Q1. The photograph shows one type of artificial heart.

The diagram shows how this artificial heart is fitted inside the body.

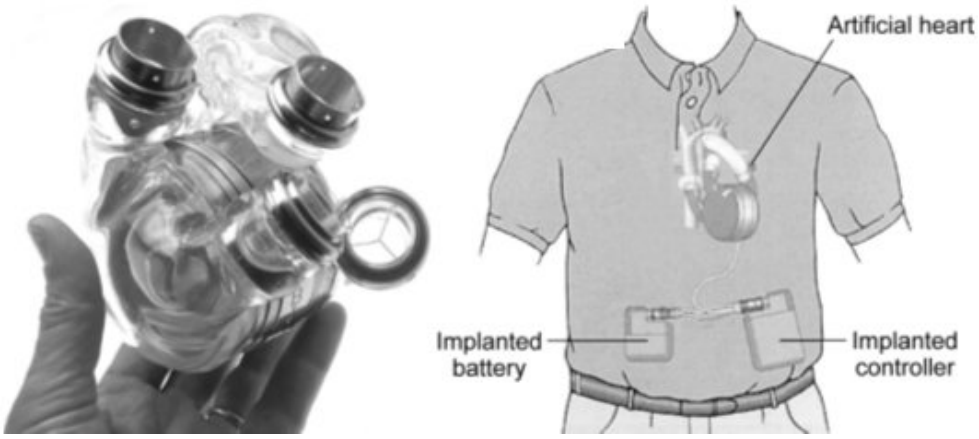

Photo: www.heartreplacement.com
Diagram: www.abiomed.com/patients_families/what_is_abiocor.cfm

Read the information about this artificial heart.

> The first patient to receive the heart lived for 151 days before dying from a stroke.
>
> The second patient was given less than a 20 % change of surviving 30 days at the time of his surgery. He lived for 512 days after receiving the heart. He died because an internal membrane in the device wore out.

Suggest **advantages** and **disadvantages** of treating patients with this artificial heart.

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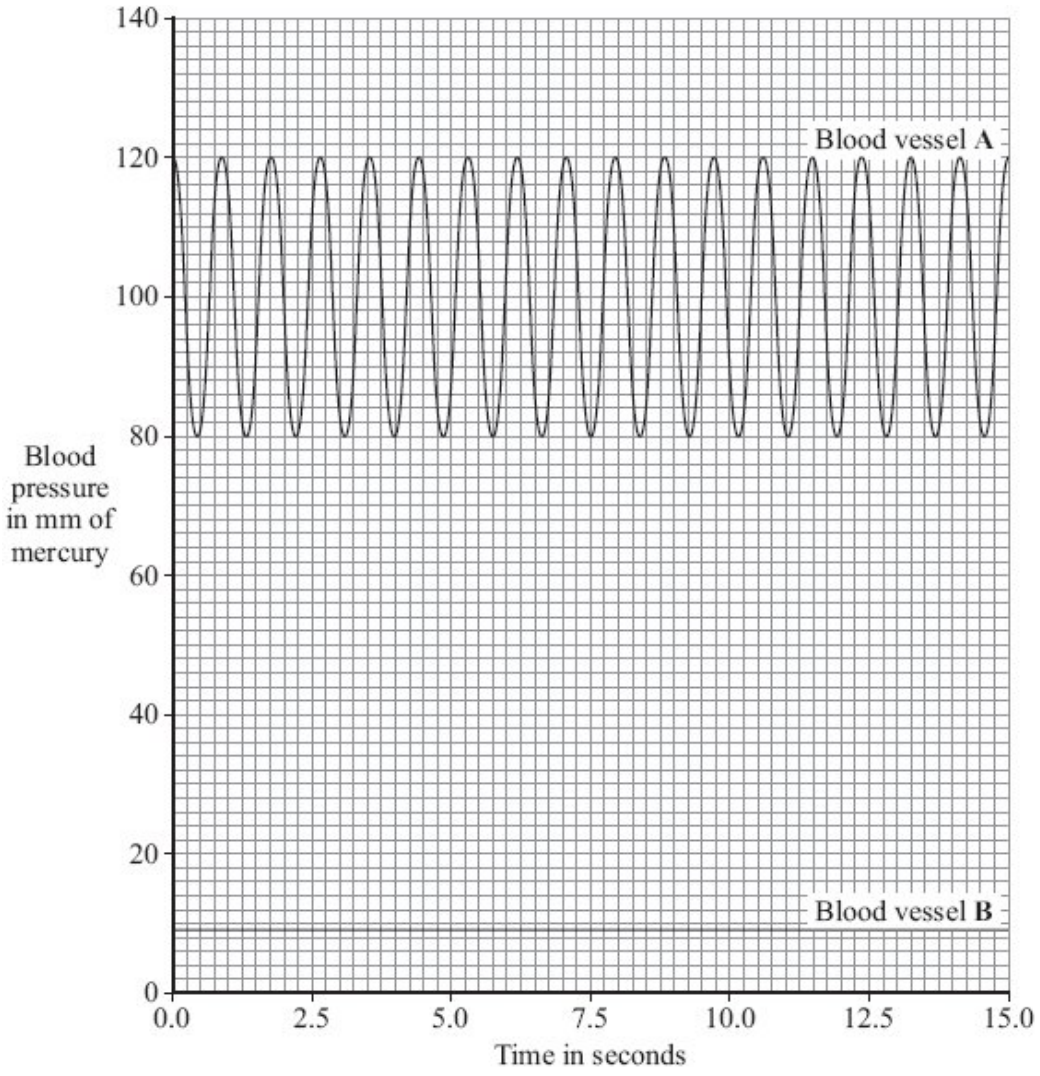
(Total 5 marks)

Q2. The heart pumps blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



(a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2)

(b) Use information from the graph to answer these questions.

