

Name:

Date:

B2 - Test 6
ORGANISATION
Advanced

GCSE

BIOLOGY

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1.

The circulatory system is composed of the blood, blood vessels and the heart.

(a) Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

1. _____

2. _____

(2)

(b) Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm^3 of blood.

Explain why having more red blood cells per cm^3 of blood is an advantage to an athlete.

(3)

(c) Which **two** blood vessels carry deoxygenated blood?

Tick **two** boxes.

Aorta

Coronary artery

Pulmonary artery

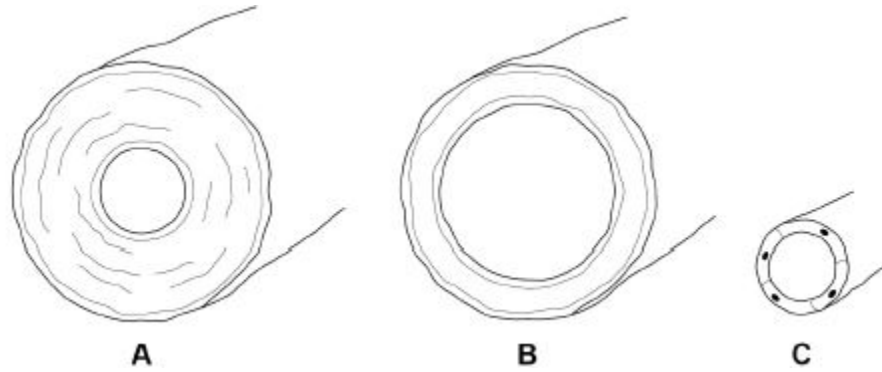
Pulmonary vein

Vena cava

(2)

Figure 1 shows the three types of blood vessel.

Figure 1



(d) Which type of blood vessel carries blood into the right atrium?

Tick **one** box.

A	<input type="checkbox"/>	B	<input type="checkbox"/>	C	<input type="checkbox"/>
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(1)

(e) Compare the structure of an artery with the structure of a vein.

(3)

- (f) Heart rate is controlled by a group of cells. This group of cells act as a pacemaker.

Figure 2 shows a section through the heart.

Draw an **X** on **Figure 2** to show the position of the pacemaker.

Figure 2



(1)

- (g) A patient may be fitted with an artificial pacemaker.

What condition may be treated using an artificial pacemaker?

(1)

(Total 13 marks)

2.

Table 1 shows information about some food components in cow's milk.

Table 1

	Value per 500 cm ³	Recommended Daily Allowance (RDA) for a typical adult
Energy in kJ	1046	8700
Fat in g	8.4	70.0
Salt in g	0.5	6.0
Calcium in mg	605	1000
Vitamin B-12 in µg	4.5	2.4

(a) How much **more** milk would a typical adult have to drink to get their RDA for calcium compared with the amount of milk needed to get their RDA for vitamin B-12?

Volume of milk = _____ cm³

(3)

A scientist investigated the effect of bile on the breakdown of fat in a sample of milk.

The scientist used an indicator that is colourless in solutions with a pH lower than 10, and pink in solutions with a pH above 10.

This is the method used.

1. Add 1 drop of bile to a test tube and one drop of water to a second test tube.
2. Add the following to each test tube:
 - 5 cm³ of milk
 - 7 cm³ of sodium carbonate solution (to make the solution above pH 10)
 - 5 drops of the indicator
 - 1 cm³ of lipase.
3. Time how long it takes for the indicator in the solutions to become colourless.

The results are shown in **Table 2**.

Table 2

	Time taken for the indicator to become colourless in seconds
Solution with bile	65
Solution without bile	143

(c) Explain why the indicator in both tubes became colourless.

(3)

(d) Give the reason why the measurement of the time taken for the indicator to become colourless might be inaccurate.

(1)

(e) Explain the difference in the results for the two test tubes in **Table 2**.

(3)
(Total 16 marks)

3. A student carried out an investigation using leaf epidermis.

This is the method used.

1. Peel the lower epidermis from the underside of a leaf.
2. Cut the epidermis into six equal sized pieces.
3. Place each piece of lower epidermis into a different Petri dish.
4. Add 5 cm³ of salt solution to the six Petri dishes. Each Petri dish should have a different concentration of salt solution.
5. After 1 hour, view each piece of epidermis under a microscope at ×400 magnification.
6. Count and record the total number of stomata present and the number of open stomata that can be seen in one field of view.

The student's results are shown in the table.

Concentration of salt solution in mol / dm ³	Number of stomata in field of view	Number of open stomata in field of view	Percentage (%) of open stomata in field of view
0.0	7	7	100
0.1	8	8	100
0.2	7	6	X
0.3	9	6	67
0.4	10	4	40
0.5	9	2	22

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

X = _____ %

(1)

(b) Give **one** conclusion from the results in the table above.

(1)

(c) How could the student find out what concentration of salt solution would result in half of the stomata being open?

(1)

(d) The student measured the real diameter of the field of view to be 0.375 mm.

Calculate the number of open stomata per mm^2 of leaf for the epidermis placed in 0.4 mol / dm^3 salt solution.

