



Exampro GCSE Biology

B3.2 Transport
Higher tier

Name:

Class:

Author:

Date:

Time: 65

Marks: 65

Comments:

Q1. Blood is part of the circulatory system.

(a) (i) Give **one** function of white blood cells.

.....
.....

(1)

(ii) Which of the following is a feature of platelets?

Tick (✓) **one** box.

They have a nucleus.

They contain haemoglobin.

They are small fragments of cells.

(1)

(b) Urea is transported by the blood plasma from where it is made to where the urea is excreted.

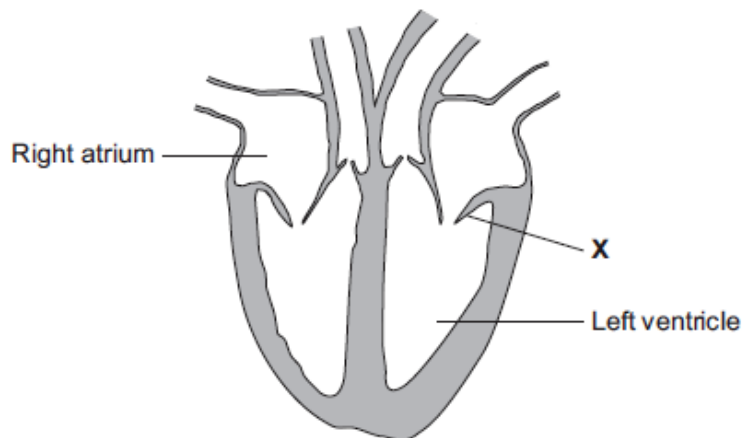
Complete the following sentence.

Blood plasma carries urea from where it is made in the

to the where the urea is removed from the blood.

(2)

(c) The illustration shows a section through the human heart.



Structure **X** is a valve. If valve **X** stops working, it may need to be replaced.

A scientist is designing a new heart valve. The scientist knows that the valve must be the correct size to fit in the heart.

Suggest **two** other factors the scientist needs to consider so that the newly designed valve works effectively in the heart.

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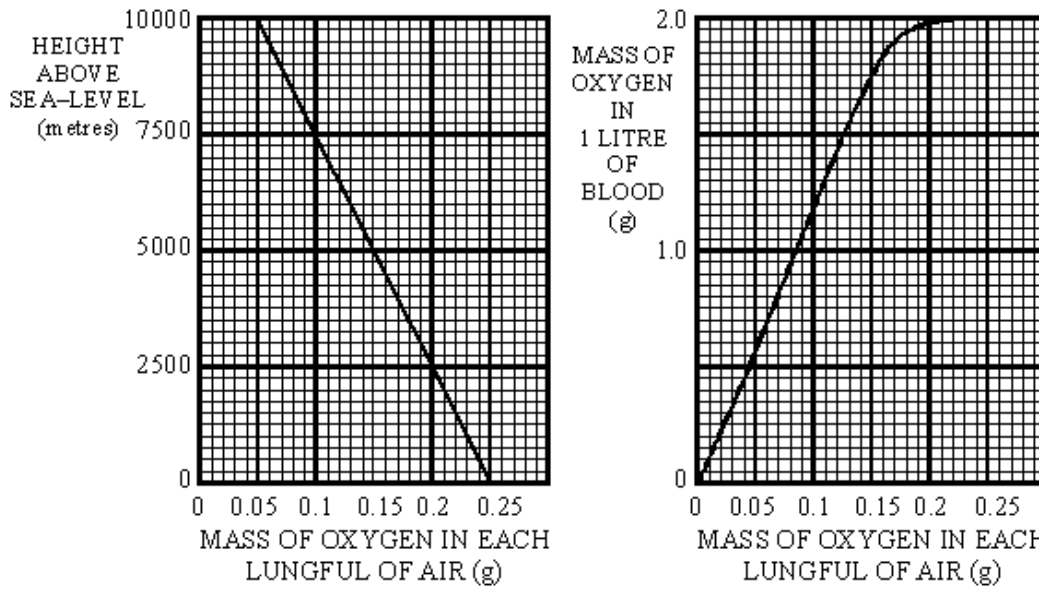
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(2)
(Total 6 marks)

Q2. Two balloonists decide to go up to 5000 metres. At this level the air is less dense, so the mass of oxygen in each lungful of air they breathe is less than at sea-level.



Describe, in as much detail as you can, how the mass of oxygen in the balloonists' blood changes as they go up from sea-level to 5000 metres.

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.....

(Total 4 marks)

##

As they go higher up a mountain, mountaineers take less oxygen into their bodies with each breath, as shown in the table below.

