H1

MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE INTERNATIONAL EDUCATION
General Certificate of Education Advanced Level

BIOLOGY **8876/01**

Paper 1 Multiple Choice **For examination from 2026**

SPECIMEN PAPER **1 hour**

You must answer on the multiple choice answer sheet.

0123456789

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **thirty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and index number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use an approved calculator.

INFORMATION

- The total mark for this paper is 30.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

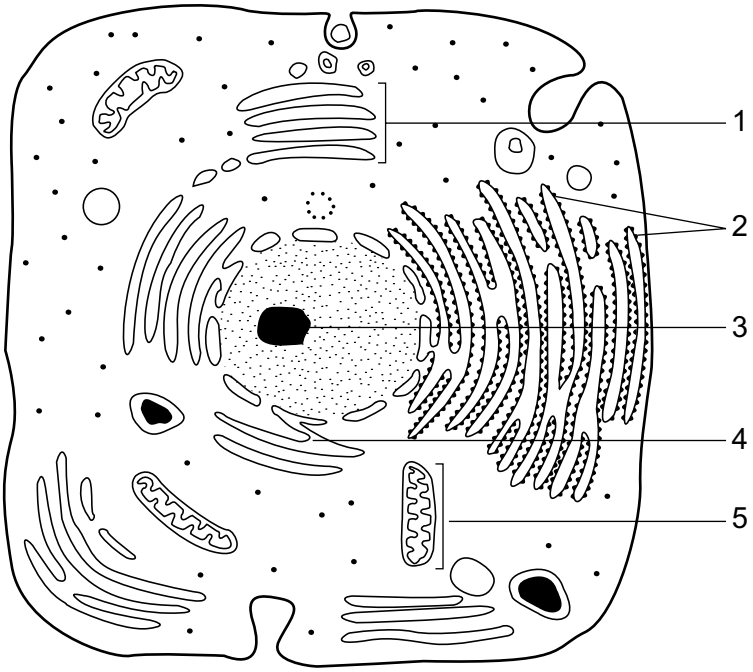
This document has **18** pages. Any blank pages are indicated.

Singapore Examinations and Assessment Board

CAMBRIDGE International Education

[Turn over

1 The diagram shows a section of a generalised animal cell as seen under the electron microscope.



Which row shows cell structures where proteins and lipids are synthesised and where they are both packaged?

	proteins synthesised	**lipids synthesised**	**proteins and lipids packaged**
A	2	1	4
B	2	4	1
C	5	3	2
D	5	2	3

2 Which statements about glycosidic bonds are correct?

1 A hydroxyl group is formed on each molecule when a glycosidic bond is hydrolysed.

2 When glucose molecules polymerise they always form 1,4-glycosidic bonds.

3 The formation and breakage of glycosidic bonds is reversible.

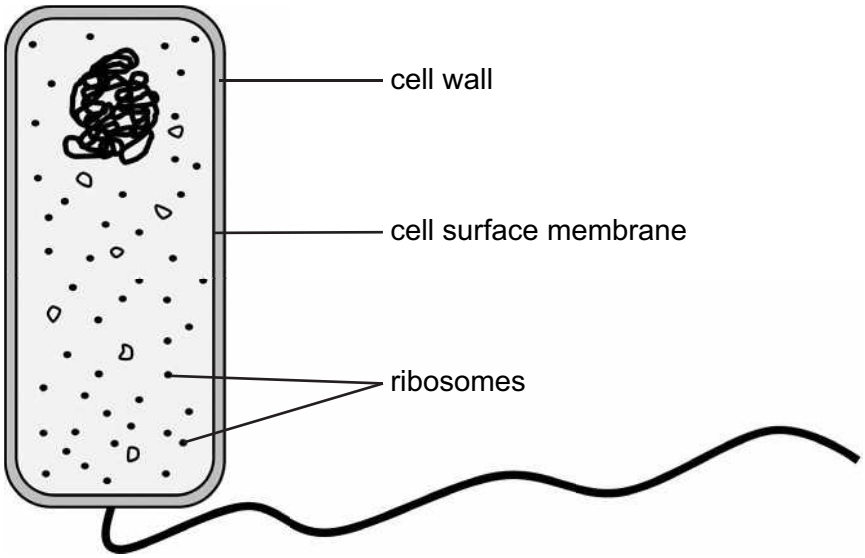
A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

