National
Qualifications
2025

X807/76/12

Biology
Paper 1 — Multiple choice

TUESDAY, 27 MAY
9:00 AM – 9:40 AM

Total marks — 25

Attempt ALL questions.

You may use a calculator.

Instructions for the completion of Paper 1 are given on *page 02* of your answer booklet X807/76/02.

Record your answers on the answer grid on *page 03* of your answer booklet.

Space for rough work is provided at the end of this booklet.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

Total marks — 25 marks

Attempt ALL questions

1. Which row in the table shows the organisation of DNA in a nucleus, chloroplast and mitochondrion?

	Nucleus	Chloroplast	Mitochondrion
A	linear chromosome	plasmid	plasmid
B	circular chromosome	plasmid	linear chromosome
C	circular chromosome	linear chromosome	linear chromosome
D	linear chromosome	circular chromosome	circular chromosome

2. The DNA sequence shown is part of a gene that is transcribed and translated.

C A G A T C G T T A C T

State how many tRNA molecules, involved in translation of the mRNA transcribed from this sequence, would have anticodons containing **only one** uracil base.

A 0

B 2

C 3

D 4

3. An investigation was carried out to compare the mass of DNA in different types of fruit.

A 10 g sample from each of 5 different types of fruit was mixed with salt solution and detergent and incubated in a water bath at 60 °C.

Ethanol was added to precipitate the DNA and the mass of DNA was measured using a balance.

The entire investigation was repeated.

The validity of the investigation was improved by

A using 5 different types of fruit

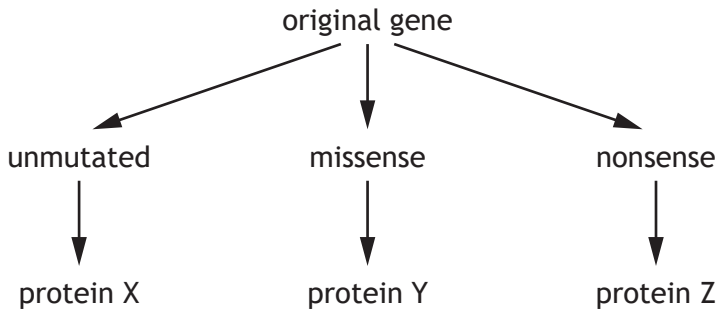
B using a balance to measure the mass of DNA

C using a water bath to incubate the mixture

D repeating the entire investigation.

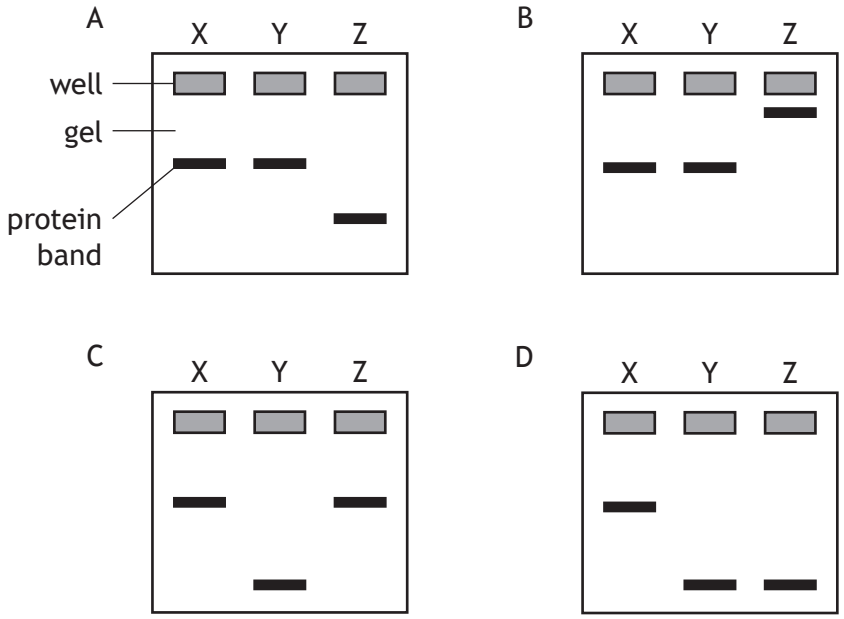
4. DNA sequences can undergo mutations, which can affect the protein produced.

