Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Foundation

Resource Set Topic 8: Exchange and Transport in Animals

Questions

(Public release version)

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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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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.

2 (a) Figure 2 shows alveoli from a healthy lung.

Figure 2

Smoking can cause a condition called emphysema.

Figure 3 shows alveoli from a person with emphysema.

Figure 3

Use words from the box to complete the following sentences.

(2)

breathing	diffusion	larger
osmosis	smaller	thicker

The alveoli from the person with emphysema have a ..... smaller .....

surface area than the alveoli from a healthy lung.

The surface area of the alveoli will affect how much oxygen moves into the blood

by the process of ..... diffusion ..... .

(b) The graph in Figure 4 shows the volume of oxygen an athlete absorbs at different running speeds.

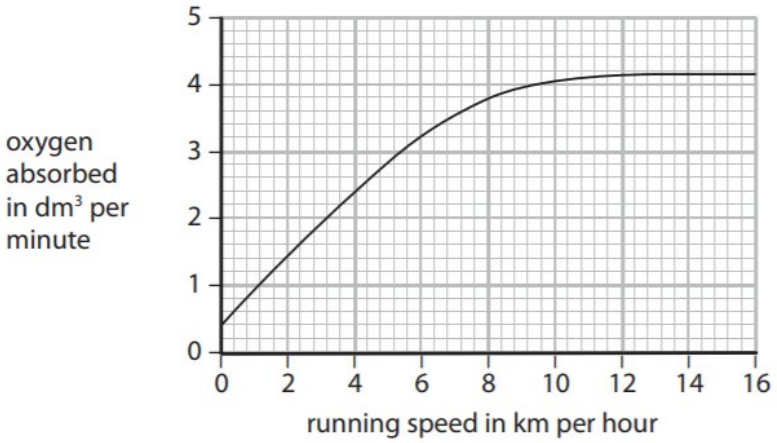


Figure 4

(i) Describe the trend shown in Figure 4.

(2)

- oxygen absorbed increases as running speed increases
- then it starts to level off and stops increasing at 4.2 dm^3/min

(ii) Which uses more oxygen when the running speed of the athlete changes from 4 to 6 km per hour?

(1)

☒ **A** increasing aerobic respiration

☐ **B** increasing anaerobic respiration

☐ **C** decreasing aerobic respiration

☐ **D** decreasing anaerobic respiration

(iii) Explain why the athlete produces lactic acid when running at 14 km per hour.

(2)

- maximum amount of oxygen absorbed so not enough oxygen in muscles
- need to conduct anaerobic respiration to meet demand of ATP which consequently produces lactic acid as one of products

8 (a) Figure 19 shows a diagram of a red blood cell from a turtle and a diagram of a red blood cell from a human.

turtle human

Figure 19

(i) These cells are animal cells.

Animal cells do not have

(1)

- ☐ **A** cytoplasm
- ☐ **B** a cell membrane
- ☒ **C** a cell wall
- ☐ **D** mitochondria

(ii) The actual length of the red blood cell from a turtle is 20.5 µm.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified 400×.

(2)

$M = \frac{I}{A}$

$400 = \frac{I}{20.5\ \mu m}$

$I = 8200 \mu m$

8200 µm

(iii) The width of the human red blood cell, when magnified 400×, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.

(2)

$M = \frac{I}{A}$

$400 = \frac{3.08\ mm}{A}$

$A = 7.7 \times 10^{-3}\ mm$

7.7×10^{-3} mm

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

Figure 20 shows the equipment used to measure the elasticity of an artery.