3 The diagram shows a bacterial cell.



Which of the labelled structures contain chains of amino acids?

	cell wall	cell surface membrane	ribosome
A	✓	✓	✓
B	✓	✓	×
C	✓	×	✓
D	×	✓	✓

key
✓ = contains chains of amino acids
× = does **not** contain chains of amino acids

4 Which row shows correct examples of carbohydrates for each structural feature?

	monomers of α-glucose	monomers of β-glucose	hydrogen bonds	1,4-glycosidic bonds	1,6-glycosidic bonds
A	amylopectin	starch	cellulose	amylose	starch
B	amylose	cellulose	starch	amylopectin	amylose
C	amylose	cellulose	cellulose	amylose	amylopectin
D	cellulose	amylose	starch	cellulose	amylopectin

5 Which statement is true for phospholipids, but **not** for proteins?

A They form a barrier to water-soluble molecules.

B They are found in cell membranes.

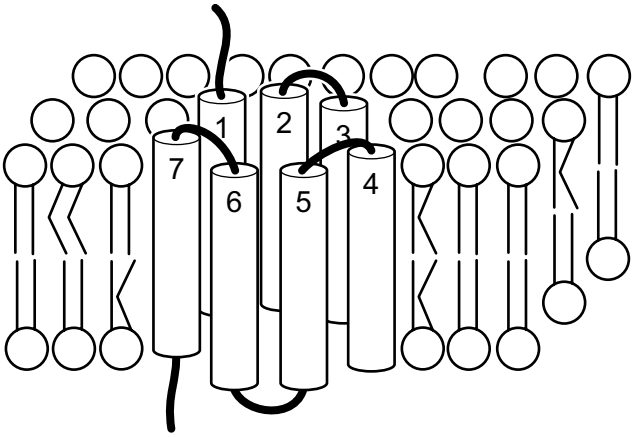
C Their molecules are synthesised from non-identical subunits.

D Their molecules have hydrophilic and hydrophobic components.

6 Which row correctly describes facilitated diffusion across a cell surface membrane?

	membrane proteins used	ATP required
A	no	no
B	no	yes
C	yes	no
D	yes	yes

7 Proteins which transport sugars out of cells have been identified. These proteins are called SWEETs. Each SWEET has seven coiled cylindrical regions, which together make up a pore through the cell surface membrane bilayer, as shown in the diagram.



What describes each of the seven coiled regions (1–7) of a SWEET shown in the diagram?

A primary structure held in its shape by ester bonds

B secondary structure held in its shape by hydrogen bonds

C tertiary structure held in its shape by peptide bonds

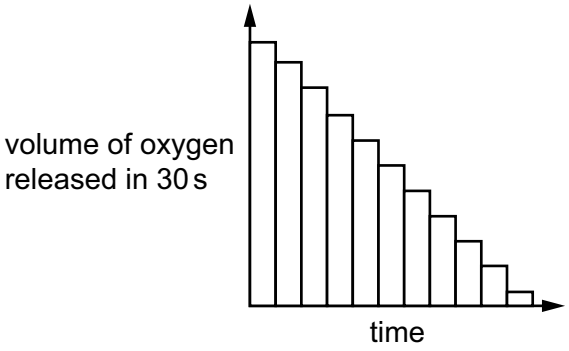
D quaternary structure held in its shape by peptide bonds

8 The decomposition of hydrogen peroxide to water and oxygen is catalysed by the enzyme catalase.

During an investigation, 2 cm^3 of catalase solution was added to 20 cm^3 of hydrogen peroxide solution. The oxygen released every 30 seconds was collected and the volume recorded.

Which chart shows the result of this investigation?