(i) How many times did the heart beat in 15 seconds? .....

(1)

(ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

.....

.....

Heart rate = ... beats per minute

(1)

(c) During exercise, the heart rate increases. This supplies useful substances to the muscles and removes waste materials from the muscles at a faster rate.

(i) Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1 .....

2 .....

(2)

(ii) Name **one** waste substance that must be removed from the muscles at a faster rate during exercise.

.....

(1)

(Total 7 marks)

Q3. A group of students looked at stomata on four different species of plants, **A, B, C** and **D**.

They estimated the number of stomata per cm^2 on the upper and lower surfaces of the leaves of the four species.

Their results are shown in the table.

Plant species	**Estimated number of stomata per cm^2 of leaf surface**	
	Upper surface of leaf	**Lower surface of leaf**
A	4000	28 000
B	0	800
C	8500	15 000
D	8000	26 000

(a) Which plant species probably lives in a dry region? ☐

Explain the reason for your answer.

.....

.....

.....

.....

.....

.....

(3)

(b) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this could help the plants to survive better.

.....

.....

.....

.....

(2)

(Total 5 marks)

Q4. Complete the table to show which part of the blood carries out each function.

Choose your answers from the list.

plasma **platelet** **red blood cell** **white blood cell**

The first answer has been done for you.

Function	Part of the blood
Transports most of the carbon dioxide	*plasma*
Transports most of the oxygen	
Helps blood to clot at a wound	
Defends the body against microorganisms	
Transports the products of digestion	

(Total 4 marks)

Q5. (a) What type of blood vessels join arteries to veins?

.....

(1)

(b) How are oxygen and carbon dioxide carried in the blood?

.....

.....

.....

.....

(2)

(c) List **three** things that are carried around the body in the blood plasma.

1. .....

2. .....

3. .....

(3)

(Total 6 marks)

M1. advantages

- useful where no other treatment available / patients near to death

  or

- extends lifespan

1

disadvantages

- low success rate

1

- device has limited lifespan

  or

  battery will need changing

1

- discomfort from heart / battery / controller

1

- risk of infection

1

[5]

M2. (a) A

no mark – can be specified in reason part
if B given = no marks throughout
if unspecified plus two good reasons = 1 mark

high(er) pressure in A

allow opposite for B
do not accept 'zero pressure' for B

1

pulse / described in A

accept fluctuates / 'changes'
allow reference to beats / beating
ignore reference to artery pumping

1

(b) (i) 17

1

(ii) 68

accept correct answer from candidate's (b)(i) × 4

1

(c) (i) oxygen / oxygenated blood

allow adrenaline

ignore air

1

glucose / sugar

extra wrong answer cancels eg
sucrose / starch / glycogen / glucagons / water

allow fructose as an alternative to glucose

ignore energy

ignore food

1

(ii) carbon dioxide / CO_2 / lactic acid

allow CO2 / CO^2

ignore water

1

[7]

M3. (a) **B**

1

(**B** has) low(est) number of stomata
or no stomata on upper surface
or only 800 (on lower surface)

1

less transpiration / evaporation / water loss owtte
or water (vapour) is lost via stomata

only allow zero water loss if linked to no stomata on upper surface / linked to leaf B upper surface

ignore references to leaf surface area

1

(b) reduce loss / amount of water (vapour)

accept converse

or

reduced transpiration (from upper surface)

*do **not** allow <u>no</u> water is lost*

1

warmer above leaf

accept converse

or wilted leaf folds over lower surface

or lower leaf in shade

ignore reference to dust

or less light / heat / sun on lower side

1

[5]

M4. red (blood cell)

1

platelet

1

white (blood cell)

1

plasma

1

[4]

M5. (a) capillaries

1

(b) (oxygen) in red blood cells **or**
haemoglobin

*the candidate **must** make clear which substance is which for **2** marks*

1

(carbon dioxide dissolved in) the plasma

accept in haemoglobin in regions of <u>high carbon dioxide concentration</u>

*accept for **1** mark oxygen + CO_2 is transported by red blood cells*

***or** haemoglobin*

*do **not** credit red + white blood cells **or** combinations of right + wrong answers*

1

(c) **one** mark for each up to a maximum of **three**

red blood cells

*award **1** mark for blood cells if no red or white*

white blood cells (or named white blood cell up to **2**)

platelets

urea

accept nitrogenous waste
*do **not** credit waste substances **or** products*

minerals (**or** one named mineral)

*accept ions **or** salts*

vitamins

water

hormones (named hormone up to 3)

protein (named blood proteins up to 2)

glucose

accept other named soluble sugar
*do **not** credit sugar(s) **or** blood sugar **or** sucrose*

fatty acids **or** glycerol

amino acids

digested food **or** nutrients (if individual foods not credited)

*do **not** credit starch **or** carbohydrates*
*do **not** credit nutrition **or** food*
*do **not** credit oxygen*
*do **not** credit haemoglobin*

carbon dioxide

accept nitrogen

antibodies

antitoxins

drugs **or** toxins (named up to 2)

bacteria **or** viruses

cholesterol

3

[6]