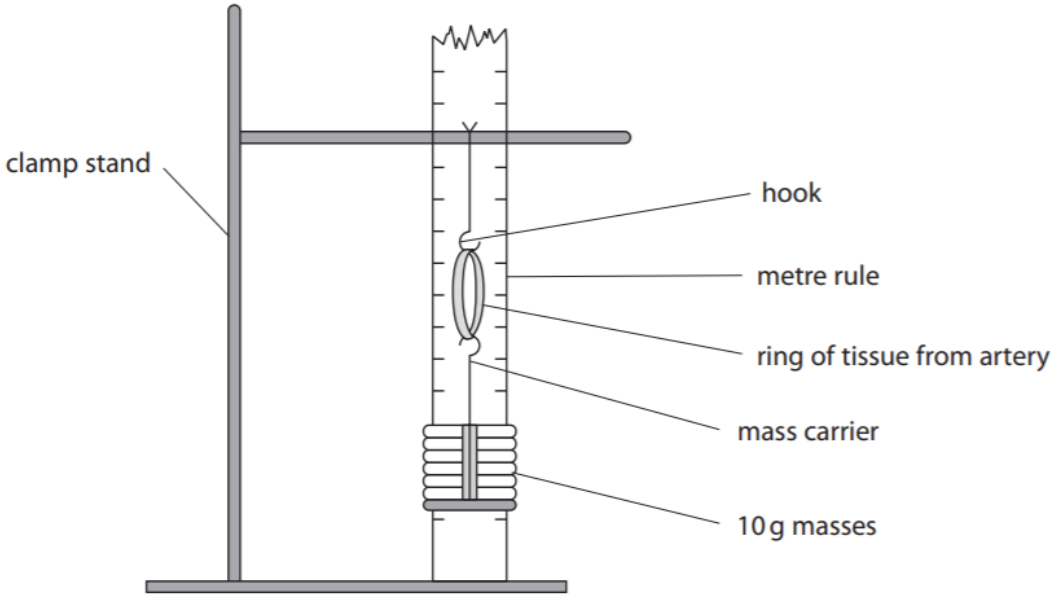


Figure 20

(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 length of tissue
- add masses
- remove mass and measure length of tissue
- repeat until tissue no longer returns to its original length

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

(1)

wear gloves

(c) Figure 21 shows the circulatory system of a frog.

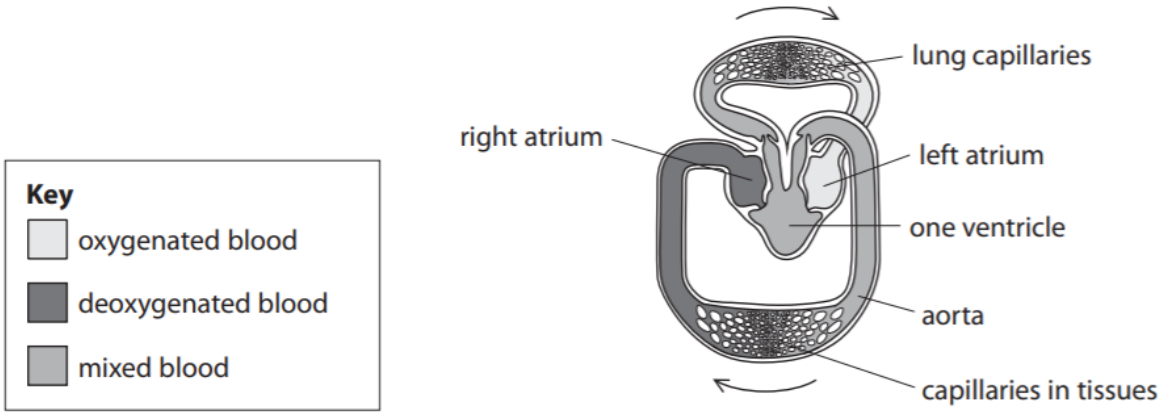


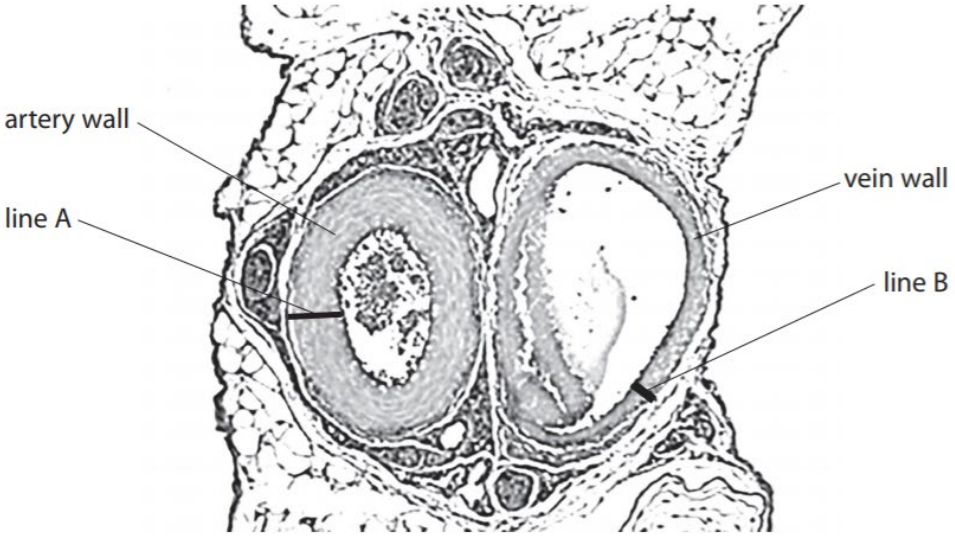
Figure 21

Explain why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than the circulatory system of a human.

