Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Higher

Resource Set Topic 8: Exchange and transport

Questions

(Public release version)

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1 (b) Figure 2 shows information about some of the components in the blood and in the filtrate in this part of the nephron.

component	concentration in the blood	concentration in the filtrate in the nephron
glucose	1.0mg per cm^3	1.0mg per cm^3
protein	47.0g per dm^3	0.0g per dm^3
red blood cells	4.5×10^6 per cm^3	0.0 per cm^3
white blood cells	8.0×10^3 per cm^3	0.0 per cm^3

Figure 2

(i) Calculate the difference in the number of red blood cells and the number of white blood cells in 1 cm^3 blood.

Give your answer in standard form.

(2)

$4.5 \times 10^6 - 8.0 \times 10^3 = 4492000$

$= 4.492 \times 10^6$

$\simeq 4.5 \times 10^6$

4.5×10^6

(ii) Explain why there are differences in the concentrations of some components in the blood and some components in this part of the nephron.

(2)

Glucose in found in the filtrate because it is a small molecule which can pass through the membrane during ultrafiltration. Proteins, red blood cells and white blood cells are too large to pass into the nephron they are not found in the filtrate.

2 (b) Red blood cells are carried in veins and arteries.

Figure 4 shows the equipment used to measure the elasticity of an artery.

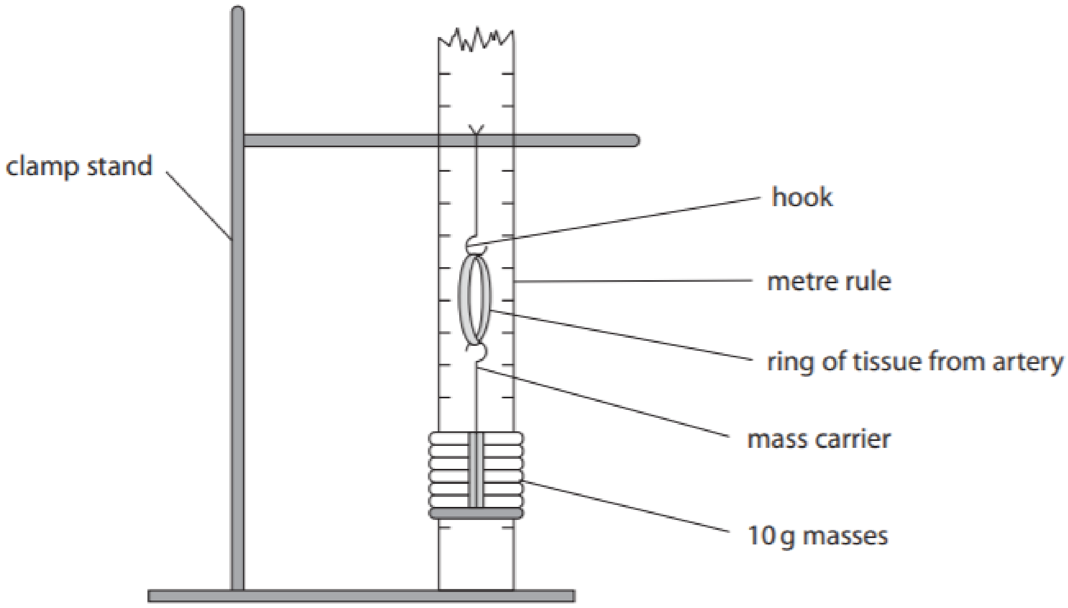


Figure 4

(i) Describe a method you could use to see how much the ring of tissue from an artery could stretch before it no longer returned to its original size.

(3)

Measure the initial length of the tissue. Add a 10g mass and remove to see if the tissue returns to its original length. Repeat this with increasing number of 10g masses, until the tissue no longer return to its original length.

(ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

wear gloves

5 Figure 10 shows the estimated blood flow through some parts of the body when a person is at rest and during exercise.

part of the body	estimated rate of blood flow in cm^3 per minute	
	at rest	during exercise
brain	750	748
heart muscle	350	1 150
digestive system	2 500	1 200
other muscles	1 200	14 500
all other organs (except lungs)	1 423	1 420

Figure 10

(a) Compare the rate of blood flow through the body when this person is at rest and during exercise.

(3)

The rate of blood flow to the heart muscle and other muscles increase during exercise, but rate of blood flow to digestive system decrease. The rate of blood flow to the brain and other organs, except the lungs, stays the same during exercise.