A



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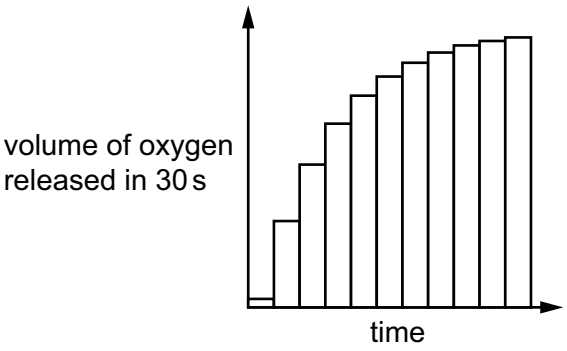

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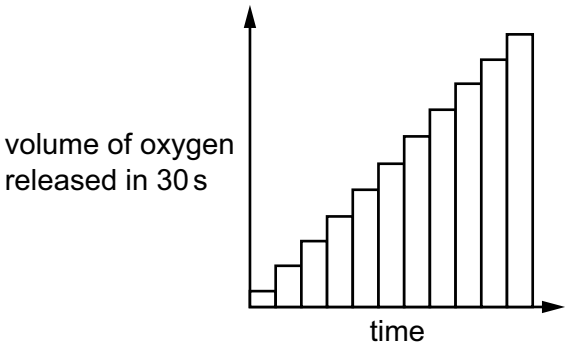
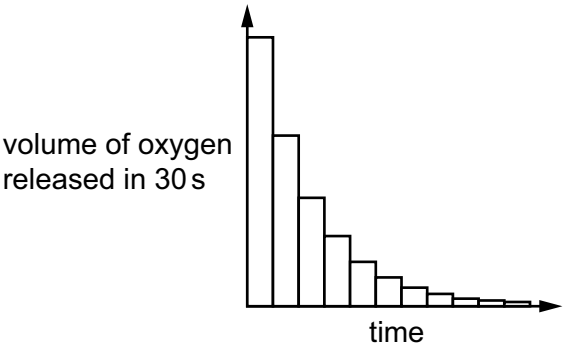


D



9 Some of the features of different types of stem cells are listed.

1 They can develop into all the cell types of the body to form a whole organism.

2 They can develop into a wide range of different types of cells.

3 They can divide indefinitely.

4 They can only develop into a limited range of cell types.

Which of these features will be shown by embryonic stem cells?

A 1 and 3 **B** 2 and 3 **C** 2 only **D** 3 and 4

10 Different viruses store genetic material in different types of nucleic acid, some of which are not normally found in cellular organisms. There are four main types of nucleic acid used to store genetic information in viruses:

- double-stranded RNA
- single-stranded RNA
- double-stranded DNA
- single-stranded DNA

The human polyomavirus and the porcine circovirus each contain one nucleic acid molecule.

The table shows the total number of nucleotides, the number of nucleotides containing the base cytosine and the number of nucleotides containing the base guanine in each of these nucleic acid molecules.

	human polyomavirus	**porcine circovirus**
total number of nucleotides	9878	1767
number of nucleotides containing cytosine	1815	491
number of nucleotides containing guanine	1815	362

What is the combined total number of hydrogen bonds between complementary nucleotide bases in the nucleic acid molecule of a human polyomavirus and the nucleic acid molecule of a porcine circovirus?

A fewer than 12 500

B between 12 500 and 25 000

C between 25 000 and 30 000

D more than 30 000

11 Acyclovir is a drug that can be used to treat infections with the herpes simplex virus by preventing viral DNA replication. In infected cells, a viral enzyme converts the drug into acyclovir monophosphate. Acyclovir monophosphate has a similar structure to the DNA nucleotide that contains the base guanine.

What could **not** explain how acyclovir monophosphate prevents viral DNA replication?

A It can act as an inhibitor of DNA polymerase.

B It can act as an inhibitor of RNA polymerase.

C It can be incorporated into the growing DNA strand.

D It can be phosphorylated to become an ‘activated’ nucleotide.

12 Three examples of the roles of hydrogen bonds in DNA and RNA are listed:

1 holding a folded polynucleotide in the correct shape

2 allowing a temporary binding of codons during translation

3 holding polynucleotide chains in a stable shape for storage.

For which polynucleotide molecules are the examples of hydrogen bonding specifically important?

	example 1	**example 2**	**example 3**
A	DNA	mRNA	tRNA
B	mRNA	rRNA	DNA
C	tRNA	DNA	mRNA
D	tRNA	mRNA	DNA

13 The table shows the DNA triplet codes for six amino acids. The DNA triplets are from the DNA strand complementary to mRNA.

amino acid	**DNA triplet code**
glycine	CCA, CCG, CCT, CCC
leucine	AAT, AAC, GAA, GAG, GAT, GAC
lysine	TTT, TTC
methionine	TAC
proline	GGA, GGG, GGT, GGC
threonine	TGA, TGG, TGT, TGC

The DNA sequence of the template strand of part of a gene is shown.