The diagram shows the proteins produced from an unmutated sequence and from the sequences following two different mutations.



The sizes of the proteins can be compared using gel electrophoresis. Smaller proteins travel further in the gel.

Which of the following diagrams show the results of gel electrophoresis of proteins X, Y and Z?



5. The list describes methods of gene transfer in organisms.

1. Coat colour gene transferred by sexual reproduction in hamsters.
2. Ethanol tolerance gene transferred by asexual reproduction in yeast.
3. Antibiotic resistance gene transferred between bacteria of the same generation.

Which of these methods are examples of horizontal gene transfer?

A 1 only

B 3 only

C 1 and 2 only

D 2 and 3 only

6. Which of the following is a description of pharmacogenetics?

A Comparing sequence data using computers and statistical analysis.

B Studying the evolutionary relatedness among groups of organisms.

C Using an individual's genome sequence to select the most effective drugs.

D Studying the mutation rate in sequences over many generations.

7. Which of the following is a list of proteins embedded in membranes?

A Pore, histone and enzyme

B Enzyme, pump and histone

C Pore, ATP synthase and pump

D Histone, pump and ATP synthase

8. Which of the following molecules must be present in a living cell for glycolysis to occur?

A NAD and ATP

B Dehydrogenase and oxygen

C Glucose and NADH

D Pyruvate and ATP

9. An experiment was carried out into the effect of the concentration of an enzyme inhibitor on the rate of respiration in yeast.

Five flasks containing yeast, glucose and different concentrations of inhibitor were set up. The CO_2 concentration was measured using a probe.

The results are shown in the table.

Inhibitor concentration (%)	**CO_2 concentration (%)**
5	0.12
10	0.09
15	0.07
20	0.04

The reliability of these results could be improved by

A including a control flask with no inhibitor

B carrying out the experiment three times at each inhibitor concentration

C using a wider range of concentrations of inhibitor

D using the same volumes of glucose and yeast in each flask.

10. The ability of an organism to maintain its metabolic rate is affected by external abiotic factors such as

A temperature, salinity and pH

B disease, predation and food availability

C temperature, disease and predation

D pH, sterility and oxygen concentration.

11. The hypothalamus is the temperature monitoring centre in mammals that sends information to effectors to regulate body temperature.

Which row in the table identifies how the hypothalamus sends information to effectors and a corrective response to an **increase** in body temperature?

	How information is sent to effectors	**Corrective response**
A	bloodstream	vasoconstriction
B	bloodstream	vasodilation
C	nerves	vasoconstriction
D	nerves	vasodilation

[Turn over

12. An investigation was carried out to compare the lactose content of human milk and cow milk.

The enzyme lactase was used to break down the lactose to glucose. The glucose concentration was measured every 30 seconds for 3 minutes.

The results are shown in the table.

Time (minutes)	Glucose concentration (%)	
	Human milk	Cow milk
0.0	0.00	0.00
0.5	0.28	0.24
1.0	0.54	0.46
1.5	0.80	0.54
2.0	1.04	0.58
2.5	1.10	0.58
3.0	1.10	0.58

What statement comparing human milk and cow milk is supported by the data?