(b) Explain why there is a change in the rate of blood flow through the digestive system during exercise.

(2)

Blood flow to the digestive system is restricted so that more blood can be supplied to muscles to provide more O_2 and glucose for exercise.

(c) The stroke volume is the amount of blood leaving one chamber of the heart per beat.

From which chamber of the heart does this volume of oxygenated blood flow?

(1)

- ☐ **A** left atrium
- ☒ **B** left ventricle
- ☐ **C** right atrium
- ☐ **D** right ventricle

(d) A person has a cardiac output of 4.9 litres per minute. The stroke volume of each heart beat is 70 ml.

Calculate the heart rate.

(2)

$\frac{4900}{70} = 70$

70 .... beats per minute

3 (a) A student investigated respiration in three different organisms.

Red hydrogencarbonate indicator was placed in each of three test tubes.

Gauze was placed in each test tube to hold the organisms.

In test tube 1 the student placed four germinating peas.

In test tube 2 the student placed four dried peas.

In test tube 3 the student placed four mealworms.

Bungs were added to each of the test tubes.

The three test tubes were left for one hour.

The equipment used is shown in Figure 3.

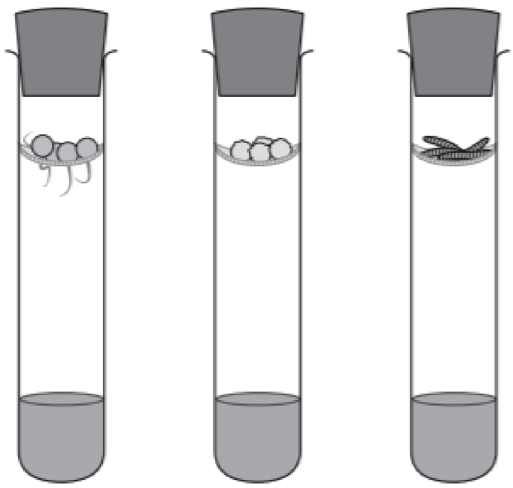


Figure 3

(i) State **two** ways this method could be improved to make the results for these three organisms more comparable.

(2)

1 use the same mass of the organisms instead of the same number

2 measure the time taken for the indicator to change colour

(ii) Describe a suitable control for this investigation.

(2)

A test tube containing the hydrogencarbonate indicator and sealed with rubber bung, but with the same mass of glass beads instead of organism.

(b) Hydrogencarbonate indicator changes from red to yellow when more carbon dioxide is present.

The results for this investigation are shown in Figure 4.

organisms	colour of hydrogencarbonate indicator
germinating peas	yellow
dried peas	red
mealworms	yellow

Figure 4

(i) Explain why the result for the germinating peas is different from the result for the dried peas.

(2)

Germinating peas respire so CO_2 is produced and the indicator changes colour, but dried peas do not respire.

(ii) How was the carbon dioxide produced in this investigation?

(1)

☐ **A** by photosynthesis

☒ **B** when glucose is broken down in the presence of oxygen

☐ **C** when glucose is broken down in the absence of oxygen

☐ **D** by the reaction between oxygen and water

(c) Explain why cellular respiration is essential for living organisms.

(2)

Energy is produced during cellular respiration in the form of ATP, and ATP is needed for many functions in living organisms such as movement

8 (a) Figure 9 shows the stroke volume at different heart rates of a person who has trained for a marathon and of a person who has not trained for a marathon.