...TAC TTT AAT GGC CCT GAG GGC TAC TGT...

Which mutated template DNA sequence would result in the same amino acid sequence as the original template DNA sequence?

A ...TAC TTT AAT GGC CCT GAG GGT CCA TGT...

B ...TAC TTC GAT GGC CCT GAG GGC TAC TGT...

C ...TAC TTT AAT GGC CCG GAG TGA TAC TGT...

D ...TAC TTT AAT GGC CCT GAG GGC TTC TGT...

14 Vincristine is a chemical that binds to the microtubules of the spindle and prevents the spindle from functioning normally.

What effect would vincristine be expected to have on mitosis?

A Chromosomes would fail to condense.

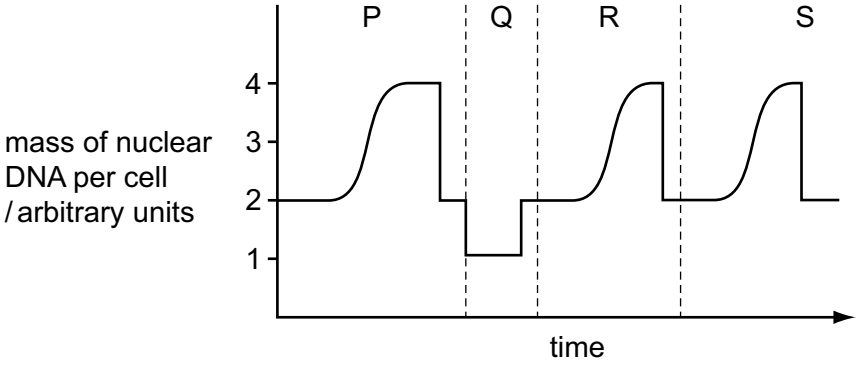
B Centromeres would fail to form.

C Chromatids would fail to separate.

D Nuclear envelope would fail to disintegrate.

15 A single cell from a female mammal undergoes changes that result in an ovum being formed. After the ovum is fertilised, further changes occur to form an embryo.

The graph shows the changes in the mass of nuclear DNA per cell during these events.



During which stages might genetic variation occur as a result of changes in the number of sets of chromosomes?

A P, Q and R

B P and Q only

C Q, R and S

D R and S only

16 Which statement about recessive alleles in mammals is true?

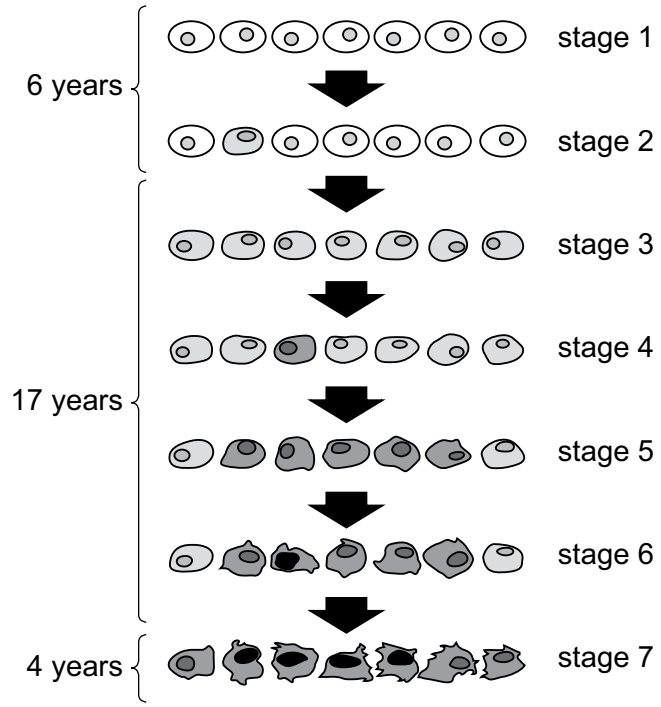
A If X-linked, they are expressed less frequently in males than females.