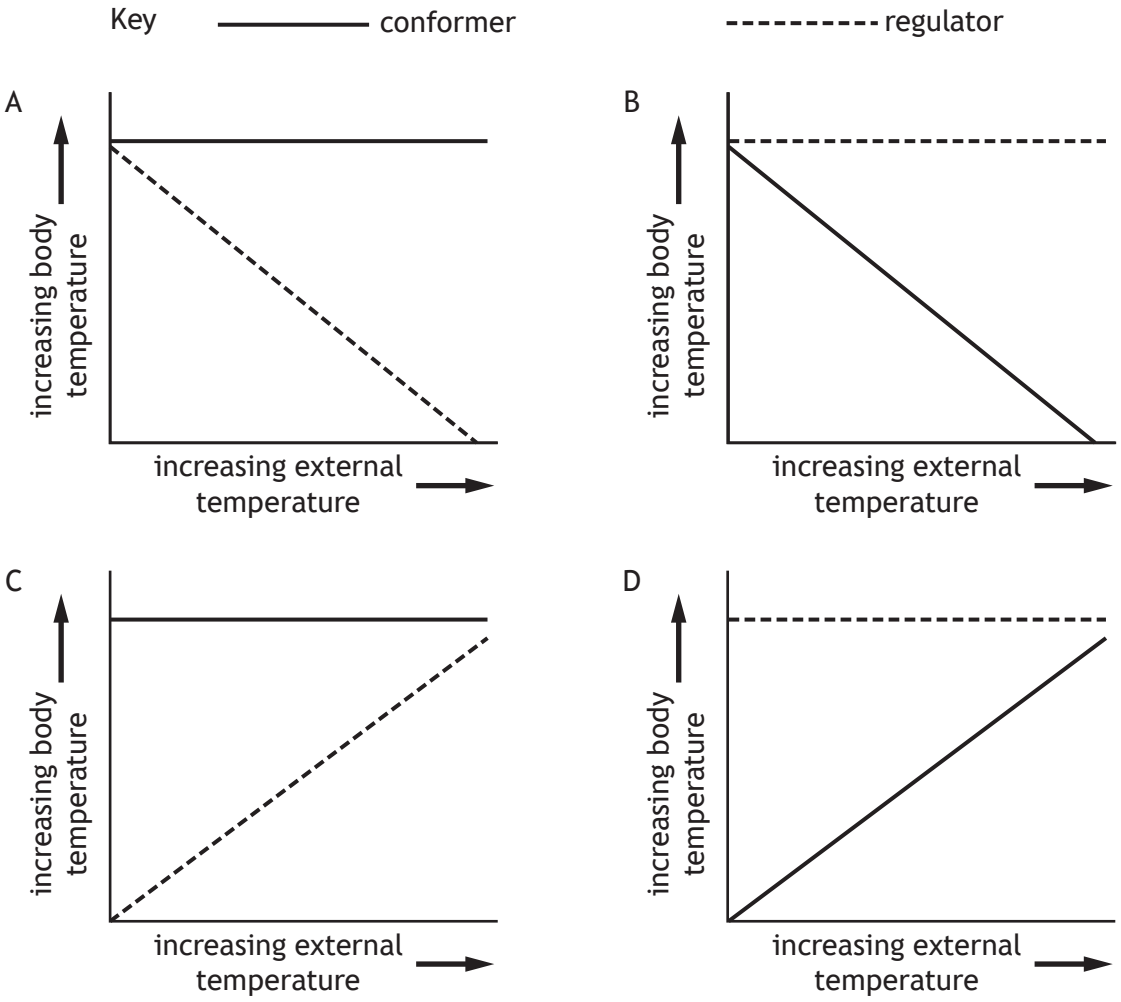
A Glucose production is faster in human milk.

B Glucose reached its maximum concentration sooner in human milk.

C No lactose remained in cow milk at 1.5 minutes.

D Glucose reached a maximum concentration in both milks at 2 minutes.

13. Which graph shows the effect of an increase in external temperature on the body temperature of conformers and regulators?



14. Which of the following descriptions relates to migration?

A It allows animals to avoid adverse conditions.

B It allows animals to survive adverse conditions.

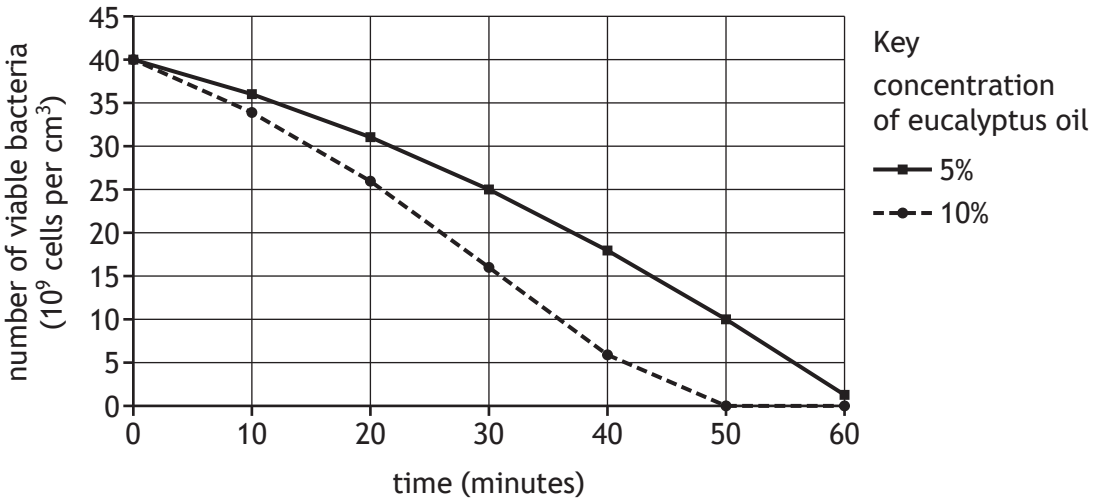
C It only involves learned behaviour.