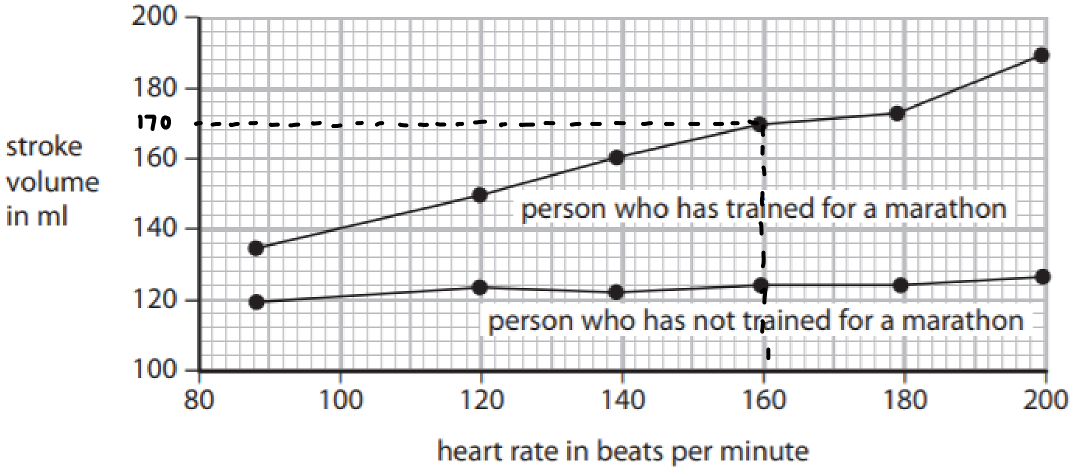


Figure 9

(i) Compare the effect of heart rate on stroke volume of the person who has trained for a marathon with the person who has not trained for a marathon.

(2)

At each heart rate, the stroke volume is higher in the person who has trained for a marathon. When heart rate increases, stroke volume increases in the person who has trained, but stays the same in the person who has not.

(ii) Calculate the cardiac output for the person who has trained for a marathon when the heart rate is 160 beats per minute.
Give the units in your answer.

(3)

160 beats per minute × 170 ml per beat

= 27200ml per minute

= 27.2 L per minute

27.2 L/minute

*(b) Blood from the body enters the heart through the vena cava.

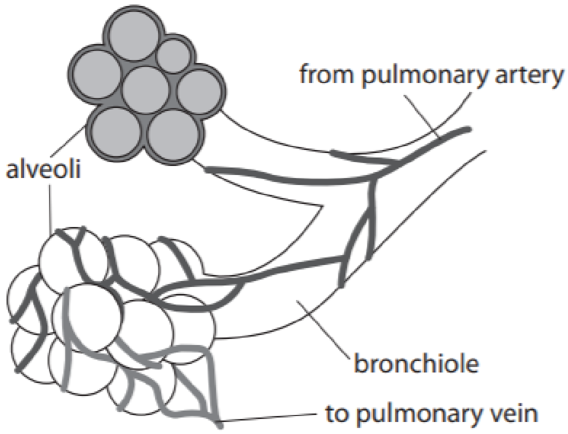
Describe how this blood flows through the heart and lungs to leave the heart through the aorta.

Include references to the chambers of the heart and the relevant valves in your answer.

(6)

Deoxygenated Blood in the vena cava enters the right atrium and then the right ventricle. The right ventricle pumps blood to the lungs through the pulmonary artery. Backflow of blood from right ventricle to right atrium is prevented by the tricuspid valve. Oxygenated blood from the lungs enter the left atrium through the pulmonary vein. The blood then fills the left ventricle, which pumps blood to all other parts of the body through the aorta. Backflow from left vertricle to left atrium is prevented by the bicuspid valve. Semilunar valves in the pulmonary artery and aorta prevent blood in the arteries from flowing back into the ventricles.

9 (a) Figure 10 shows alveoli from a lung.



© David Darling 2016

Figure 10

(i) Explain why these alveoli have the internal structure shown in Figure 10.

(3)

There is a large surface area so that gasses can diffuse at a high rate. The epithelia of alveoli and the capillaries surrounding them are only one cell thick, so the diffusion distance is minimised. The alveoli are surrounded by a rich network of capillaries so a steep concentration gradient is maintained.

(ii) How does oxygen move across the alveolar membrane into the capillary?

(1)

☐ **A** by osmosis

☐ **B** by active transport

☒ **C** by diffusion

☐ **D** by respiration

(b) Figure 11 shows the movement of molecules across a membrane.