B Their possession is harmful to the organism.

C They are expressed in the homozygous condition.

D They are partially masked in the heterozygous condition.

17 The diagram represents stages in the development of a particular cancer in an adult person, over a period of 27 years.



Which row shows the processes happening between each of the stages indicated?

	stage 1 to stage 2	stage 3 to stage 4	stage 4 to stage 5	stage 5 to stage 6
A	mutation	mutation	proliferation	mutation
B	mutation	mutation and proliferation	proliferation	mutation and proliferation
C	mutation	proliferation	mutation and proliferation	mutation and proliferation
D	mutation and proliferation	mutation and proliferation	proliferation	mutation

18 A fly with wild-type wings and brown eyes was crossed with a fly with vestigial wings and red eyes. All the F1 offspring had wild-type wings and brown eyes.

When these F1 offspring were crossed with each other, the resulting F2 generation comprised:

- 21 male and 24 female flies with wild-type wings and brown eyes
- 10 male and 7 female flies with wild-type wings and red eyes
- 7 male and 9 female flies with vestigial wings and brown eyes
- 2 male and 3 female flies with vestigial wings and red eyes
- 1 male fly with wild-type wings and orange eyes.

What is a possible explanation for the results of this dihybrid cross?

A sex linkage

B codominance

C gene mutation

D multiple alleles

19 Which set of reactions releases the largest number of ATP molecules from one molecule of glucose?

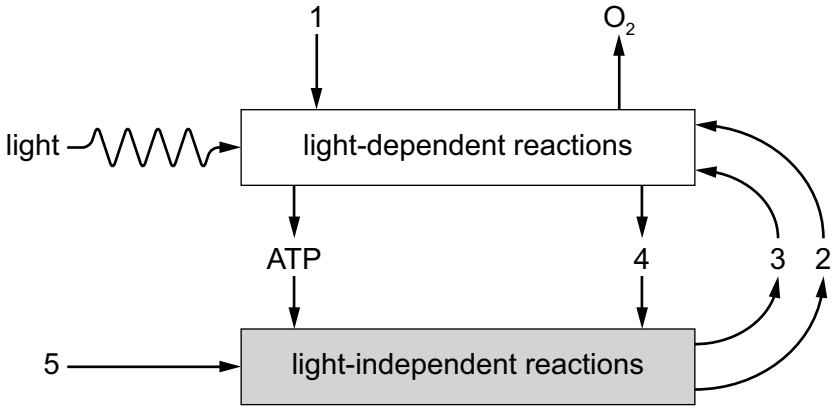
A conversion of glucose to carbon dioxide and ethanol

B conversion of glucose to carbon dioxide and water

C conversion of glucose to lactic acid

D conversion of glucose to pyruvate

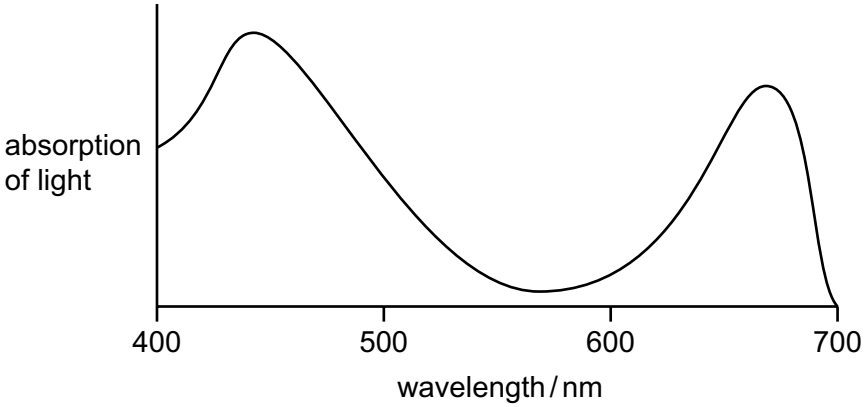
20 The diagram summarises the process of photosynthesis.



Which row identifies the reactants 1, 2, 3, 4 and 5?