D It only involves innate behaviour.

[Turn over

15. Eucalyptus oil inhibits growth of bacteria. A study was carried out to investigate the effect of the concentration of eucalyptus oil on bacterial growth. Bacteria were incubated for 1 hour with 5% and 10% eucalyptus oil.

The graph shows the number of viable cells in each culture at 10 minute intervals.



The percentage of bacteria killed by 5% eucalyptus oil after 50 minutes was

A 10%

B 25%

C 30%

D 75%.

16. Which statement about recombinant DNA technology is **not** correct?

A Plasmids are examples of vectors.

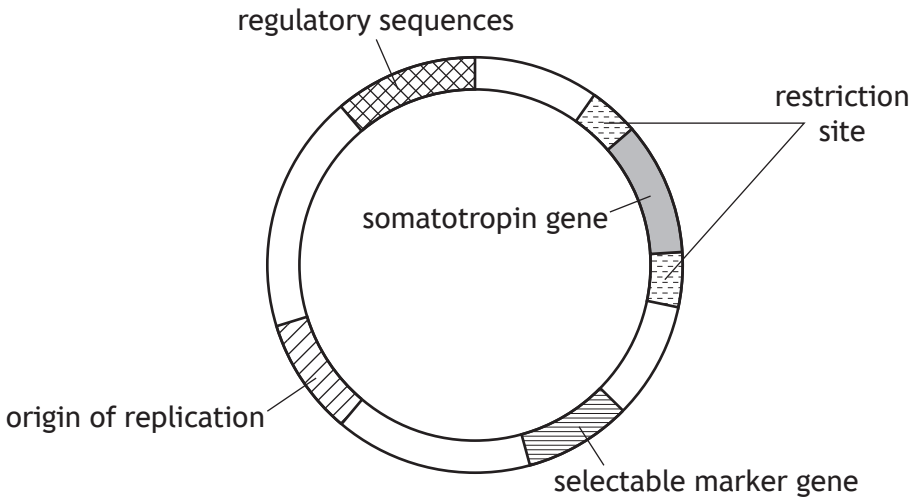
B Ligase cuts open plasmids and cuts specific genes out of chromosomes.

C Recombinant bacteria may result in proteins that are folded incorrectly.

D Artificial chromosomes are used when larger fragments of DNA are inserted.

17. A pharmaceutical company used recombinant DNA technology to produce genetically modified bacteria that synthesised the human growth hormone somatotropin.

The diagram shows the modified plasmid that was used to transform the bacteria.



The transformed bacteria were resistant to the antibiotic ampicillin.

Which feature of the modified plasmid is responsible for this resistance?

A Regulatory sequences

B Somatotropin gene

C Origin of replication

D Selectable marker gene

18. The following statements describe reactions in the carbon fixation stage of photosynthesis.

1. RuBP is converted to 3-phosphoglycerate (3PG).
2. 3PG is converted to glyceraldehyde-3-phosphate (G3P).
3. G3P is converted to glucose.

Which row in the table identifies a reaction catalysed by RuBisCO and a reaction that requires hydrogen ions?

