

FOR OFFICIAL USE

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Totals for
Sections
B and C

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X274/12/02

NATIONAL WEDNESDAY, 23 MAY
QUALIFICATIONS 1.00 PM – 3.30 PM
2012

BIOLOGY
HIGHER (REVISED)

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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SECTION A—Questions 1—30 (30 Marks)

Instructions for completion of Section A are given on Page two.

For this section of the examination you must use an **HB pencil**.

SECTIONS B AND C (100 Marks)

- (a) All questions should be attempted.
(b) It should be noted that in **Section C** questions 1 and 2 each contain a choice.
- The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, **and must be written clearly and legibly in ink**.
- Additional space for answers will be found at the end of the book. If further space is required, supplementary sheets may be obtained from the Invigilator and should be inserted inside the **front** cover of this book.
- The numbers of questions must be clearly inserted with any answers written in the additional space.
- Rough work, if any should be necessary, should be written in this book and then scored through when the fair copy has been written. If further space is required, a supplementary sheet for rough work may be obtained from the Invigilator.
- Before leaving the examination room you must give this book to the Invigilator. If you do not, you may lose all the marks for this paper.



Read carefully

- 1 Check that the answer sheet provided is for **Biology Higher (Revised) (Section A)**.
- 2 For this section of the examination you must use an **HB pencil**, and where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate Number) and **Centre Name** printed on it.
Do not change any of these details.
- 4 If any of this information is wrong, tell the Invigilator immediately.
- 5 If this information is correct, **print** your name and seat number in the boxes provided.
- 6 The answer to each question is **either** A, B, C or D. Decide what your answer is, then, using your pencil, put a horizontal line in the space provided (see sample question below).
- 7 There is **only one correct** answer to each question.
- 8 Any rough working should be done on the question paper or the rough working sheet, **not** on your answer sheet.
- 9 At the end of the examination, put the **answer sheet for Section A inside the front cover of this answer book**.

Sample Question

The apparatus used to determine the energy stored in a foodstuff is a

- A calorimeter
- B respirometer
- C klinostat
- D gas burette.

The correct answer is **A**—calorimeter. The answer **A** has been clearly marked in **pencil** with a horizontal line (see below).



Changing an answer

If you decide to change your answer, carefully erase your first answer and using your pencil fill in the answer you want. The answer below has been changed to **D**.



SECTION A

**All questions in this section should be attempted.
Answers should be given on the separate answer sheet provided.**

1. The genetic material in the mitochondria of eukaryotic cells is found in
- A linear chromosomes
 - B circular plasmids
 - C circular chromosomes
 - D inner membranes.

2. A DNA molecule contained 8000 nucleotides of which 20% contained adenine.

How many nucleotides would have contained guanine?

- A 1600
- B 2400
- C 3200
- D 4800

3. The following three questions relate to evolution.

- 1 How closely are groups of organisms related?
- 2 At what times did lineages diverge?
- 3 What is the main sequence of events in evolution?

Which questions could be answered using sequence data?

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

4. The list below shows barriers to gene exchange which can be important in speciation.

- 1 behavioural
- 2 geographical
- 3 ecological

Which line in the table below correctly matches the barriers with the type of speciation in which they are involved?

	<i>Type of speciation</i>	
	<i>Sympatric</i>	<i>Allopatric</i>
A	1 and 3	2 only
B	1 and 2	3 only
C	2 only	1 and 3
D	1 only	2 and 3

5. The hooded crow and the carrion crow can hybridise in parts of Scotland where both species are found. During an investigation within the zone of hybridisation, the numbers of each species and any hybrids found were estimated at each of three counting stations.

<i>Counting station</i>	<i>Crows</i>		
	<i>Hooded</i>	<i>Carrion</i>	<i>Hybrid</i>
1	90	70	40
2	40	30	30
3	40	10	50

What percentage of the crows at counting station 1 were hybrids?