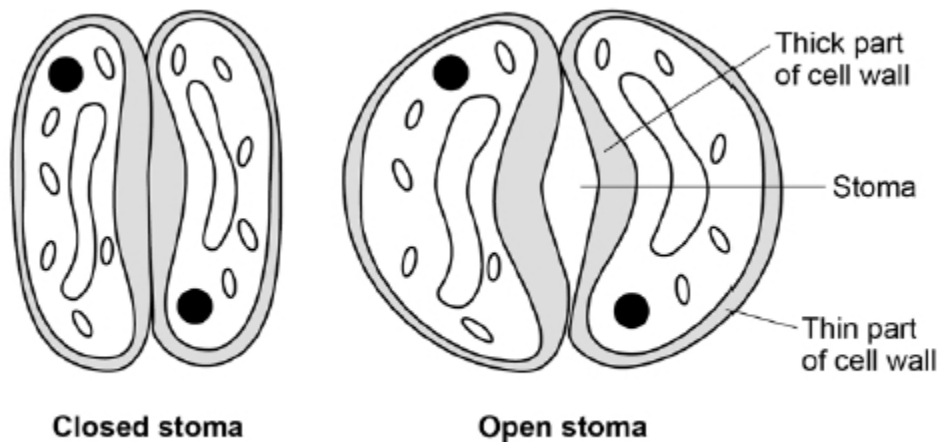
Use information from the table above.

Take π to be 3.14

Number of open stomata = _____ per mm^2

(3)

- (e) The diagram below shows two guard cells surrounding a closed stoma and two guard cells surrounding an open stoma.



When light intensity is high potassium ions are moved into the guard cells.

Describe how the movement of potassium ions into the guard cells causes the stoma to open.

(4)

(Total 10 marks)

4.

The leaves of most plants have stomata.

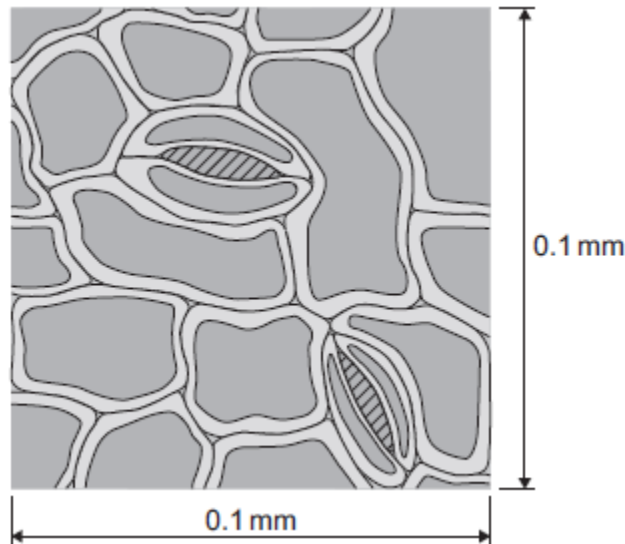
- (a) (i) Name the cells which control the size of the stomata.

(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 mm^2 of this leaf surface.

_____ per mm^2

(2)

(ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 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)

5.

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** .

(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.

(2)

(Total 7 marks)

6.

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.

(4)

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

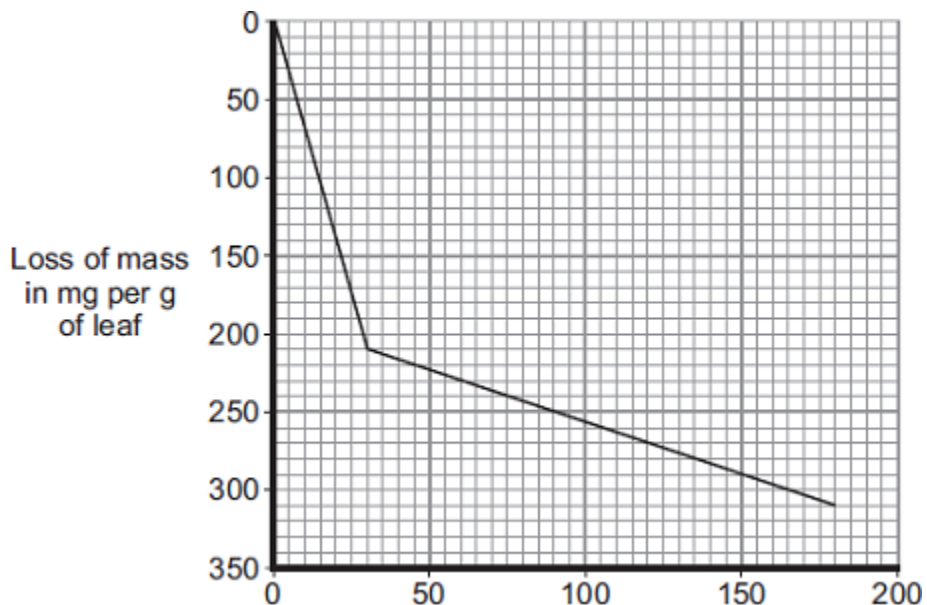
(3)

(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)