



Additional Assessment Materials  
Summer 2021

Pearson Edexcel GCSE in Biology (1BI0)  
Higher

Resource Set Topic 2: Cells and control

Questions

(Public release version)

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## 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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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 Figure 1 shows an eye.

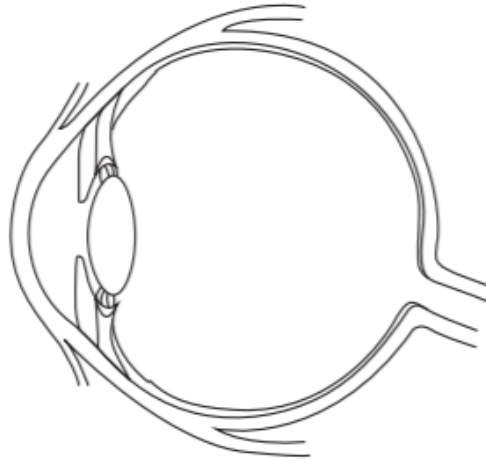


Figure 1

(a) (i) When the eye changes from focusing on a distant object to focusing on a near object (1)

- A the lens gets thinner to bend the light rays more
- B the lens gets thicker to bend the light rays more
- C the lens gets thinner to bend the light rays less
- D the lens gets thicker to bend the light rays less

(ii) Give a reason why people who are short-sighted cannot see distant objects clearly. (1)

The lens is too thick so the light is focused in front of the retina.

(iii) State the type of lens that can be used to correct short-sightedness. (1)

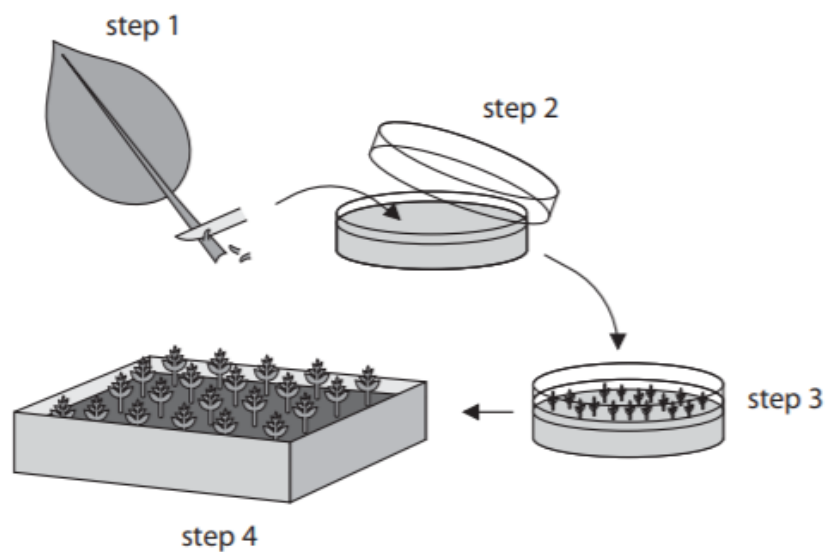
concave lens

(b) A student was given the hypothesis 'People with brown eyes are more likely to be short-sighted than people with blue eyes.'

Devise a plan to test this hypothesis.

Select equal numbers of people with brown eyes and blue eyes <sup>(3)</sup> in random and test their vision. Compare the number of people who are short-sighted in each group. Repeat and calculate the average number of short-sighted people. Then conduct a hypothesis / statistical test to see if the difference is significant.

4 (a) Figure 8 shows a method of producing plants.



Step 1. Cells taken from parent plant.

Step 2. Cells placed on agar growth medium.

Step 3. Cells develop into tiny plantlets.

Step 4. Plantlets grown in compost.

Figure 8

(i) Some cells in each plantlet develop into root cells.

Name the process occurring as these cells develop into root cells.

(1)

differentiation

(ii) Describe the advantages of producing plants by the method shown in Figure 8.

(2)

Many plants are produced in a short time. The plants produced are genetically identical to the parent thus all the plants have the desired characteristics.

(iv) One of the plantlets had different coloured leaves.

Give **one** reason why this plantlet had different coloured leaves.

(1)

mutation

6 (a) In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research.