	1	2	3	4	5
A	carbon dioxide	ADP + phosphate	reduced NAD	NAD	water
B	carbon dioxide	reduced NADP	ADP + phosphate	NADP	water
C	water	NAD	reduced NAD	ADP + phosphate	carbon dioxide
D	water	NADP	ADP + phosphate	reduced NADP	carbon dioxide

21 The graph shows the absorption of light at different wavelengths by intact chloroplasts from a pondweed.



A sample of the same pondweed was exposed to four different wavelengths of light of the same intensity for the same time. The table shows the number of bubbles produced by the pondweed at each wavelength of light.

experiment	number of bubbles			mean number of bubbles
1	15	14	16	15
2	12	11	13	12
3	3	4	2	3
4	1	2	0	1

Which row shows the mean number of bubbles produced by the different wavelengths of light investigated?

	mean number of bubbles			
	440 nm	**520 nm**	**560 nm**	**670 nm**
A	1	12	15	3
B	3	1	12	15
C	12	15	3	1
D	15	3	1	12

22 Until the early 1980s, the only species of ground finch living on the small Galápagos island of Daphne Major was *Geospiza fortis*.

In the years after a drought in 1977, when the seeds that they normally ate became scarce, the mean beak size of the finches in the population became larger, allowing the birds to eat larger, tougher seeds.

In the early 1980s, a larger species of ground finch, *G. magnirostris*, colonised the island and increased in number. *G. magnirostris* has a larger beak than that of *G. fortis*.

The numbers of both species fell in a drought in 2004, but *G. magnirostris* was better at cracking and eating the remaining large seeds. By 2005, the mean beak size of the *G. fortis* population was smaller than in previous years.

Which statements explain the changes in the mean beak size of the *G. fortis* population?

1 The mean beak size in the population changed as a result of natural selection.

2 After the drought in 1977, *G. fortis* with larger beaks were more likely to survive and breed than those with smaller beaks.

3 After the drought in 2004, the ability of *G. fortis* with larger beaks to survive and breed was reduced due to competition with *G. magnirostris*.

4 After the drought in 2004, *G. fortis* with smaller beaks were more likely to survive and breed than those with larger beaks.

A 1, 2, 3 and 4 **B** 1, 2 and 4 only **C** 2 and 3 only **D** 3 and 4 only

23 Myxomatosis is a viral disease of rabbits. It spreads rapidly and most rabbits die within 14 days of being infected. Myxomatosis has been deliberately used to reduce the number of rabbits in countries where they are a significant crop pest.

The initial release of the virus caused populations of rabbits to fall by over 90%. Resistance to myxomatosis increased in the 70 years following initial release, so at the present time up to 50% of infected rabbits are able to survive.

Which statement could explain the increasing frequency of resistance to myxomatosis in the years following release of the virus?

A During disease outbreaks there is greater food availability for the remaining rabbits, increasing the probability that infected rabbits will survive and breed.

B In populations with high incidences of myxomatosis, mutations leading to resistance are more likely to occur.

C Rabbits with genotypes that increase resistance to the disease are more likely to survive disease outbreaks and pass on their genes to the next generation.

D Since rabbits breed very rapidly, in between outbreaks of the disease the frequency of alleles for resistance to myxomatosis quickly increases.

24 The copying of DNA is **not** always accurate, resulting in occasional, random changes to its base sequence. For example, scientists have calculated that one amino acid in vertebrate haemoglobin protein is changed every 10 million years.

Which statement about this process is correct?

A Only the primary structure of a protein is affected by a single amino acid substitution.

B All changes in the base sequence of DNA are affected by natural selection.

C Natural selection can cause some of the amino acid changes in proteins.

D The variability of DNA in a population will be greater than the variability of its proteins.

25 The grey dagger and dark dagger are small moths that live in the same places and breed at the same time. They are identical in appearance but their reproductive systems are distinctly different.

The hooded crow and carrion crow are birds with a similar shape and size. Their behaviour and calls are also similar, but they are easily separated on appearance. In areas where the carrion crow and hooded crow both occur, they can reproduce together resulting in offspring that are intermediate in appearance. The offspring are less well adapted to the environment than either of their parents and hybrids do not spread outside of the region of overlap.

The common brushtail possum is a mammal that is found naturally in Australia. There is also a well-established and expanding population in New Zealand, separated from Australia by the Tasman Sea. The brushtail possum was introduced to New Zealand from Australia in the 1850s.