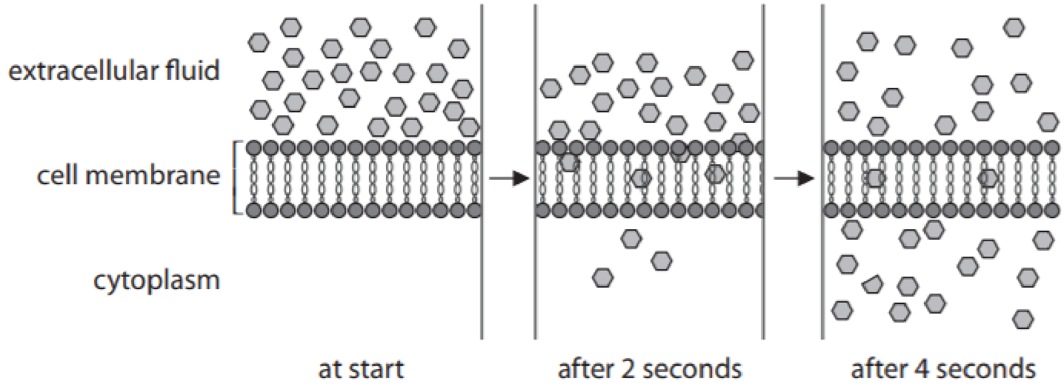


Figure 11

Describe how Figure 11 illustrates movement of molecules across a membrane.

(2)

Molecules diffuse from an area of high concentration to an area with low concentration, down the concentration gradient, across the partially permeable cell membrane.

*(c) Explain, using Fick's law, the factors that affect the diffusion rate of molecules into and out of cells.

(6)

According to Fick's law, the rate of diffusion is proportional to surface area and concentration gradient, but inversely proportional to the thickness of membrane. When surface area or concentration gradient doubles, the diffusion rate doubles. When the thickness of membrane doubles, rate of diffusion decreases to half.

3b. (iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

(1)

Glucose is broken down in respiration to provide energy in the form of ATP.

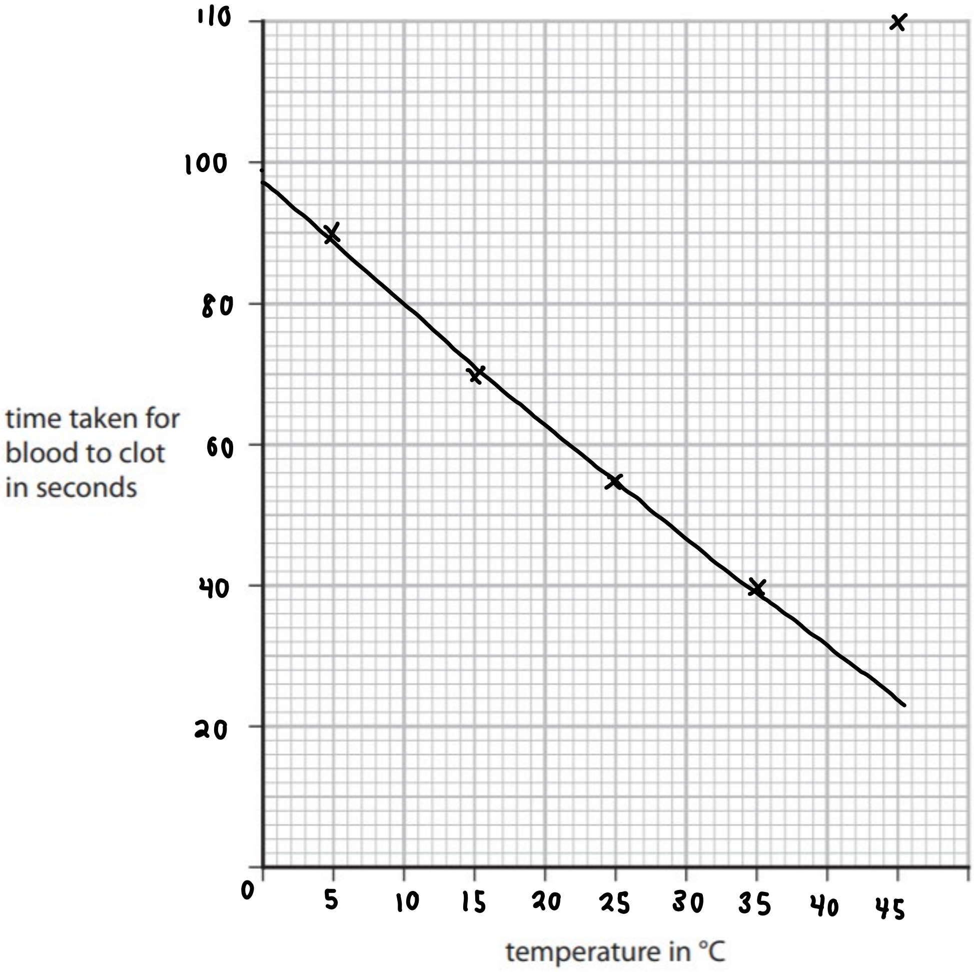
6 (a) Figure 11 shows the time taken for blood to clot at different temperatures.

temperature in °C	time taken for blood to clot in seconds
5	90
15	70
25	55
35	40
45	110

Figure 11

(i) Draw a graph to show the data in Figure 11.

