ g

(1)

(d) The loss in mass of water was measured after 24 hours.

Calculate the mass of water lost in grams per hour for leaf **D**.

Mass of water lost per hour = _____ g

(2)

The student concluded:

'More water is lost from the lower surface of a leaf than from the upper surface.'

(e) What evidence is there in the table above to support the student's conclusion?

(1)

(f) What do the results in the table above show about the number of stomata on the surfaces of a leaf?

Tick (✓) **one** box.

There are more stomata on the lower surface.	☐
There are more stomata on the upper surface.	☐
There are the same number of stomata on both surfaces.	☐

(1)

(g) The investigation was done at 20 °C

How would the mass of water lost be different if the investigation was done at 25 °C?

Give a reason for your answer.

Difference _____

_____

Reason

_____

_____

(2)

(Total 9 marks)

Q5.

Pathogens cause infectious diseases.

(a) Draw **one** line from each disease to the type of pathogen that causes the disease.

Disease	Type of pathogen
	Bacterium
Gonorrhoea	
	Fungus
	Protist
Measles	
	Virus

(2)

The body defends itself against pathogens in different ways.

(b) Give **two** ways that the body prevents pathogens entering the body.

1. _____

_____

2. _____

_____

(2)

(c) If pathogens do enter the body the immune system tries to destroy the pathogens.

Describe how the immune system defends the body against disease.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(d) Give **one** reason why antibiotics cannot be used to treat HIV infections.

_____

_____

(1)

(e) Give **two** ways to prevent the spread of HIV.

1. _____

_____

2. _____

_____

(2)

(f) Some people with a HIV infection develop AIDS.

Some people with AIDS may die from a different type of infection, such as a chest infection.

Why do people with AIDS die from a different type of infection?

Tick (✓) **one** box.

HIV damages the immune system. ☐

Pathogens enter the body more easily. ☐

People with AIDS are immune to HIV. ☐

(1)

(Total 14 marks)

Q6.

Starch is digested to form sugar molecules in the digestive system.

(a) What is the name of the enzyme that digests starch?

_____

(1)

(b) Where are most food molecules absorbed?

Tick (✓) **one** box.

