



Additional Assessment Materials  
Summer 2021

Pearson Edexcel GCE in AS Biology

Topic 2: Cells, Viruses and Reproduction of  
Living Things

(Public release version)

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

### Context

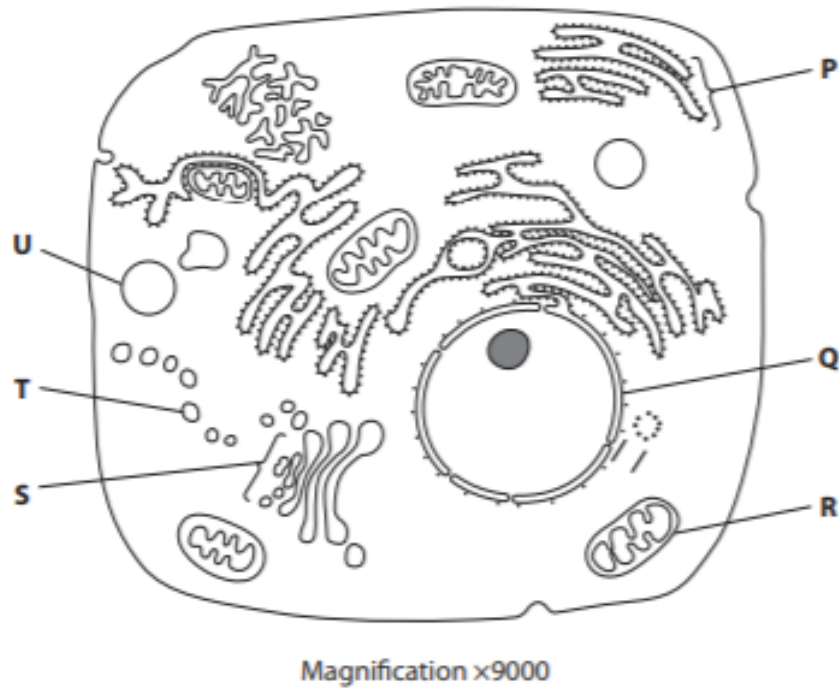
- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

The diagram shows the ultrastructure of an animal cell.



(a) (i) The structure labelled **R** on the diagram represents a

(1)

- A** chloroplast
- B** lysosome
- C** mitochondrion
- D** ribosome

(ii) The structure labelled **Q** on the diagram represents the

(1)

- A** cell surface membrane
- B** nuclear envelope
- C** rough endoplasmic reticulum
- D** smooth endoplasmic reticulum

(iii) Calculate the actual diameter of the structure labelled **U**.

(2)

Answer \_\_\_\_\_



(b) Which row in the table is correct for structures found in animal cells and prokaryotic cells?

(1)

	Nucleolus		Plasmid		Ribosome	
	Animal cell	Prokaryotic cell	Animal cell	Prokaryotic cell	Animal cell	Prokaryotic cell
<input checked="" type="checkbox"/> A	✓	✗	✓	✓	✓	✓
<input checked="" type="checkbox"/> B	✗	✓	✓	✓	✗	✓
<input checked="" type="checkbox"/> C	✓	✗	✗	✓	✓	✓
<input checked="" type="checkbox"/> D	✓	✓	✓	✗	✓	✗

(c) Explain why it is possible to see the detailed structure of a prokaryotic cell with an electron microscope but not with a light microscope.

(2)