(3)



(ii) Give **two** safety precautions that should be used when handling blood samples.

(2)

1 wash hands and wear gloves

2 sterilise equipment before use

(b) (i) Which part of the blood causes blood to start clotting?

(1)

- ☐ **A** erythrocytes
- ☐ **B** lymphocytes
- ☒ **C** platelets
- ☐ **D** antibodies

(ii) Give **one** advantage of a blood clot forming.

(1)

prevent further blood loss

(c) Explain how **one** structure of a vein helps the blood return to the heart.

(2)

have valves which prevent backflow and ensure blood flows in one direction

8 Figure 13 shows the heart rate of person A and person B.

Person A does not do any regular exercise.

Person B has been running regularly for one year.

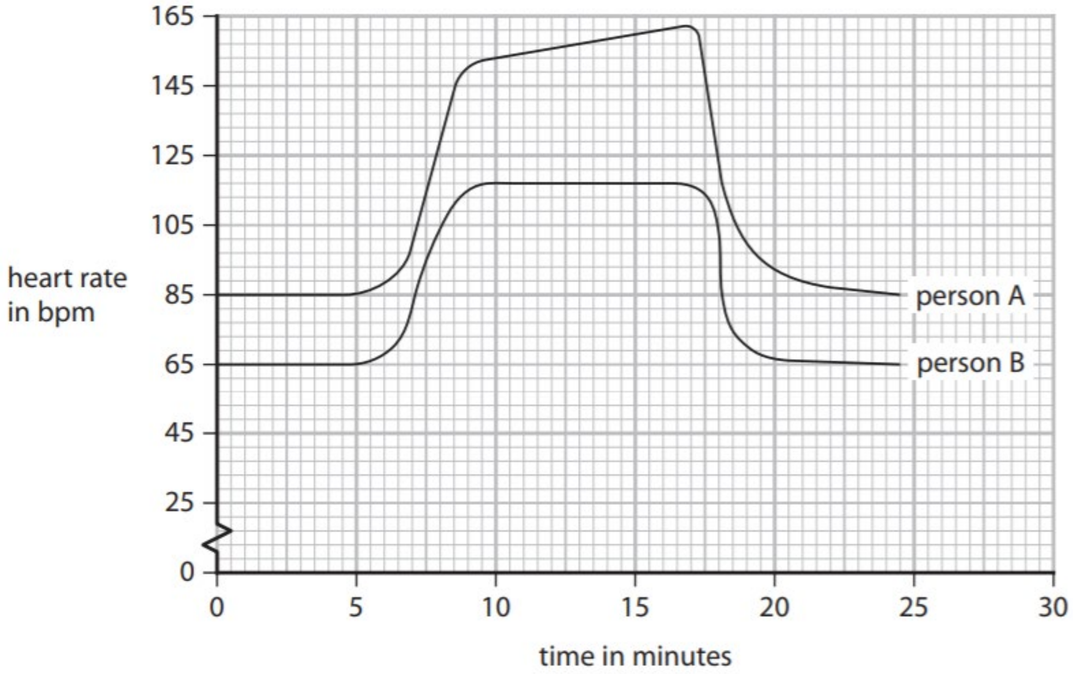


Figure 13

(a) Both people rested for the first 6 minutes, then did the same high intensity exercise for the next 12 minutes, then rested.

Compare the heart rates of person A with the heart rates of person B.

(4)

The heart rate is always higher in person A, both during exercise and at rest. From 6 to 10 minutes, when the exercise started, the heart rate of person A increases more significantly. Throughout the exercise, the heart rate of person B remains constant but the heart rate of person A continues to increase.

(b) The stroke volume for person B before exercising was 61 ml per beat.

Calculate the cardiac output for person B before exercising.

Give your answer in litres per minute.

(3)

61 ml / beat × 65 beats / min

= 3965 ml / min

= 3.965 l / min

3.965 litres per minute

(c) The cardiac output for person A during exercise was 5.5 litres per minute.

Explain why the heart rate for person A needed to be higher than the heart rate for person B during exercise.

(3)

The stroke volume of person A is lower, so a higher heart rate is needed to produce the same cardiac output.

TOTAL = 68 MARKS