	Catalysed by RuBisCO	**Requires hydrogen ions**
A	3	2
B	1	2
C	1	1
D	3	1

[Turn over

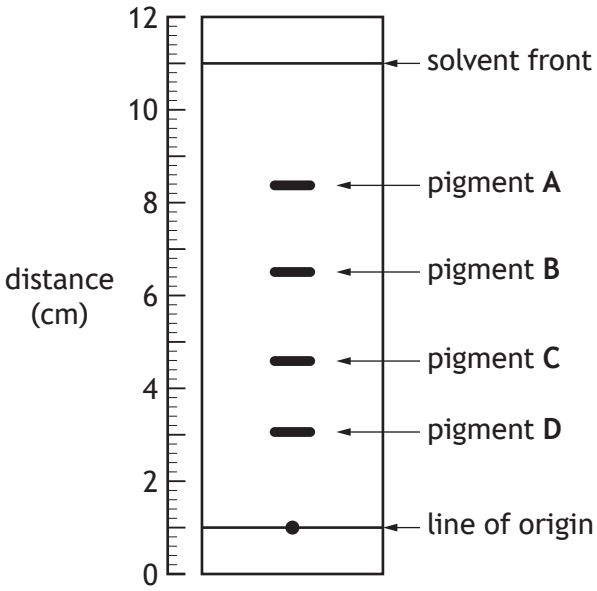
19. Pigments were extracted from plant leaves and separated using thin layer chromatography.

R_f values for each pigment can be calculated using the formula:

$$\frac{\text{distance travelled by pigment from the line of origin}}{\text{distance travelled by the solvent from the line of origin}}$$

The diagram shows a chromatogram in which four plant pigments have been separated.

The table gives the R_f values of some plant pigments.



Pigment	R_f value
Chlorophyll a	0.35
Chlorophyll b	0.20
Carotene	0.74
Xanthophyll	0.55
Anthocyanin	0.45
Phaeophytin	0.59

Using information from the chromatogram and the table, identify which pigment is xanthophyll.

20. The list describes features of a field trial designed to compare the yield of maize cultivars.

1. Treatments are allocated to plots randomly.
2. Trial includes plots of four different maize cultivars.
3. A sufficient number of replicates is used.

Which of the features would take into account the variability of yield in each cultivar?

A 2 only

B 3 only

C 1 and 2 only

D 1 and 3 only

21. Packs of grey wolves are found in many regions of Canada. The total area of territories in each region studied was measured and the number of packs of grey wolves found in each region was recorded.

The results are shown in the table.

Region of Canada	Total area of territories (km^2)	Number of packs
X	240	2
Y	351	14
Z	840	28

Calculate how many times larger the average area of territory per pack in region X is compared to region Z.

A 0.25

B 3.50

C 4.00

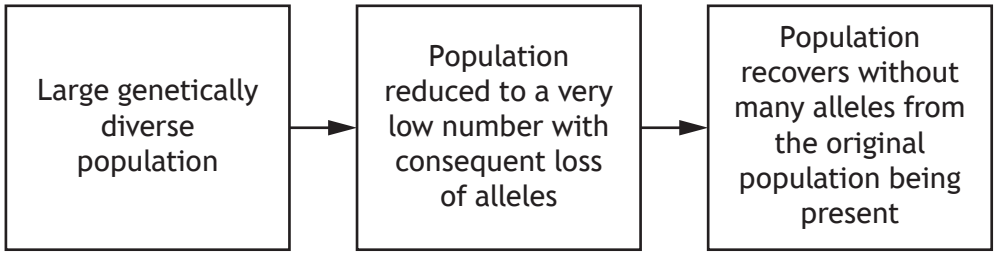
D 14.00

22. Which row in the table identifies kin selection?

	Donor	Recipient	Type of relationship
A	benefits	harmed	altruism
B	harmed	benefits	mutualism
C	harmed	benefits	altruism
D	benefits	harmed	mutualism

[Turn over

23. The sequence describes a population in a specific habitat over a long period of time.



This sequence describes

A natural selection
B prevention of gene flow
C recovery of genetic diversity
D the bottleneck effect.

24. The list describes components of biodiversity:

1. Number of different species in an ecosystem
2. Number and frequency of alleles in each species in an ecosystem
3. Proportion of each species in an ecosystem.

Which components would need to be considered when measuring species diversity?

A 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

25. Grey squirrels were brought into the UK from North America over 100 years ago. They are now described as an invasive species because they have spread rapidly and

A were introduced from outside the UK
B have become established within natural habitats
C have eliminated native red squirrels in many areas
D occupy the same habitat as native red squirrels.

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