HEIGHT	MILLIGRAMS OF OXYGEN TAKEN INTO LUNGS WITH EACH NORMAL BREATH	MILLIGRAMS OF OXYGEN INTO BLOOD WITH EACH NORMAL BREATH	
		AT FIRST	AFTER STAYING AT 4500 METRES FOR TWO WEEKS
sea-level	300	60	90
1500 metres	250	50	
3000 metres	200	40	
4500 metres	150	30	45

(a) (i) How does the amount of oxygen taken into the blood with each breath vary with the amount of oxygen breathed into the lungs with each breath?

.....

(2)

(ii) Use the idea of diffusion to explain why the amount of oxygen taken into the blood varies in this way.

.....
.....

(1)

(b) (i) How does staying at an altitude of 4500 metres for two weeks affect the mountaineers?

.....

(2)

(ii) Suggest an explanation for this.

.....
.....

(1)

(iii) Add the two missing figures to the right-hand column of the table.

(2)

(Total 8 marks)

Q4. (a) (i) Name the red pigment found in red blood cells.

.....

(1)

(ii) Describe, in detail, the function of this red pigment.

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

(2)

(b) Describe **one** other way in which the structure of a red blood cell is different from the structure of a white blood cell.

.....
.....

(1)

(Total 4 marks)

Q5. The photograph shows a red blood cell in part of a blood clot. The fibres labelled **X** are produced in the early stages of the clotting process.



(a) Suggest how the fibres labelled **X** help in blood clot formation.

.....

(1)

- (b) The average diameter of a real red blood cell is 0.008 millimetres.
On the photograph, the diameter of the red blood cell is 100 millimetres.

Use the formula to calculate the magnification of the photograph.

$$\text{Diameter on photograph} = \text{Real diameter} \times \text{Magnification}$$

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

$$\text{Magnification} = \dots\dots\dots$$

(2)

- (c) Some blood capillaries have an internal diameter of approximately 0.01 millimetres.

- (i) Use information given in part (b) to explain why only one red blood cell at a time can pass through a capillary.

.....

(1)

- (ii) Explain the advantages of red blood cells passing through a capillary one at a time.

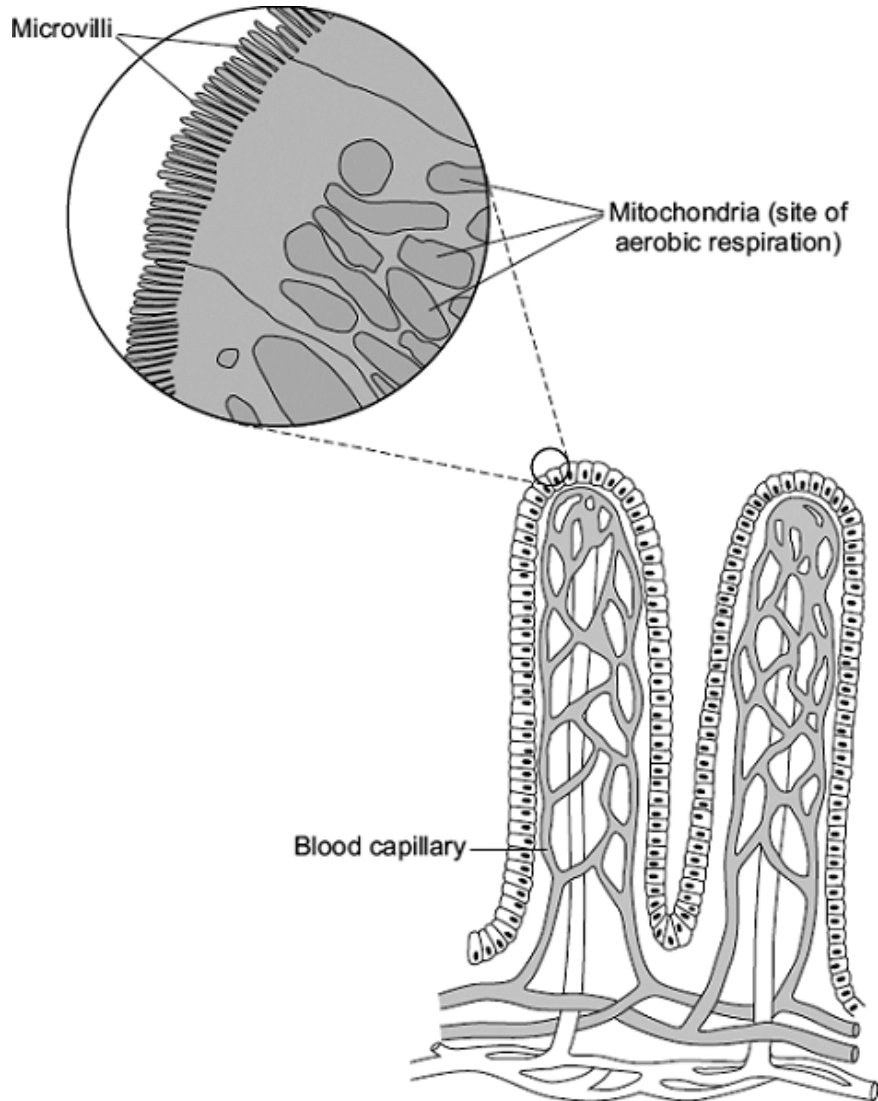
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(3)