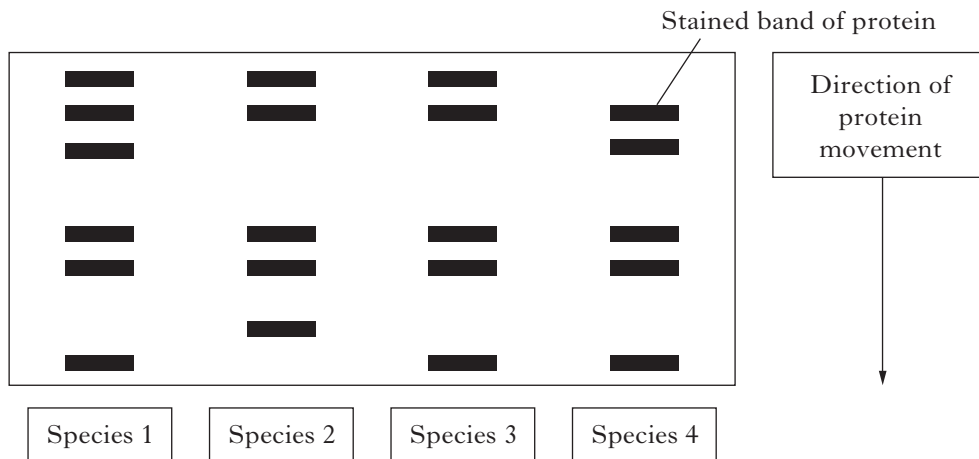
- A 10%
- B 20%
- C 25%
- D 40%

Questions 6 and 7 refer to the following information.

Protein fingerprinting is a technique used to compare proteins from different species. Species which are closely related have similar protein fingerprints.

Samples of protein are extracted from cells, separated by gel electrophoresis, then stained to make each type of protein show up as a band. The smaller the protein molecules the further they travel through the gel.

The diagram below shows protein fingerprints for four different species.



6. Which species contain protein with the smallest molecules?

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

7. Which two species show the **greatest** difference in their protein fingerprints?

- A Species 1 and 4
- B Species 1 and 2
- C Species 1 and 3
- D Species 3 and 4

8. Proteins may be modified after translation before they become functional.

The list shows changes which could modify protein chains.

List

- 1 cutting and combining polypeptide chains
- 2 adding carbohydrates to the protein chain
- 3 adding phosphates to the protein chain

Which of these changes are examples of post translation modifications?

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

9. Which chromosome structure mutation involves a section of one chromosome becoming detached and joined to a different chromosome?

- A deletion
- B duplication
- C inversion
- D translocation

10. Which line in the table below correctly describes meristems?

	Type of cell present	Cell division occurring
A	specialised	no
B	unspecialised	no
C	specialised	yes
D	unspecialised	yes

11. Membranes can form small compartments within cells.

Small compartments have

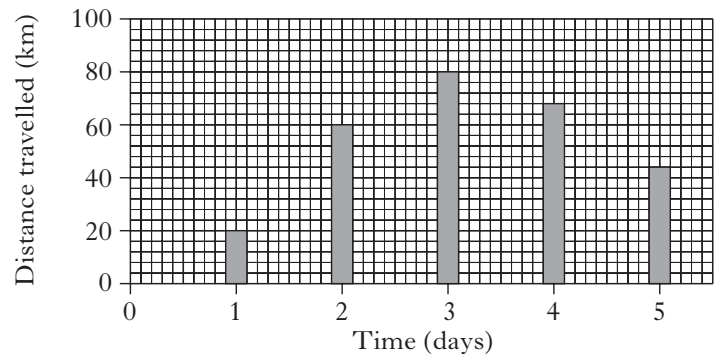
- A high surface to volume ratios and allow low concentrations of substrates inside
- B high surface to volume ratios and allow high concentrations of substrates inside
- C low surface to volume ratios and allow low concentrations of substrates inside
- D low surface to volume ratios and allow high concentrations of substrates inside.

12. An inhibitor of an enzyme-catalysed reaction can be described as competitive if

- A its effect is decreased by raising substrate concentrations
- B it is the final product in a metabolic pathway
- C it switches off the gene encoding the enzyme
- D it permanently changes the shape of the active site.

13. The buff-breasted pipit is a bird which migrates into parts of the USA each spring.

The chart below shows the average distance travelled by the birds in the first five days of their migration.