(3)

Reprogrammed adult cells can differentiate into any cell type and be used in cell transplants. Patients can use their own adult cells for treatment so there is a smaller chance of the body rejecting their own cells.

This avoids the ethical issue about using embryonic stem cells.

(b) Figure 11 shows four stages of mitosis, labelled P, Q, R and S.

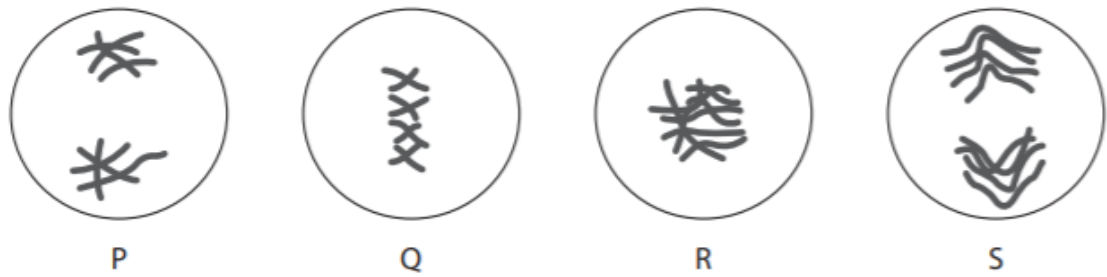


Figure 11

(i) Which is the correct order for these stages?

(1)

- A Q → R → S → P
- B R → Q → S → P
- C R → S → Q → P
- D Q → S → R → P

(ii) The stage of mitosis labelled S in figure 11 is

(1)

- A anaphase
- B prophase
- C telophase
- D metaphase

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase.

(2)

Cells obtains nutrients and create molecules required (e.g. proteins).  
Cells also grow and DNA is being replicated.

- 4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 4 shows the results.

age of volunteers	distance (mm)			mean distance (mm)
	person 1	person 2	person 3	
40	256	261	257	258
45	282	275	280	279
50	292	301	297	?
55	311	309	307	309

Figure 4

- (i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

$$\begin{aligned} \frac{292 + 301 + 297}{3} &= \frac{890}{3} \\ &= 296.67 \\ &\approx 297 \end{aligned}$$

297 mm

- (ii) Give **one** conclusion that can be made from the data in Figure 4.

(1)

The mean focusing distance of the volunteers increases with age.

- (iii) Give **two** improvements that are needed in this investigation before a valid conclusion can be made.

(2)

1 more volunteers are needed in each age group

2 repeat the experiment on each person 2 more times and calculate the mean



(b) Which part of the eye detects coloured light?

(1)

- A iris
- B lens
- C cones
- D cornea

(c) Figure 5 shows light rays entering the eye of a person with normal vision.

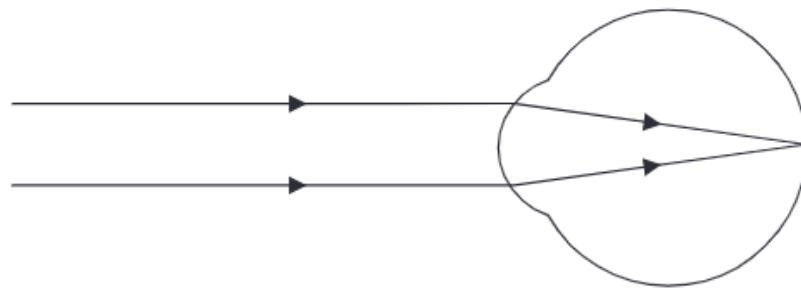


Figure 5

(i) Describe how light rays are focused to give normal vision.

(2)

When light rays pass through the lens, they are refracted by the lens and cornea so they are focused on the retina.

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(ii) Figure 6 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

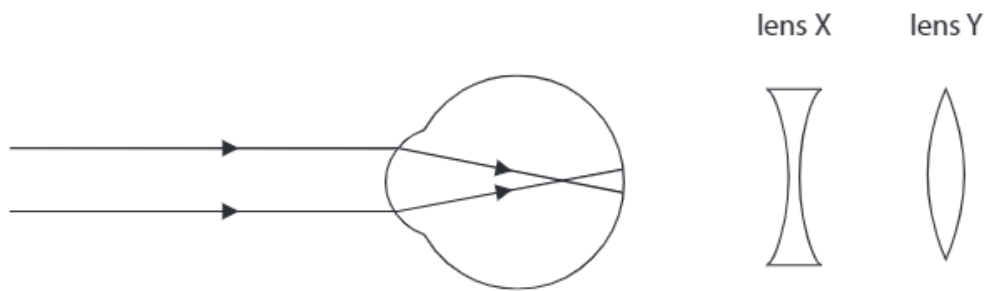


Figure 6

Explain which lens would correct the eye defect shown in Figure 6.