Large intestine ☐

Liver ☐

Small intestine ☐

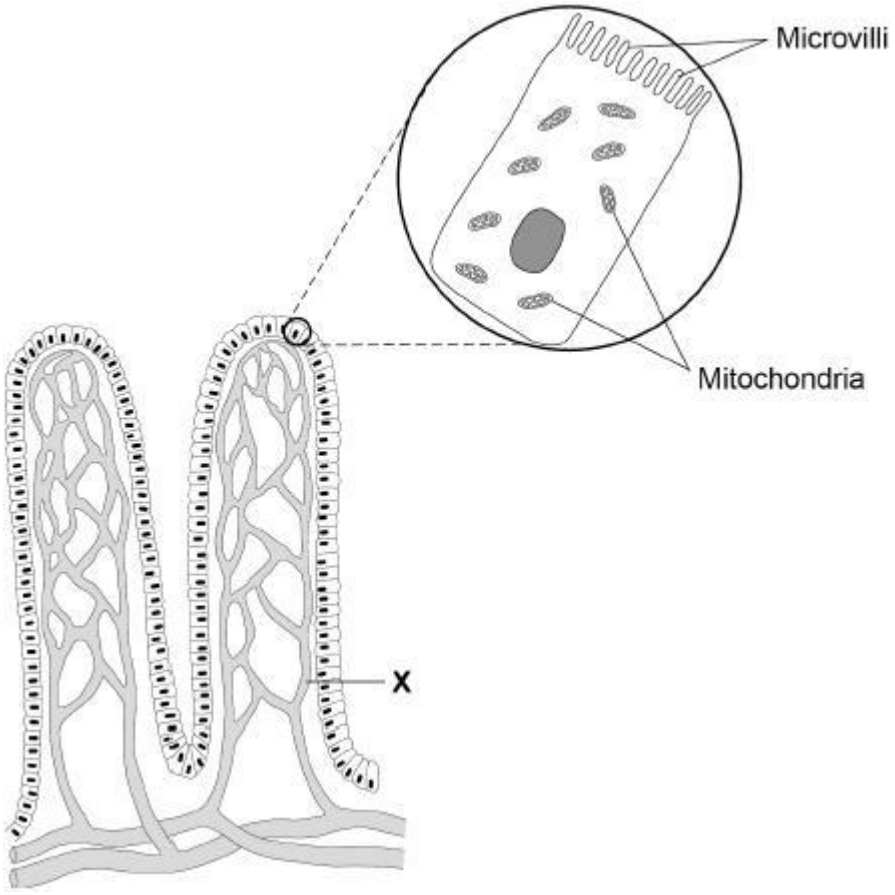
Stomach ☐

(1)

Figure 1 shows two villi.

Figure 1 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 1



(c) Give **one** advantage of using an electron microscope compared with using a light microscope.

_____

_____

(1)

(d) What type of blood vessel is labelled **X**?

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

(1)

(e) The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of ×20

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

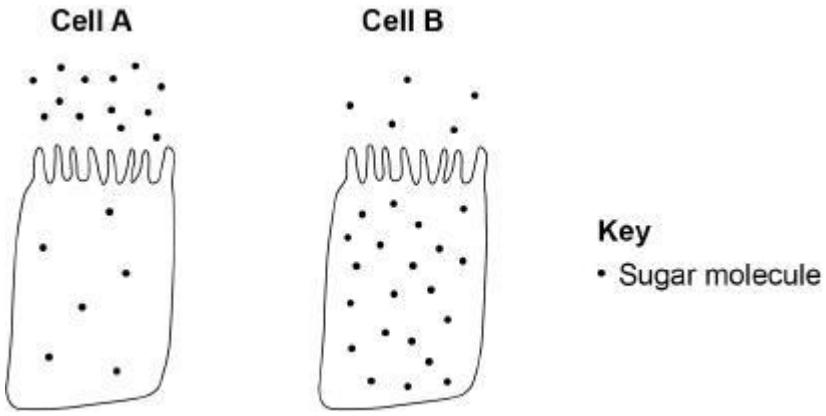
Image length = _____ mm

(3)

Figure 2 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 2



(f) Name the process by which sugar moves into cell **A**.

(1)

(g) Name the process by which sugar moves into cell **B**.

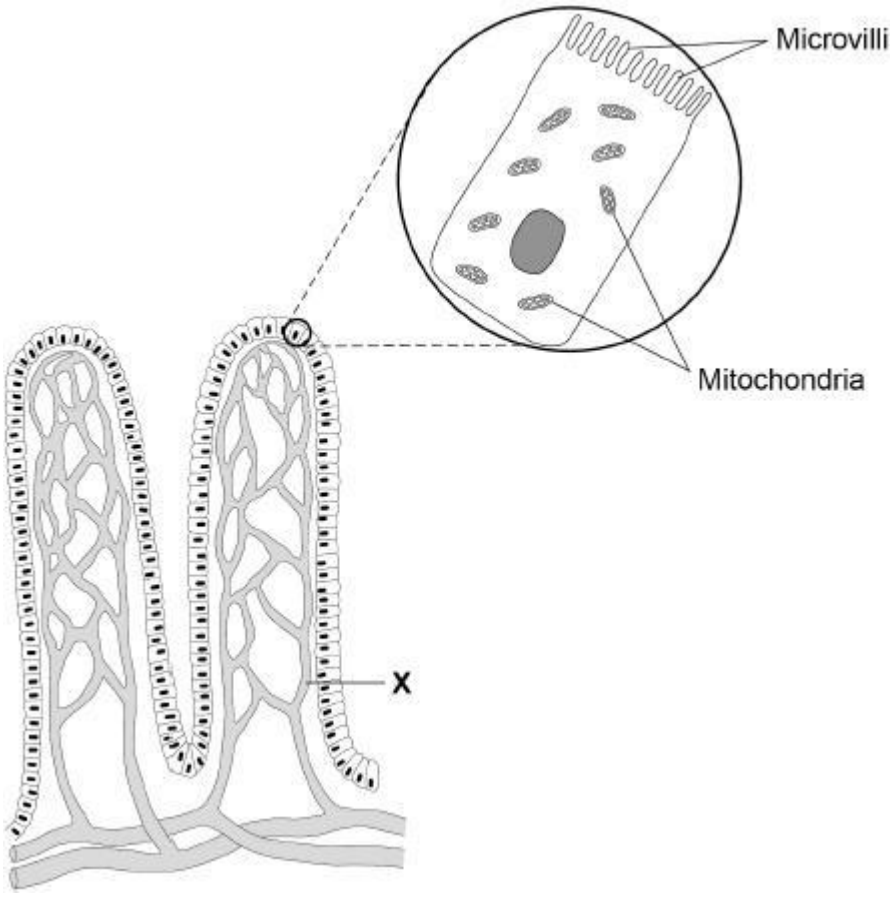
(1)