The Welsh ragwort is a plant that was first recorded in 1925. It is the result of recent hybridisation between two different species followed by a chromosomal aberration. It has a different number of chromosomes to both of the original parental species.

Which statement correctly interprets the biological concept of the species to draw a valid conclusion?

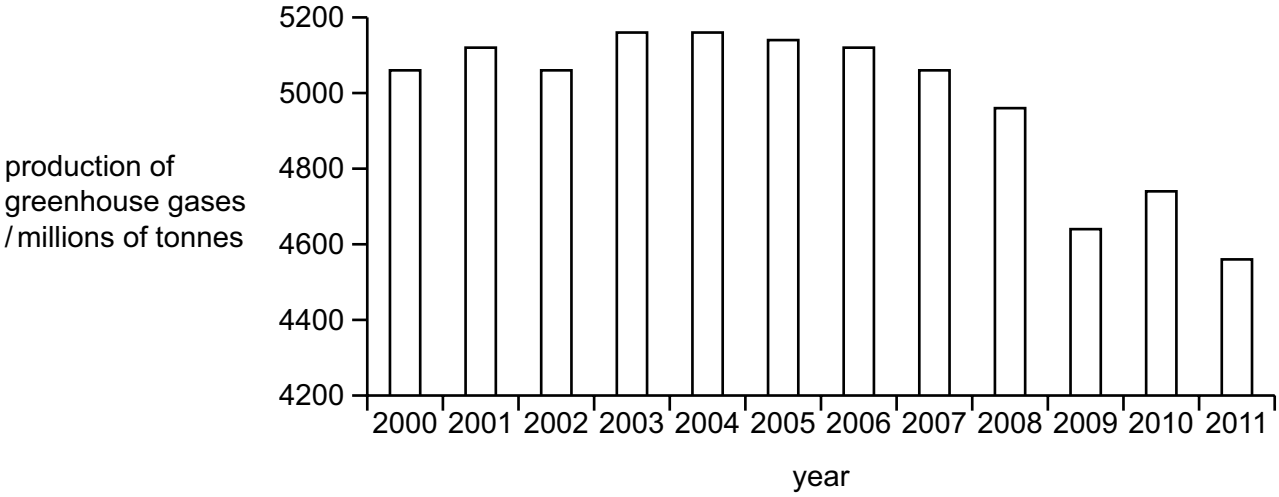
A The grey dagger and dark dagger moths should be classified as the same species because they appear identical. Differences in their reproductive systems do **not** justify classifying them as different species because these differences are only visible after killing and cutting the moths open.

B The hooded crow and carrion crow should be classified as the same species because hybridisation allows their genes to mix freely. As a result, in time it will **not** be possible to distinguish hooded crows and carrion crows from one another.

C The Australian and New Zealand populations of the brushtail possum should be classified as two different species because there is no possibility of gene flow between the two populations, showing that they **cannot** reproduce together.

D The Welsh ragwort should be classified as a separate species from both of its original parents because the differences in chromosome numbers mean that offspring of crosses between the Welsh ragwort and either of its parental species **cannot** form functional gametes.

26 The bar chart shows the production of greenhouse gases (CO_2 and methane) from agriculture in the European Union (EU) from 2000 to 2011, measured in millions of tonnes.



Which of the following could contribute to the trend seen between 2003 and 2009?

A conversion of intensive farmland into woodland reserves

B greater use of agricultural machinery for harvesting

C increased consumption of meat-based products

D increased import and export of crops between EU countries

27 Bhutan was the first country in the world to achieve carbon negativity. This means that in Bhutan, more carbon dioxide and other greenhouse gases are removed from the atmosphere every year than are released.

Which description could account, on its own, for the fact that Bhutan removes more greenhouse gases from the atmosphere than it releases?