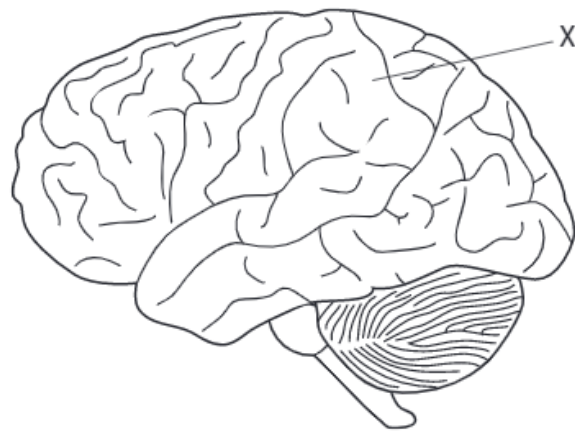
(2)

A concave lens, lens X can be used so the image will be focused further behind, on the retina. Lens X would diverge the light rays.

7.

(b) A measles infection can cause inflammation of the brain.

Figure 11 shows a brain.



**Figure 11**

(i) Name the part of the brain labelled X.

(1)

cerebrum

(ii) The death rate from measles is 0.15%.

In 2015, 134 250 people died from measles.

Calculate the number of people infected with measles in 2015.

Give your answer in standard form.

(3)

$$0.15\% = 134250$$

$$100\% = \frac{134250}{0.15} \times 100$$

$$= 89500000$$

$$= 8.95 \times 10^7$$

$$\underline{8.95 \times 10^7} \text{ people}$$

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

Motor neurons need to transmit the impulses for a longer distance and at a faster speed so myelination is needed, whereas neurones in the brain may have shorter axons and impulses are not transmitted as far. Myelination speeds up the impulse transmission.

10 (a) Figure 16 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	$1.0 \times 10^5$
frog	$1.6 \times 10^7$
rat	$2.0 \times 10^8$
human	$8.6 \times 10^{10}$

Figure 16

- (ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

Motor neurones need to be myelinated because,

- For rapid transmission of nerve impulses
- The fatty acid layer of myelin offers protection of the neurone from environmental toxins.

However neurones in the brain don't need myelination because the CNS is where sensory neurones transmit their impulses to motor and the CNS

(b) Figure 17 shows a sensory neurone.

is in the Brain: transmission rate of impulses is very high due to short distance of travel of impulses

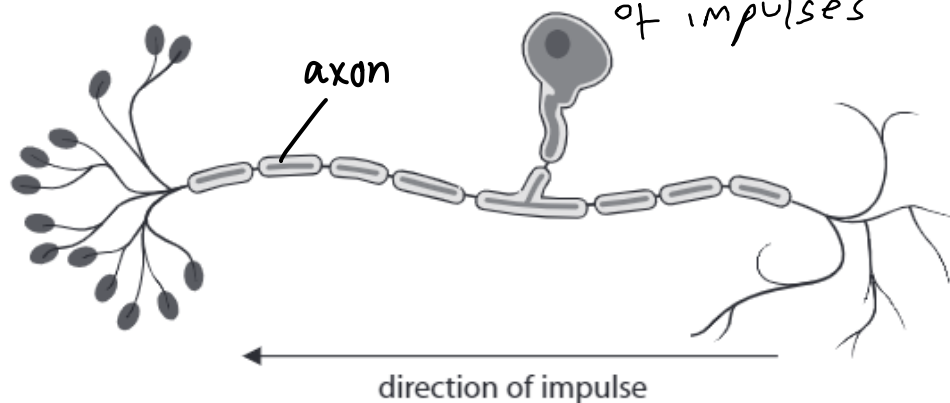


Figure 17

- (i) Label the axon on Figure 17.