(3)

- oxygenated blood mixes with deoxygenated blood when entering heart as no septum separating ventricles
- only one ventricle compared to two, one for pumping blood to lung and one for whole body thus force of pump shared between to lungs and to body so takes longer or less blood reaches body tissue to provide oxygen

4 (a) Figure 6 shows a cross section of an artery and a vein.



(Source: © The University of Kansas Medical Center)

Figure 6

(i) Measure the length of line A and the length of line B in mm.

(1)

line A 7 mm

line B 3 mm

(ii) State the ratio of the thickness of the artery wall to the thickness of the vein wall.

(1)

7 : 3

2.33 : 1

2.33 : 1

(b) (i) Give a reason why veins have valves.

(1)

prevent the backflow of blood due to low pressure in it & as travelling back up

(ii) Name the artery that transports oxygenated blood from the heart to the body.

(1)

aorta

(c) A scientist investigated the relationship between exercise and the ability to run at 3 metres per second for 20 minutes.

The scientist collected data from six groups of people.
Each group exercised for a different number of hours per week for six months.

There were 100 people in each group.

Figure 7 shows their results.

group	number of hours of exercise per week	number of people who could run at 3 metres per second for 20 minutes
A	0	9
B	2	20
C	4	33
D	6	52
E	8	61
F	10	62

Figure 7

(i) Describe the relationship shown by this data.

(2)

- as the number of hours of exercise per week increases, the number of people who could run increases
- rapid increase initially but starts to level off towards the end

(ii) Explain why some people's leg muscles tired quickly and developed cramp when they were running.

(3)

- they had more fast-twitch fibres and less of slow-twitch fibres so muscles contract/work for a short period of time with high rate of ATP hydrolysis so don't work efficiently for long 20 minutes, providing less ATP in the future
- high demand of ATP means anaerobic respiration occurs as well as aerobic respiration which produces lactic acid, causing cramp

9 (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 16.

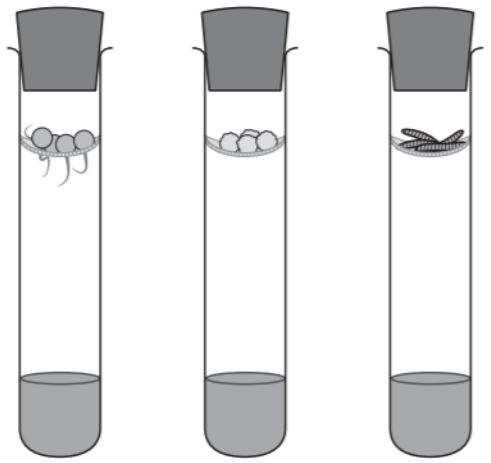


Figure 16

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

(2)

1 same mass of organisms

2 same concentration of hydrogencarbonate indicator

(ii) Describe a suitable control for this investigation.

(2)

same volume & concentration of indicator, gauze in a test tube with bung that is fitted but without any organisms inside. replace the organism with the same mass of glass beads

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

The results for this investigation are shown in Figure 17.

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

Figure 17

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

(2)

- dried peas do not carry out aerobic respiration but (no chemical reaction) germinating peas aerobically respire
- aerobic respiration produces CO_2 which is absorbed by indicator to change colour

(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) Carbon dioxide is carried in blood plasma.

Human blood also contains red blood cells and white blood cells.

Explain how the structure of red blood cells and white blood cells is related to their function.