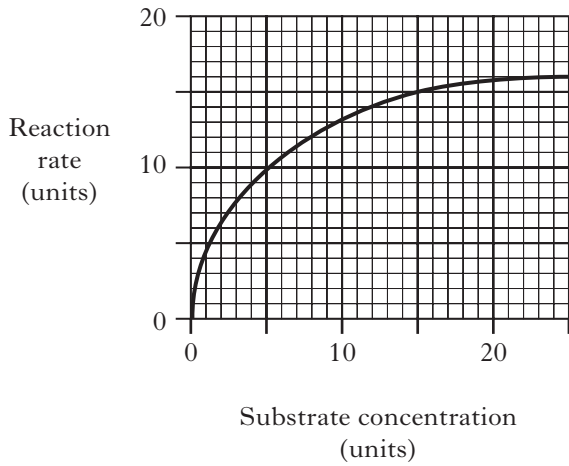


The greatest distance travelled by the pipit is on days

- A 1 and 2
- B 2 and 3
- C 3 and 4
- D 4 and 5.

[Turn over

14. The graph below shows the effect of substrate concentration on the rate of an enzyme-catalysed reaction.



At which substrate concentration is the reaction rate equal to 75% of the maximum rate?

- A 5 units
- B 8 units
- C 12 units
- D 15 units

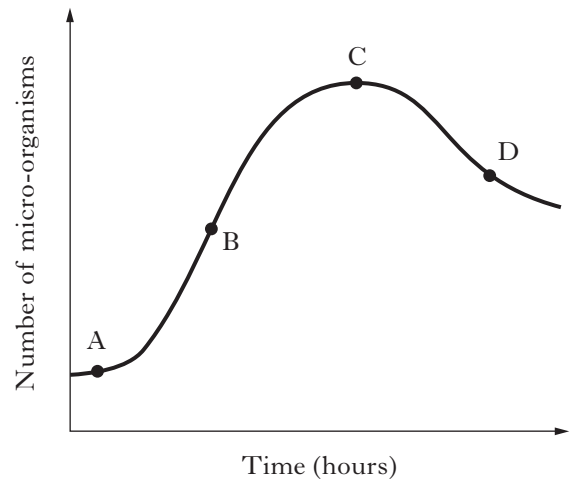
15. The reaction below is part of a metabolic pathway in cells.



Which line in the table below correctly identifies the type of reaction and whether it releases or takes up energy?

	Type of reaction	Energy released or taken up
A	catabolic	released
B	anabolic	released
C	catabolic	taken up
D	anabolic	taken up

16. The graph below shows a typical growth pattern for micro-organisms in culture.



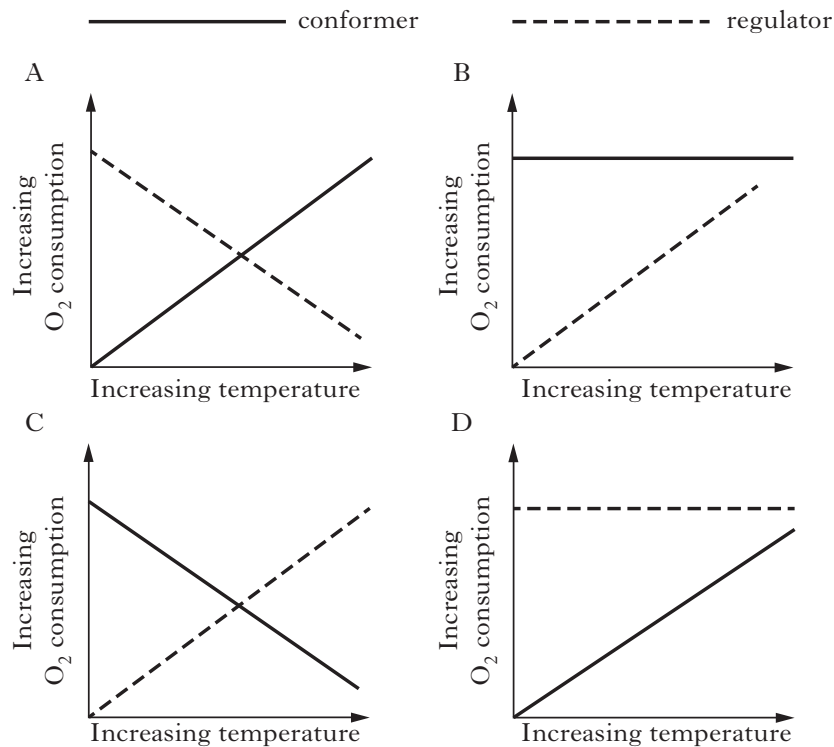
At which point on the graph are most enzymes being induced to metabolise available substrates?