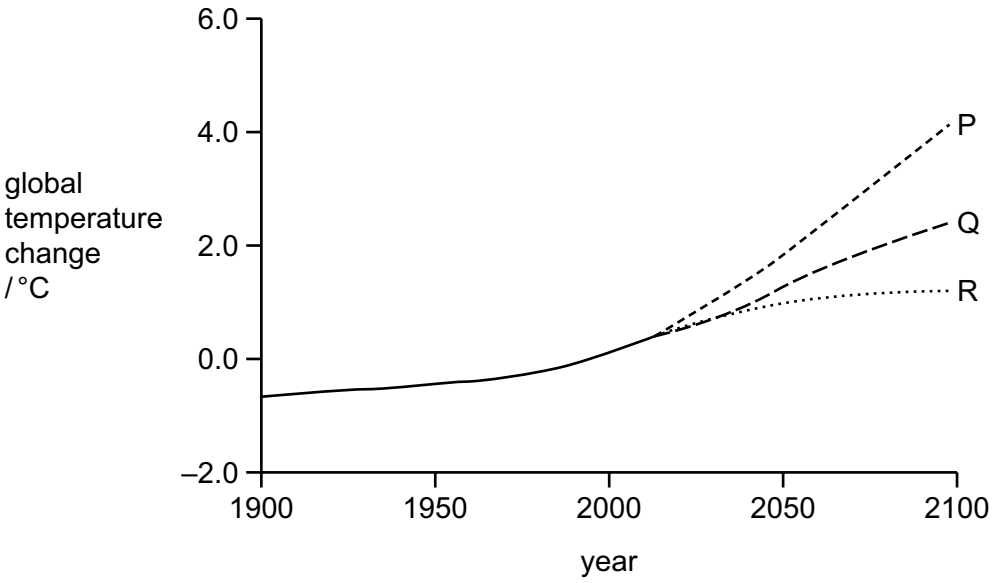
A Bhutan has a small population of fewer than one million and more than 75% of its land area is forested.

B Bhutan generates most of its energy without using fossil fuels and exports much of this energy to neighbouring countries, such as India.

C Manufacturing contributes little to the economy of Bhutan with agriculture providing the main income for a large proportion of the population.

D In Bhutan, export of logs from forestry is banned and free electricity is provided to rural farmers.

28 The graph shows the predicted change in global temperatures (compared to 1992) using three different models, P, Q and R. Model Q assumes that no new factors act to influence the rate of climate change.



The predictions based on models P and R can be explained using some of the following statements.

1 An increased global temperature and reduced rainfall will lead to an increase in forest fires.

2 Soil and sediment that has been frozen for thousands of years in the Arctic will begin to thaw as global temperatures increase.

3 Rising sea temperatures will cause increased growth of photosynthetic algae.

4 Rising sea temperatures will reduce the solubility of greenhouse gases in the oceans.

Which row correctly links each statement to the model that it supports?

	statements that support model P	**statements that support model R**
A	1, 2 and 4	3
B	1 and 3	2 and 4
C	2	1, 3 and 4
D	3 and 4	1 and 2

29 Over a 100-year period, the emission of 10 tonnes of nitrous oxide has the same contribution to global warming as the emission of 2650 tonnes of carbon dioxide. One tonne is equal to 1000 kg.

Which statement is a correct consequence of this relationship over a 100-year period?

A For the same mass of gas released, the contribution to global warming of carbon dioxide is less than 0.04% of the contribution of nitrous oxide.

B Nitrous oxide is 2650 times more effective as a greenhouse gas than carbon dioxide.

C Releasing 1 tonne of carbon dioxide has a smaller contribution to global warming than releasing 3.8 kg of nitrous oxide.

D A 0.1% reduction in the release of nitrous oxide into the atmosphere would have the same effect on global warming as a 26.5% reduction in the release of carbon dioxide.

30 Rice crops in Japan are damaged by the green rice leafhopper, *Nephotettix cincticeps*, an insect pest that reduces crop yield.

In a study of the effect of climate change on crop damage by the green rice leafhopper, it was found that an increase in winter temperatures caused an increase in damage, while an increase in summer temperatures caused a decrease in crop damage.

Which of the following are possible explanations for these findings?

1 Increased temperatures in the summer cause a rise in metabolic rate that results in the leafhoppers reproducing more rapidly.

2 Increased temperatures in the summer raise the metabolic rate above the range that the leafhoppers can tolerate.

3 Increased temperatures in the winter disrupt the leafhopper's life cycle and result in fewer being able to reproduce.

4 Increased temperatures in the winter allow more leafhoppers to survive, resulting in an increase in the leafhopper's population.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

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