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2

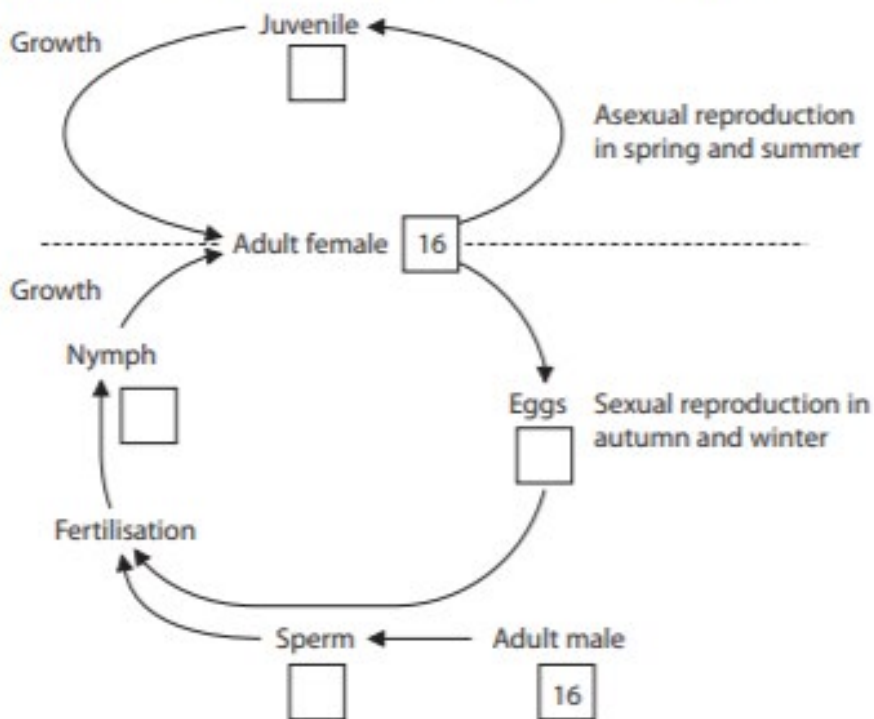
Adult female cabbage aphids (*Brevicoryne brassicae*) undergo either asexual reproduction or sexual reproduction depending on the time of year.

The photograph shows some cabbage aphids on a cabbage leaf.



Source: © Denis Crawford/Alamy Stock Photo

Some of the boxes in the diagram show the number of chromosomes present in a single cell from a particular stage of each of the alternative methods of reproduction.



(a) (i) Complete the empty boxes in the diagram to show the number of chromosomes present in a single cell at that stage of reproduction.

(2)

(ii) Label the arrows on the diagram with the letter **M** to show where meiosis takes place.

(1)



(b) Explain why a juvenile aphid is genetically identical to its parent.

(3)

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(c) (i) Complete the table with a ✓ or ✗ to compare the events during mitosis and meiosis. The first row in the table has been completed for you.

(3)

Event	Mitosis	Meiosis I	Meiosis II
chromosomes shorten and thicken	✓	✓	✗
homologous chromosomes pair together			
crossing over can cause genetic variation			
homologous chromosomes separate			
sister chromatids separate			

(ii) Which of the following increases the number of different alleles in a population? (1)

- A** crossing over
- B** gene mutation
- C** independent assortment of chromosomes during nuclear division
- D** random fusion of gametes

**3**

Male fertility can be determined by a number of different factors.

(a) Describe the process of spermatogenesis.

(4)

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(b) The mean volume of the semen produced by a male ejaculation is  $3.4\text{ cm}^3$ .

This contains a mean concentration of  $17\,000\text{ sperm mm}^{-3}$ .

Calculate the mean total number of sperm in a single ejaculation.

Give your answer in standard form.

(2)

Answer \_\_\_\_\_

(c) The distance from the point of ejaculation in the vagina to the upper end of the fallopian tube (where fertilisation takes place) is 19 cm.

Some sperm travel this distance in three hours.

Calculate the mean speed of these sperm in  $\text{cm min}^{-1}$ .