(Total 7 marks)

Q6. The villi of the small intestine absorb the products of digestion.

The diagram shows two villi. It also shows parts of some of the surface cells of a villus, as seen with an electron microscope.



Describe and explain how the villi are adapted to maximise the rate of absorption of the products of digestion.

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(5)
(Total 5 marks)

Q7. Oxygen is transported round the body by the blood.

Blood leaving the human lung can carry about 250 milligrams of oxygen per litre. However, only 7 milligrams of oxygen will dissolve in one litre of water at body temperature.

(a) Suggest an explanation for the difference.

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

(2)

(b) Blood leaving the skeletal muscles during exercise may contain only 30 milligrams of oxygen per litre.

Explain what causes the difference in oxygen concentration between the blood leaving the lungs and the blood leaving the skeletal muscles.

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(4)
(Total 6 marks)

Q8. Plants exchange substances with the environment.

- (a) Plant roots absorb water mainly by osmosis.
Plant roots absorb ions mainly by active transport.

Explain why roots need to use the two different methods to absorb water and ions.

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(4)

- (b) What is meant by the *transpiration stream*?

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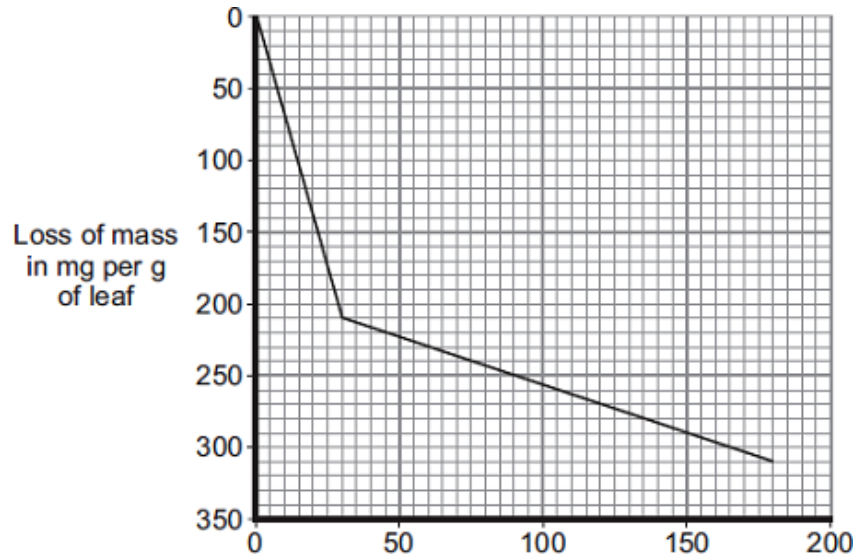
(3)

(c) Students investigated the loss of water vapour from leaves.

The students:

- cut some leaves off a plant
- measured the mass of these leaves every 30 minutes for 180 minutes.

The graph shows the students' results.



(i) The rate of mass loss in the first 30 minutes was 7 milligrams per gram of leaf per minute.

Calculate the rate of mass loss between 30 minutes and 180 minutes.

.....
.....

Rate of mass loss = milligrams per gram of leaf per minute

(2)

(ii) The rate of mass loss between 0 and 30 minutes was very different from the rate of mass loss between 30 and 180 minutes.

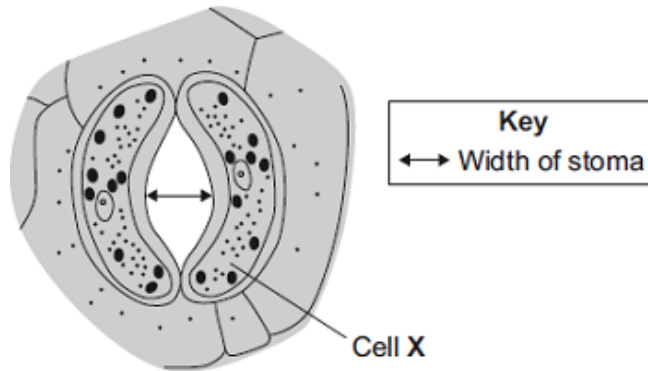
Suggest an explanation for the difference between the two rates.