(1)

(ii) Describe the role of sensory neurones.

(2)

Sensory neurones send impulses from receptors to relay neurones, which sends impulses to motor neurones, which causes the effector to respond. They convert stimuli into electrical signal to sense environment. (They lead from PNS to CNS.)

(c) Explain how impulses are transmitted at synapses.

(4)

As impulses reach the axon terminal, neurotransmitters are released into the synapse. Neurotransmitters diffuse across the synapse and bind to specific receptors on the membrane of the second neurone. An electrical impulse is then generated in the second neurone and transmitted down the axon.

3 Figure 2 shows a banana plantation.



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**Figure 2**

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(a) (i) Describe the function of a meristem in the growth of a plant.

(2)

Cells in meristem divide by mitosis and differentiate into other cells. This allows the plant to grow taller and wider.

8 (a) The reaction time of five people was tested using a computer.

These people were then given 100 cm<sup>3</sup> of a liquid to drink.

Their reaction times were recorded 10 minutes after drinking the liquid.

Figure 9 shows the results.

person	reaction time in seconds		
	before drinking the liquid	after drinking the liquid	difference
1	0.256	0.245	-0.011
2	0.234	0.232	-0.002
3	0.268	0.259	-0.009
4	0.254	0.248	-0.006
5	0.215	0.208	-0.007

Figure 9

(i) Calculate the mean difference in reaction time.

Give your answer in milliseconds.

$$\frac{(-0.011) + (-0.002) + (-0.009) + (-0.006) + (-0.007)}{5} = \frac{-0.035}{5} = -0.007 \text{ ms}$$

(ii) The drinks manufacturer wants to advertise the effect of the drink on reaction time.

The manufacture needs to confirm the effect on reaction time by improving the investigation.

Give **two** improvements the manufacturer would need to make to this investigation. (2)

1. repeat the experiment on each person for two more times and calculate the mean for each person
2. record the reaction time 30 minutes or 1 hour after drinking (because 10 minutes could be too short)



(b) Figure 10 shows a neurone.

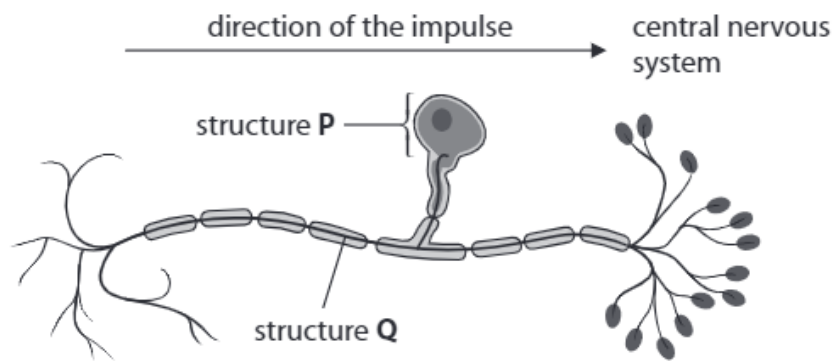


Figure 10

(i) Name the type of neurone shown in Figure 10.

(1)

sensory neurone

(ii) Which row identifies structure P and structure Q?

(1)

	structure P	structure Q
<input type="checkbox"/> A	myelin sheath	axon
<input checked="" type="checkbox"/> B	cell body	dendron
<input type="checkbox"/> C	myelin sheath	dendron
<input type="checkbox"/> D	cell body	axon

\*(c) Some painkillers prevent neurotransmitters binding to receptors in a synapse.

Explain how a signal is transmitted at a synapse and how the painkillers reduce the pain felt by the person.

(6)

When an electrical impulse reaches the axon terminal, it triggers the release of chemical messengers, called neurotransmitters, into the synapse. Neurotransmitters diffuse across the synapse and bind to specific receptors on the membrane of the second axon, causing an electrical impulse to be generated. Painkillers which has a similar shape to the neurotransmitters can bind to the receptors. This prevents the neurotransmitters from binding and the electrical impulse from being generated in the post-synaptic neurone then reached to CNS.

9aii (ii) Cell division occurs during the cell cycle.

During which stage of the cell cycle is DNA replicated?

(1)

- A anaphase
- B prophase
- C interphase
- D telophase

**TOTAL = 57 MARKS**