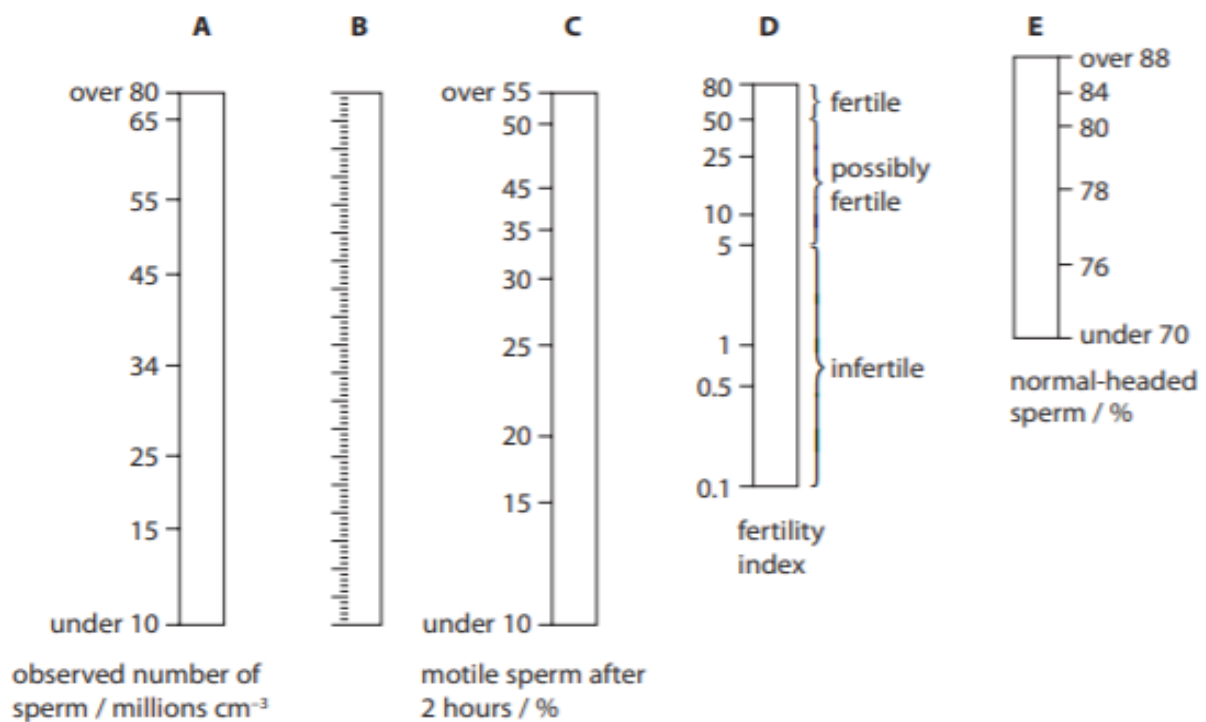
(1)

Answer .....

(d) Male fertility can be estimated using scales that take into account the number of sperm, their mobility and the percentage with a normal 'head'.

To calculate male fertility using these scales:

- draw a straight line between the observed number of sperm (scale A) and the percentage of sperm motile after 2 hours (scale C)
- from the intersection of this line with scale B, draw another straight line to scale E (the percentage of normal-headed sperm)
- the point where this second line crosses scale D (the fertility index), provides a relative assessment of fertility.



(i) Estimate the fertility of a man who produces a semen sample with:

- 25 million sperm per  $\text{cm}^3$
- 35% of which are motile after 2 hours and
- 84% of which have normal heads.

(2)

Answer .....

(ii) Deduce why fertilisation is unlikely to occur if there are 5 million spermatozoa per  $\text{cm}^3$ .

(1)

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4

In 2014 there was an Ebola virus outbreak in West Africa.

(a) Which of the following viruses contains RNA and the enzyme reverse transcriptase?

(1)

- A Ebola virus
- B human immunodeficiency virus (HIV)
- C  $\lambda$  (lambda) phage
- D tobacco mosaic virus

(b) Ebola virus begins its lytic cycle soon after the infection of body cells.

(i) Describe the lytic cycle of a virus.

(2)

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(ii) Some doctors believe that the Ebola virus may undergo latency within body cells.

State what is meant by the term latency.

(2)

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- (c) An experimental drug called Zmapp was used to treat patients during this outbreak of Ebola virus.

Patients with Ebola virus were randomly split into two groups.

Both groups received standard medical treatment.

One group was also given Zmapp on days 1, 3 and 5.

Some of the patients suffered severe side effects after treatment with Zmapp and required additional medical care.

The results are shown in the table.

Day	Number of patients surviving		Number of patients with severe side effects after treatment with Zmapp on days 1, 3 and 5
	Without Zmapp	With Zmapp	
1	35	36	11
2	32	33	
3	31	31	7
4	30	29	
5	29	28	3
6	26	28	
7	23	28	
8	22	28	
9	22	28	

Analyse the data to assess the effectiveness of Zmapp to treat patients with Ebola virus.