(h) Give **one** use of sugar in the body.

(1)

(i) **Figure 1** is repeated below.

Figure 1



Explain how villi are adapted for efficient absorption of sugar molecules.

(4)

(Total 14 marks)

Q1.

(a) (absorbed from soil) by osmosis through root hair (cells)

allow (absorbed from soil) by diffusion through root hair (cells)

1

travels through xylem (vessels) to the leaves

ignore travels upwards in the xylem unqualified

1

lost through <u>stomata</u> (to atmosphere)

1

idea of driven by evaporation / transpiration

ignore evaporation / transpiration unqualified

1

(b) translocation

1

(c) have pores in the end walls

allow sap for dissolved sugars

1

(so) dissolved sugars / food / contents can move from cell to cell

or

no nucleus **or** few / no sub-cellular structures (1)

allow few / no organelles

ignore cells are empty

to maximise space for movement of dissolved sugars / food / contents (1)

allow thick / rigid cell wall (1) to withstand pressure inside cell

1

(d) any **one** from: (the process):

- requires energy
- is an active process
- uses active transport

1

(reason) cells have many mitochondria

allow flow of dissolved sugars / food in sieve tube cell is not impeded (1)

(reason) companion cell is flattened (1)

1

(e) sugars are made in the leaves by photosynthesis

allow glucose for sugar

allow sugars are not made in the root / meristems

(by photosynthesis)

1

all cells / tissues need sugar for respiration

allow every cell / tissue needs sugar for respiration

allow whole plant needs sugar as an energy source

1

(sugars) transported to meristems for growth / cell division / mitosis

or

(sugars) transported for storage as starch / fat / oil

1

[12]

Q2.

(a) D

1

(b) C

1

(c) right atrium → right ventricle → pulmonary artery

1

(d) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked. 1–2 AO1

1–2

No relevant content

0

Indicative content

Advantages of statins

- easy to take **or** not invasive (procedure)
- decrease blood cholesterol
- slow down build-up of fatty materials in arteries
- maintain blood flow to heart muscle cells
- low cost (compared to stent operation)

Disadvantages of statins

- might be side effects of drug eg muscle pain
- effects take time to happen
- drug will need to be taken long term
- might forget to take drug

Advantages of stent

- blocked artery is held open
- blood flow to heart muscle cells is increased
- stent will remain in place for a long time
- effect of stent is immediate
- rapid recovery from operation

Disadvantages of stent

- risk of infection from operation
- risk of surgery eg heart attack **or** bleeding
- risk of thrombosis **or** blood clot

For Level 3, arguments for and against **both** treatments are needed.