17. The energy content of a glucose molecule is 2900 kilojoules. A glucose molecule entering aerobic respiration transfers 1160 kilojoules of the energy to ATP.

What percentage of energy in glucose is transferred to ATP?

- A 40
- B 60
- C 150
- D 250

18. Which graph below best illustrates the effect of increasing temperature on oxygen consumption in a conformer and a regulator?



19. The gene encoding a protein was removed from the human genome and transferred into two different recipient cells by different methods as shown in the table below.

<i>Recipient cells</i>	<i>Method of transfer</i>
bacteria	bacterial plasmid
yeast	artificial chromosome

The protein was functional **only** when produced in yeast cells.

The most likely reason for this was because the

- A bacterial plasmids did not contain marker genes
- B protein produced in bacteria had an incorrect amino acid sequence
- C bacterial plasmids did not contain self-replication genes
- D protein produced in bacteria was not folded correctly.

20. Some species of lungfish live in African lakes. If there is a drought, lakes may dry out but the lungfish can survive by burying themselves in the remaining mud and becoming dormant.

Which line in the table correctly identifies the description and the type of dormancy displayed by the lungfish in these circumstances?

	<i>Description of dormancy</i>	<i>Type of dormancy</i>
A	predictive	aestivation
B	consequential	aestivation
C	predictive	hibernation
D	consequential	hibernation

21. Which of the following are adaptations of **perennial** weeds?

- A short life cycle and storage organs
- B storage organs and vegetative reproduction
- C high seed output and short life cycle
- D vegetative reproduction and short life cycle

22. Dandelions are weeds which often grow in grass lawns.

Which of the following could be sprayed onto a lawn to remove the dandelions?

- A non-selective herbicide
- B non-selective fungicide
- C selective herbicide
- D selective fungicide

23. Which line in the table below correctly describes the type of variation and inheritance pattern normally involved in growth rate in pigs?

	Type of variation	Inheritance pattern
A	continuous	polygenic
B	discrete	polygenic
C	continuous	single gene
D	discrete	single gene

24. A cabbage crop was sprayed with pesticide to treat an infestation of caterpillars. The concentration of pesticide was measured in the tissues of the caterpillars and of birds which ate them.

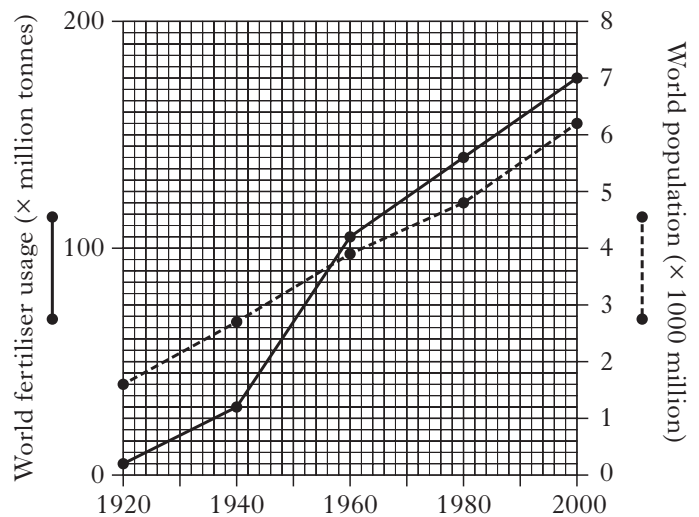
Which line in the table below shows the animal with the highest pesticide concentration in its tissues and identifies the reason for this?