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

(2)

(Total 11 marks)

- Q9.** Plant leaves have many stomata.
The diagram shows a stoma.



(a) Name cell **X**

(1)

- (b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.
Species **A** grows in hot, dry deserts.
Species **B** grows in the UK.

	Time of day in hours	Mean width of stomata as a percentage of their maximum width	
		Species A	Species B
Dark	0	95	5
	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

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(4)
(Total 5 marks)

Q10. The leaves of most plants have stomata.

(a) (i) Name the cells which control the size of the stomata.

.....

(1)

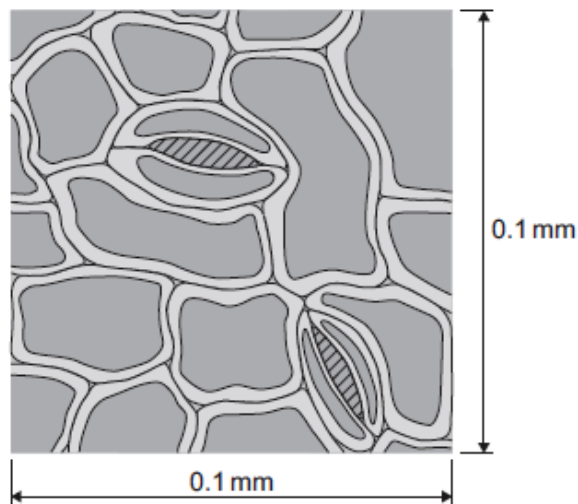
(ii) Give **one** function of stomata.

.....

.....

(1)

(b) The image below shows part of the surface of a leaf.



The length and width of this piece of leaf surface are both 0.1 mm.

(i) Calculate the number of stomata per mm² of this leaf surface.

.....
.....
..... per mm²

(2)

(ii) A different plant species has 400 stomata per mm² of leaf surface.

Having a large number of stomata per mm² of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

.....
.....

(1)

(c) A student investigated the loss of water from plant leaves.

The student did the following:

- Step 1: took ten leaves from a plant
- Step 2: weighed all ten leaves
- Step 3: hung the leaves up in a classroom for 4 days
- Step 4: weighed all ten leaves again
- Step 5: calculated the mass of water lost by the leaves
- Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves
- Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

The table below shows the student's results.

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

(i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

.....
.....

Mass = g

(1)

(ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

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

(3)

(Total 9 marks)

- M1.** (a) (i) defence against **or** destroy pathogens / bacteria / viruses / microorganisms
do not allow 'destroy disease'
accept engulf pathogen / bacteria / viruses / microorganism
accept phagocytosis
accept produce antibodies / antitoxins
allow immune response 1
- (ii) they are small fragments of cells 1
- (b) liver
in this order only 1
- kidney(s) 1
- (c) any **two** from:
- that it doesn't cause an immune response **or** isn't rejected / damaged by white blood cells
 - whether it is a long lasting material / doesn't decompose / corrode / inert
 - if it is strong (to withstand pressure)
 - it will open at the right pressure
 - that it doesn't cause clotting
 - that it doesn't leak **or** it prevents backflow
 - non toxic
- ignore correct size* 2
- [6]

##

ideas that

- mass of oxygen in blood unaffected/stays at 2.0g per litre at low altitudes
- mass of oxygen in blood falls at higher altitudes
- starts to fall above 2500 metres
- 75 g per litre (at 5000 metres)
Don't credit simply "gets lower as you get high", but don't penalise for 1 mark each

[4]

- M3.** (a) (i) increasing one increases the other
gains 1 mark
- but
they increase in proportion/ 1/5 taken in at first / 3/10 taken in after 2 weeks
gains 2 marks 2
- (ii) *idea that* more/faster diffusion with higher concentration
for 1 mark
- or**
with more oxygen particles/molecules (in same space) 1
- (b) (i) can take more oxygen from (the same) air/changes from 30 to 45/increases by 15
gains 1 mark
- but
takes 50% more or 1.5 times as much
gains 2 marks
- or**
increases by 15 mg breath 2
- (ii) more red blood cells develop
or
more haemoglobin in the blood
(*not just 'acclimatises'*)
for 1 mark 1
- (iii) 75
60
each for 1 mark 2

[8]

- M4.** (a) (i) haemoglobin / oxyhaemoglobin
must be phonetic 1
- (ii) carries oxygen **or** forms oxyhaemoglobin
Ignore references to CO₂ / iron
cancel if extras like food / glucose 1
- from lungs to tissues 1

- (b) no nucleus **or** biconcave disc (described)
ignore references to size
ignore vague references to being
'round' / 'donut' shaped etc.