(4)

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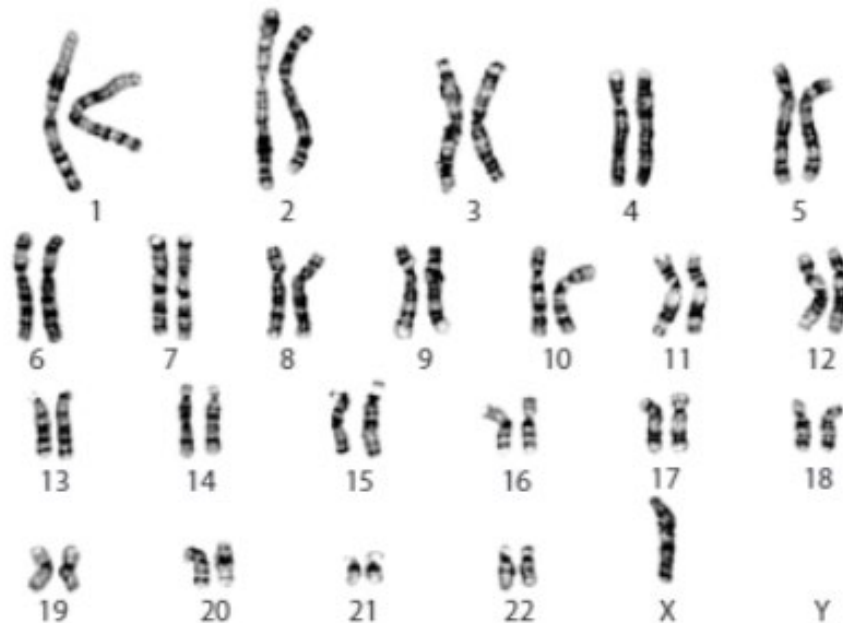
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5

A karyotype shows the chromosomes found in the cells of an individual.

The photograph shows a karyotype from a child with a genetic condition.



(Source: © Dept. of Clinical Cytogenetics, Addenbrookes Hospital/Science Photo Library)

(a) (i) Which of the following identifies the genetic condition shown in the photograph? (1)

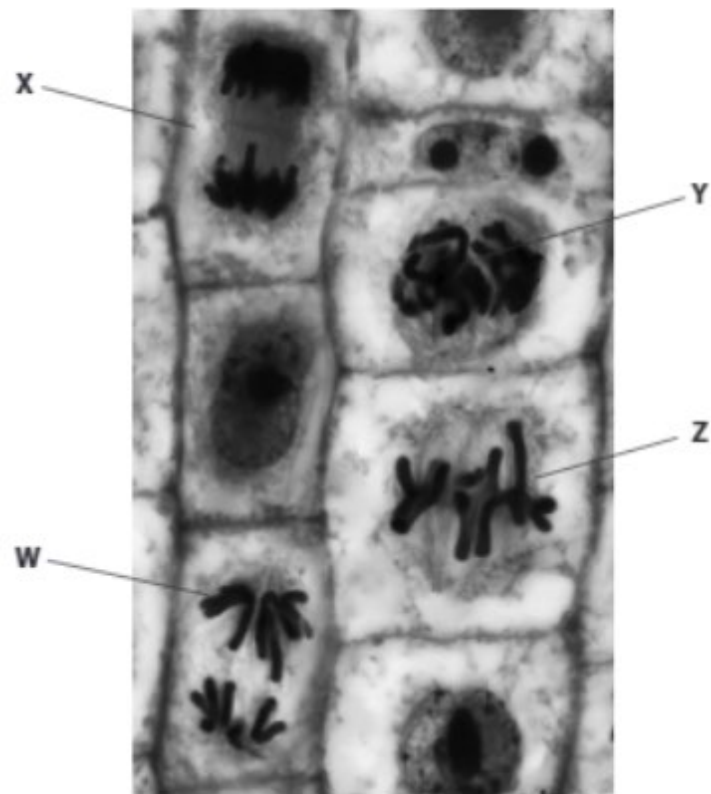
- A Down's syndrome due to monosomy
- B Down's syndrome due to polysomy
- C Turner's syndrome due to monosomy
- D Turner's syndrome due to polysomy

(ii) Which process would have caused the genetic condition shown by this karyotype? (1)

- A base insertion
- B base substitution
- C non-disjunction
- D translocation



(b) The photograph shows cells in different stages of mitosis.



(Source: © STEVE GSCHMEISSNER/Science Photo Library)

(i) Which of the following correctly identifies the stages shown in the photograph?

(1)

	W	X	Y	Z
<input type="checkbox"/> A	anaphase	telophase	prophase	metaphase
<input type="checkbox"/> B	anaphase	prophase	telophase	metaphase
<input type="checkbox"/> C	prophase	anaphase	metaphase	telophase
<input type="checkbox"/> D	telophase	metaphase	anaphase	prophase