	Animal with highest pesticide concentration	Reason
A	caterpillars	pesticide is systemic
B	caterpillars	accumulation has occurred
C	birds	pesticide is systemic
D	birds	accumulation has occurred

25. Which line in the table below best describes the effects of altruistic behaviour on the donor and the recipient?

	Effect on donor	Effect on recipient
A	benefits	benefits
B	benefits	harms
C	harms	benefits
D	harms	harms

26. The graph below shows how world population and fertiliser usage changed between 1920 and 2000.



Which of the following conclusions can be drawn from these results?

- A World fertiliser usage was 55 million tonnes in 1930.
- B World population increased steadily between 1960 and 2000.
- C World fertiliser usage was 140 million tonnes in 1980.
- D World fertiliser usage first increased more rapidly than the population growth in 1956.

27. A pride of lions was studied hunting for three different prey species.

The table below shows the number of hunts carried out and the percentage of hunts that resulted in one kill.

<i>Prey species</i>	<i>Number of hunts</i>	<i>Percentage of hunts resulting in one kill</i>
Buffalo	60	15
Impala	80	30
Wildebeest	80	25

Which of the following conclusions can be drawn from this data?

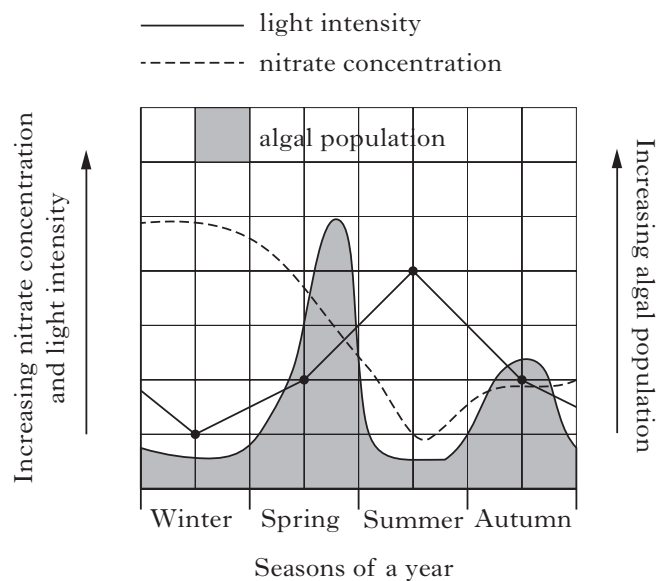
- A Cooperative hunting allows the lions to hunt more successfully.
- B Lions killed more impala than any other prey species.
- C Buffalo used social defence mechanisms most successfully.
- D More individual buffalo escaped than any other prey species.
28. Which of the following best describes the effect of the emergence of a dominant heather species on a moorland plant community?

- A Lowers species diversity and lowers relative abundance of the dominant heather
- B Raises species diversity and raises relative abundance of the dominant heather
- C Lowers species diversity and raises relative abundance of the dominant heather
- D Raises species diversity and lowers relative abundance of the dominant heather

29. Which of the following best describes why worker honeybees from the same colony cooperate?

- A They are closely related.
- B They are keystone species.
- C Each individual benefits.
- D This helps them to pollinate flowers.

30. The graph below shows how the population of algae in a fresh water loch was affected by the concentration of nitrate ions in the loch water and by light intensity through the seasons of a year.



Which of the following statements can be deduced from the graph?

- A The increase in algal population in spring is triggered by an increase in concentration of nitrate ions in the water.
- B The size of the algal population depends directly on the level of light intensity.
- C The increase in nitrate ion concentration in late summer is followed by an increase in algal population.
- D The algal population decreases when light intensity decreases.

Candidates are reminded that the answer sheet MUST be returned INSIDE the front cover of this answer booklet.

[Turn over

Marks

SECTION B

**All questions in this section should be attempted.
All answers must be written clearly and legibly in ink.**

1. (a) DNA and RNA molecules are found in the cells of both eukaryotes and prokaryotes. DNA molecules are double-stranded whereas RNA molecules are single-stranded.

(i) Give **two** other structural differences between DNA and RNA molecules.

1 _____

2 _____

2

(ii) Describe the function of RNA polymerase in the synthesis of a primary transcript.

