Pearson Edexcel

Additional Assessment Materials
Summer 2021

# Pearson Edexcel GCE in AS Biology

## Topic 4: Exchange and Transport

## (Public release version)

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Additional Assessment Materials, Summer 2021

**General guidance to Additional Assessment Materials for use in 2021**

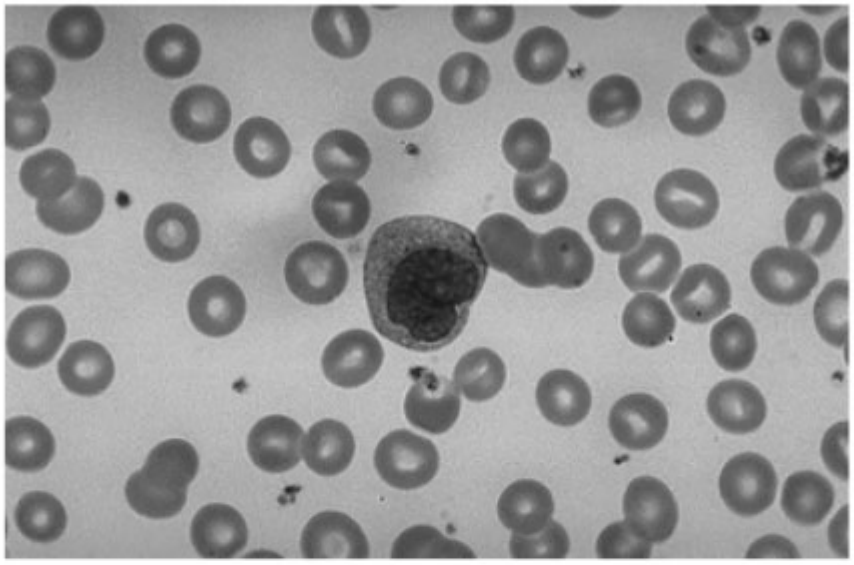
**Context**

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

**1** The photograph shows blood cells as seen using a light microscope.



*Source:* Library.med.utah.edu

(a) Explain how the structures of erythrocytes and monocytes are related to their functions.

**(3)**

(b) Blood is able to clot and prevent further blood loss from a cut.

Give **one** other function of blood clotting.

**(1)**

(c) Doctors can measure the effectiveness of the clotting process using the prothrombin time test (PTT).

This test measures how long it takes for a sample of blood to clot.

Two groups of adults had their PTT recorded.

One group had liver disease and the other group was a healthy control.

The results are shown in the table.

| Group | Mean PTT / seconds | Standard deviation / seconds |
|---|---|---|
| with liver disease | 20.1 | 0.3 |
| control | 13.5 | 0.1 |

Analyse the data to deduce whether PTT is a useful indicator of liver disease.

**(3)**

**2** Substances move into and out of cells by different mechanisms.

(a) (i) Which of these mechanisms moves substances against a concentration gradient?

(1)

- ☐ **A** active transport
- ☐ **B** diffusion
- ☐ **C** facilitated diffusion
- ☐ **D** osmosis

(ii) Which of these mechanisms enables non-polar molecules to pass through cell membranes?

(1)

- ☐ **A** diffusion
- ☐ **B** facilitated diffusion
- ☐ **C** osmosis
- ☐ **D** transpiration

(b) Which of the following is usually found in a greater concentration in lymph than in blood?

(1)

- ☐ **A** fatty acids
- ☐ **B** glucose
- ☐ **C** haemoglobin
- ☐ **D** oxygen

(c) The size of an animal can affect gas exchange.

As animals increase in size, their

(1)

- ☐ **A** surface area decreases and volume increases
- ☐ **B** surface area to volume ratio decreases
- ☐ **C** surface area to volume ratio increases
- ☐ **D** surface area to volume ratio remains constant

(d) Explain the features of gas exchange surfaces that are common to both insects and mammals.

**(4)**

**3**

Increased blood pressure is one risk factor associated with atherosclerosis.

A study investigated the effect of aspirin on the risk of having a heart attack or a stroke.

In the study, which lasted 10 years, 12 000 adults with one or more risk factors for atherosclerosis were used.

The adults were split into two equal sized groups.

Each adult in one group was given 100 mg of aspirin every day and each adult in the other group was given a placebo.

The list shows the results of this study:

- 4.29% of the people who received aspirin died
- 4.48% of the people who received the placebo died
- there was no effect on the incidence of strokes
- people who took the aspirin experienced twice the bleeding into the digestive system compared with people in the placebo group
- the numbers of people with bleeding into the digestive system in both groups was low.