(e) heart (muscle) cannot contract / pump as effectively / powerfully

allow heart (muscle) is not as strong

1

(so) less blood pumped out of heart **or** to body (on each beat / contraction)

ignore reference to rate of blood flow

1

(so) less oxygen (reaches cells / body) for (aerobic) respiration

allow (so) more anaerobic respiration

1

(so) breathing rate increases to supply more oxygen
or
(so) breathing rate increases to repay oxygen debt

allow (so) breathing rate increases to break down lactic acid

1

(f) stem cells are undifferentiated cells

allow stem cells can differentiate

allow stem cells can develop into different types of cell

ignore stem cells can become specialised

ignore stem cells are not specialised

1

(therefore) can form heart (muscle) cells

allow (therefore) can form muscle cells

1

(g) any **two** from:

- cells will not be rejected

  allow converse if clearly referring to embryonic stem cells

- no risk of damage to embryo

  allow no (potential) human life destroyed / damaged

- adult can give consent
  ignore unethical unqualified
  ignore religion unqualified

2

[17]

Q3.

(a) eat less fatty food

1

(b) any **two** from:

- strengthens muscles
  ignore references to losing weight / mass
  ignore references to immediate effects of exercise on body eg increases heart rate
  ignore makes you healthier
  allow makes you stronger
  allow improves stamina
- strengthens heart (muscle)
  allow keeps your heart healthy
- reduces risk of (coronary) heart disease / CHD / cardiovascular disease
  allow reduces (blood) cholesterol
  allow improves circulation
- reduces blood pressure
- reduces risk of (Type 2) diabetes
- improves mental health / mood
- improves mobility
  allow strengthens bones
  allow boosts immunity
  allow reduces risk of (some) cancers
  allow makes you fitter
  ignore improves a person's appearance

2

(c) glucose + oxygen → carbon dioxide + water

1

(d) C

1

(e) any **two** from:

- lowest / lower resting breathing rate
  statements must be comparative
- lowest / lower breathing rate after exercise
- lowest / lower increase in breathing rate

- least amount of time for breathing rate to return to resting rate

  allow less time for breathing rate to return to resting rate

  allow shortest recovery time

2

(f) any **two** from:

- only based on one measurement
- person B may have done less intense exercise

  allow person B may have done a different type of exercise

- other factors (besides breathing rate) indicate fitness

  eg stamina / strength / speed

  allow age / sex / body mass may not have been controlled

  ignore references to medical conditions

2

(g) deeper breathing

allow heavier breathing
ignore breathing rate increases

1

increased heart rate

allow blood flows faster
ignore more blood flows around body
allow increased (body) temperature
allow (increased) sweating
allow increased blood flow to skin
*do **not** accept lactic acid is produced 1*

1

(h) oxygen

word takes precedence
allow O_2
ignore O / O^2

1

lactic acid

1

[13]

Q4.

(a) transpiration

1

(b) guard cells

1

(c) 0.04 (g)

1

(d)

$\frac{0.15}{24}$

allow $\frac{1}{160}$

1

= 0.0062(5) (g)
or
= 6.2(5) × 10^{-3} (g)

allow 0.006 / 0.0063 / 6 10^{-3} / 6.3 × 10^{-3} (g)

1

(e) any **one** from:

- leaf B lost more mass / water than leaf C
  or
  leaf C lost less mass / water than leaf B

  *allow B lost 013 g of mass / water **and** C lost 0.05 g of mass / water*

  *allow lower surface lost 0.13 g of mass / water **and** upper surface lost 0.05 g of mass / water 1 AO3*

- when lower surface covered less mass / water was lost (than when upper surface covered)

- when upper surface covered more mass / water was lost (than when lower surface covered)