(6)

RED BLOOD CELLS
- no nucleus
  - maximum amount of haemoglobin can fit in the red blood cell so maximum amount of oxygen can be bonded to be transported to the tissues
- biconcave shape
  - flexible so is able to squeeze through capillary one cell at a time to maximise time of diffusion to & from red blood cells to tissues (oxygen absorption)

WHITE BLOOD CELLS
- no haemoglobin and has a nucleus to be able to have motility to move towards pathogens to destroy them
- large/long and irregular to be able to ingest foreign materials and cellular debris to defend body against infection

1 Figure 1 shows a diagram of the heart.

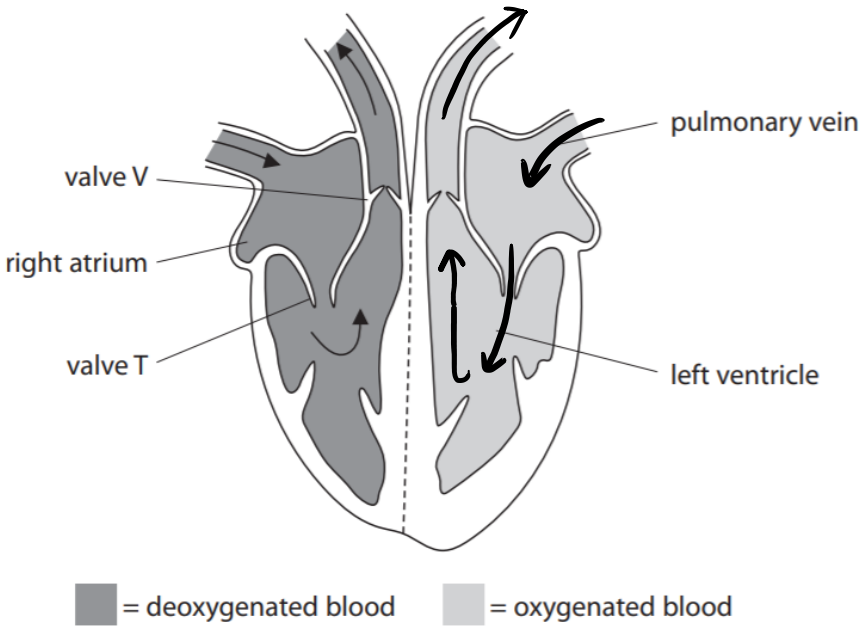


Figure 1

(a) (i) Draw arrows on Figure 1 to show how oxygenated blood moves through the heart.

(1)

(ii) What happens when the right ventricle contracts?

(1)

☒ **A** valve T opens

☒ **B** valve T closes

☒ **C** blood is forced into the left atrium

☒ **D** blood is forced into the pulmonary vein

(iii) Draw **one** straight line from each structure to its function.

(2)

structure	**function**
pulmonary vein	carries deoxygenated blood
	forces blood towards body organs
	carries blood from the lungs to the heart
left ventricle	takes blood to the right side of the heart
	forces blood towards the lungs

(b) Figure 2 shows a dissected vein.

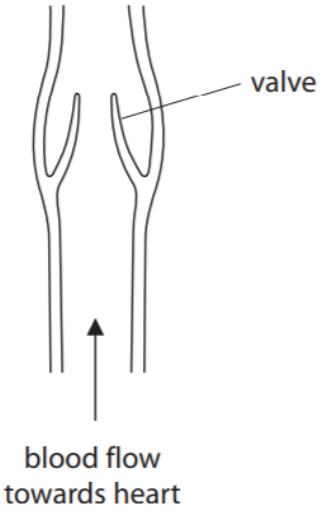


Figure 2

(i) Explain how the valves in veins help the blood, at low pressure, flow towards the heart.

(2)

- prevents the backflow of blood
- valve pocket allows blood to flow through in one direction towards heart

(ii) The equipment used to dissect the vein was cleaned and put into disinfectant.

State why this equipment was put into disinfectant.

(1)

to not contaminate other specimens which would be dissected later

5.

(c) (i) Which row of the table shows the type or types of respiration that use glucose?

(1)

		aerobic respiration	anaerobic respiration
☒	**A**	yes	yes
☐	**B**	yes	no
☐	**C**	no	yes
☐	**D**	no	no

(ii) A scientist measured the rate of respiration in a person when sleeping and then running at different speeds.

Figure 12 shows the results.

activity	speed in km per hour	respiration rate in kJ per minute
sleeping	0	3
running slowly	8	90
running quickly	12	130

Figure 12

Explain the trend shown in Figure 12.

(3)

- very low respiration rate when sleeping: not moving so muscles don't require much ATP due to no movement, 0 km/h
- high respiration rate when running slowly: moving at a fast speed requires lots of ATP for muscle contraction
- very high respiration rate when running quickly: moving very fast so lots of muscle contraction requiring most ATP from aerobic & anaerobic respiration
- greater the speed, greater respiration rate

TOTAL = 52 MARKS