1

[4]

- M5. (a) hold cells together **or** prevent flow of cells **or** trap cells

1

- (b) 12500

if correct answer, ignore working / lack of working

$$\frac{100}{0.008} \text{ for 1 mark}$$

ignore any units

2

- (c) (i) size RBC approximately same size capillary **or**
no room for more than one cell **or**
only one can fit **or**
RBC is too big
allow use of numbers
*do **not** accept capillaries are narrow*

1

- (ii) more oxygen released (to tissues) **or**
more oxygen taken up (from lungs)

1

and any **two** from:

- slows flow **or** more time available
- shorter distance (for exchange) **or** close to cells / capillary wall
- more surface area exposed

2

[7]

M6. D – *many* microvilli (1)
 Ex – provide large surface area (1)
five points made
max 3 descriptions
max 3 explanations

D – *many* capillaries / *good* blood supply (1)
 Ex – maintain concentration / diffusion gradient **or** quickly removes food (1)

D – thin wall / one cell thick surface / capillaries near surface (1)
allow villi are thin
ignore villi are one cell thick

Ex – short distance for food to travel (1)

D – *many mitochondria* (1)
 Ex – provide energy / ATP for active uptake / transport (1)

5

[5]

M7. (a) blood has red (blood) cells / haemoglobin

1

haemoglobin combines with / carries oxygen
ignore 'mix'
NB Blood can form oxyhaemoglobin = 2 marks

1

(b) blood gains oxygen / becomes oxygenated (in the lungs)
idea of acquiring oxygen must be unambiguous

1

blood loses oxygen to the muscles / cells

1

because muscles are respiring (aerobically)

1

to provide energy (for exercise)

1

[6]

M8. (a) solution in soil is more dilute (than in root cells)
concentration of water higher in the soil (than in root cells)

1

so water moves from the dilute to the more concentrated region
*so water moves down (its) concentration gradient **or** water moves from a high concentration of water to a lower concentration*

1

concentration of ions in soil less (than that in root cells)

1

so energy needed to move ions

or

ions are moved against concentration gradient

the direction of the concentration gradient must be expressed clearly

accept correct reference to water potential or to concentrations of water

1

(b) any **three** from:

- movement of water from roots / root hairs (up stem)
- via xylem
- to the leaves
- (water) evaporates
- via stomata

3

(c) (i) 0.67/0.7

accept 0.66, 0.666666... or $\frac{2}{3}$ or 0.6

correct answer gains 2 marks with or without working

if answer incorrect allow evidence of $\frac{100}{150}$ for 1 mark

*do **not** accept 0.6 or 0.70*

2

(ii) during the first 30 minutes

any **one** from:

- it was warmer
- it was windier
- it was less humid
- there was more water (vapour) in the leaves

1

so there was more evaporation

ignore 'water loss'

or

stomata open during first 30 minutes **or** closed after 30 minutes (1)

so faster (rate of) evaporation in first 30 min **or** reducing (rate of) evaporation after 30 min (1)

1

[11]

M9. (a) guard cell

ignore stoma / stomata

1

(b) Species A:

allow converse points for species B

stomata open in dark / at night **or** close in light / in day

1

stomata closed during warm(est) period **or** open when cool(er)

1

heat (energy) / warmth increases evaporation / transpiration

must give explicit link between heat and transpiration

1

reduces water loss / evaporation / transpiration

ignore photosynthesis

1

[5]

M10. (a) (i) guard (cells)

allow phonetic spelling

1

(ii) any **one** from:

ignore reference to cells

- allow carbon dioxide to enter
*allow control loss / evaporation of water **or** control transpiration rate*
- allow oxygen to leave.
allow 'gaseous exchange'

1

(b) (i) 200

correct answer gains 2 marks with or without working

allow 1 mark for $0.1 \times 0.1 = 0.01$ (mm^2)

2

- (ii) more / a lot of / increased water loss
allow plant more likely to wilt (in hot / dry conditions) 1
- (c) (i) 0.12 1
- (ii) the lower surface has most stomata 1
- stomata are now covered / blocked (by grease) 1
- so water cannot escape / evaporate from the stomata
ignore waterproof
to gain credit stomata must be mentioned at least once 1
- [9]