(a) (i) Explain how increased blood pressure increases the risk of atherosclerosis.

**(4)**

(ii) Describe how **three** factors, other than increased blood pressure, can increase the risk of atherosclerosis.

(3)

(iii) Calculate the total number of people who died in this study.

(2)

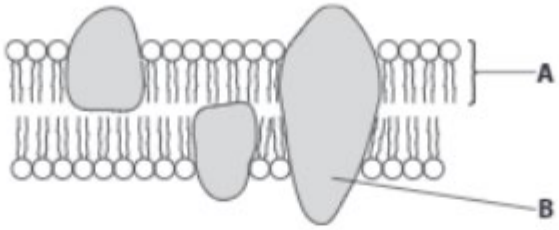
Answer .....

(b) Discuss whether patients at risk of a heart attack or stroke should take a 100 mg dose of aspirin every day.

(5)

**4**

The diagram shows the structure of a cell membrane.




(a) Name the parts labelled **A** and **B**.

**(1)**

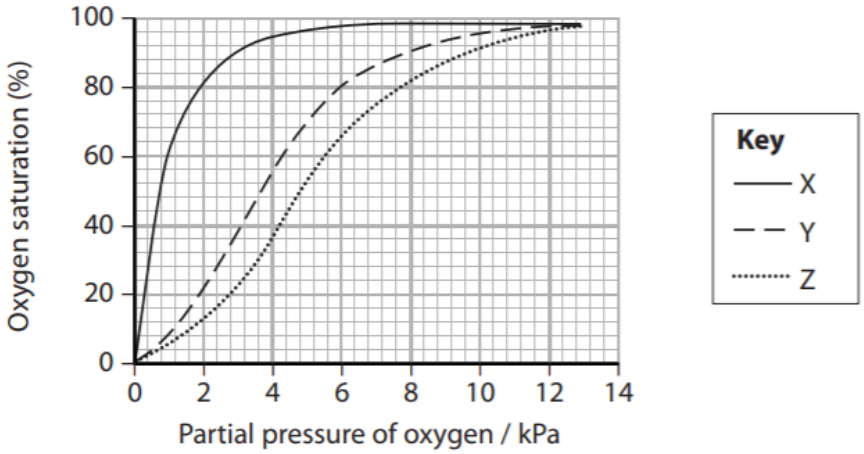
(b) Explain how the structure of the membrane controls the transport of polar molecules.

**(4)**

**5**

(b) Northern elephant seals have a high concentration of haemoglobin in their blood.

The graph shows the oxygen dissociation curves for myoglobin, adult haemoglobin and fetal haemoglobin.




Which of the rows correctly matches each curve with myoglobin, adult haemoglobin and fetal haemoglobin?

**(1)**

| | Myoglobin | Adult haemoglobin | Fetal haemoglobin |
|---|---|---|---|
| ☒ **A** | X | Y | Z |
| ☒ **B** | X | Z | Y |
| ☒ **C** | Y | Z | X |
| ☒ **D** | Z | X | Y |

(c) Northern elephant seals are able to dive to great depths and hold their breath for up to two hours.

The tables show data for four diving mammals.

| Species | Maximum time holding breath / min | Maximum diving depth / m | Mass of animal / kg |
|---|---|---|---|
| bottlenose dolphin | 5 | 20 | 200 |
| harbour seal | 17 | 19 | 24 |
| Weddell seal | 82 | 400 | 400 |
| Northern elephant seal | 119 | 437 | 400 |

| Species | Volume of oxygen in body / $cm^3\ kg^{-1}$ | Concentration of haemoglobin in blood / $g\ dm^{-3}$ | Total blood volume / $cm^3\ kg^{-1}$ | Percentage of stored oxygen in different body tissues | | |
|---|---|---|---|---|---|---|
| | | | | lungs | blood | muscle |
| bottlenose dolphin | 36 | 14 | 71 | 34 | 27 | 39 |
| harbour seal | 57 | 21 | 132 | 13 | 54 | 33 |
| Weddell seal | 87 | 210 | 173 | 5 | 66 | 29 |
| Northern elephant seal | 97 | 216 | 207 | 4 | 71 | 25 |

(i) Calculate the total mass of haemoglobin in a Northern elephant seal.

**(3)**

Answer .....

*(ii) Analyse the data to explain how marine mammals are adapted for diving.

(6)

**TOTAL FOR TEST = 44 MARKS**