1

(f) there are more stomata on the lower surface

1

(g) more (mass / water) lost

'it' refers to the mass of water lost

1

(because) evaporation / transpiration would be faster

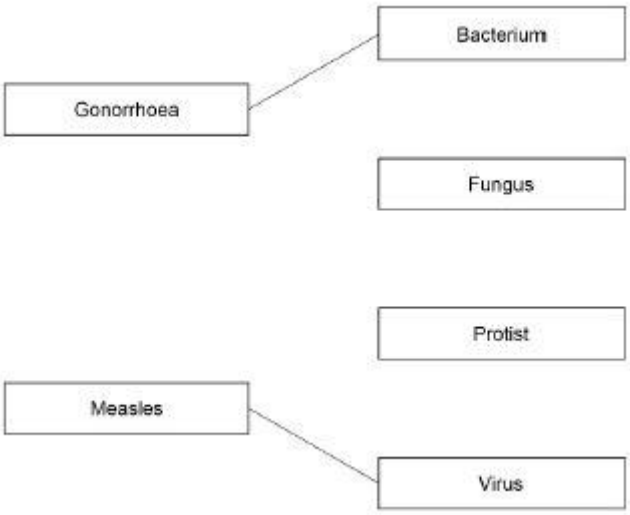
1

[9]

Q5.

(a) extra line(s) from a disease negates that mark

1



1

(b) any **two** from:

- skin (acts as a barrier)
  ignore references to the immune response
- *mucus in trachea / bronchi
  allow mucus in airways
- *mucus in nose
  - **allow mucus unqualified if **neither** idea given*
- cilia (in trachea / bronchi / respiratory tract)
  ignore references to hairs
- (hydrochloric) acid in stomach
  allow scab forms (if you cut yourself)
  allow tears

2

(c) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

4–6

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–3

No relevant content

0

Indicative content

- white blood cells
- detect / identify foreign antigens / cells / pathogens / bacteria
- destroy / kill invading cells

- phagocytes
- engulf invading cells
- digest / kill invading cells

- produce antibodies
- (antibodies) attach to invading cells
- (antibodies) destroy / kill invading cells
- (antibodies) make invading cells clump together
- (so) phagocytes can engulf more cells / pathogens / bacteria

- produce antitoxins
- to destroy toxins
- (so) less tissue damage
- (therefore) don't feel as ill

- produce memory cells
- (so) immune response (to later exposure) is faster

A description of the ways that white blood cells act is needed for Level 2.

(d) any **one** from:
- HIV is a virus

  *allow HIV is **not** a bacterium*
- antibiotics do **not** kill viruses
- antibiotics (are used to) kill bacteria

1

(e) any **two** from:
- avoid sexual intercourse

  ignore handwashing
  ignore social distancing

- use a condom

  allow practise safe sex
  ignore use protection unqualified
  ignore use contraception unqualified

- do not share needles

- use antiretroviral drugs

  ignore use medication unqualified

- screen blood used for transfusions

  allow have regular checks / tests to see if you have HIV

  *if no other marks awarded allow **1** mark for do not exchange body fluids*

2

(f) HIV damages the immune system

1

[14]

Q6.

(a) amylase

allow phonetic spelling
allow carbohydrase
*do **not** accept amylose*

1

(b) small intestine

1

(c) any **one** from:
- greater magnification
- higher resolving power

allow can see (smaller) sub-cellular structures / parts

allow can see more detail (inside cells)

allow reference to 3-D images

1

(d) capillary

1

(e)

$$20 = \frac{\text{image length}}{0.8}$$

1

image length = 0.8 x 20

1

image length = 16 (mm)

1

(f) diffusion

1

(g) active transport

allow active uptake

1

(h) any **one** from:
- respiration

allow as an energy source

*do **not** accept to make / use / create / produce energy*

- to form glycogen
- to make amino acids / proteins

allow to make lipid / fat

1

(i) **Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- have (many) microvilli
- (to) increase surface area

- wall of villus only one cell thick **or** is thin
- capillaries are close to surface
- (so) short pathway

- good blood supply
- (to) transport food molecules away **or** to the body
- (and) maintain a diffusion gradient

- cells have many mitochondria
- (where) respiration takes place
- (where) energy is transferred
- (as) active transport requires energy
- energy is needed to absorb sugar / food / molecules

For Level 2 must make links between structure and it's function

[14]