2

(iii) In eukaryotic cells mRNA is spliced after transcription.

Describe what happens during RNA splicing.

1

(iv) Describe the role of mRNA in cells.

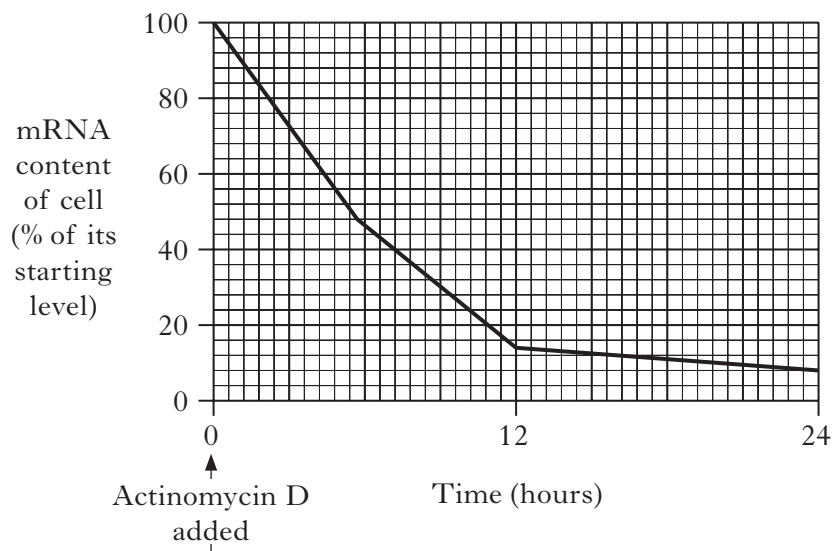
1

Marks

1. (continued)

- (b) Actinomycin D is an antibiotic which binds to DNA in cells of both eukaryotes and prokaryotes and inhibits transcription.

The graph below shows changes in the mRNA content of a cell over a 24 hour period after actinomycin D was added.



- (i) State the time taken for the mRNA content of the cell to drop by 70% of its starting level.

_____ hours **1**

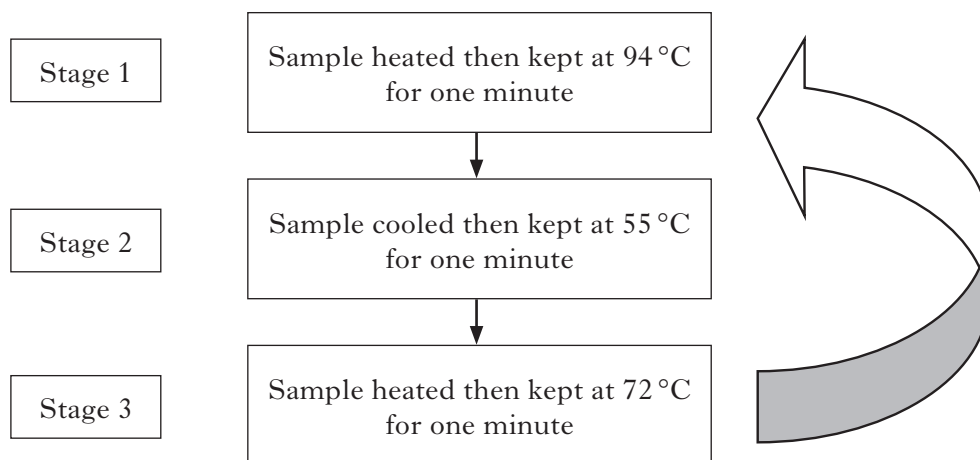
- (ii) Explain why actinomycin D would not be suitable in the treatment of bacterial infections in humans.

2

[Turn over

Marks

2. The polymerase chain reaction (PCR) amplifies specific sequences of DNA *in vitro*. The flow chart below shows how a sample of DNA was treated during a cycle of the PCR procedure.



- (a) Describe the effect of heating the DNA at Stage 1.

1

- (b) Give the reason for decreasing the temperature to 55 °C at Stage 2.

1

- (c) (i) Name the enzyme used to replicate DNA.

1

- (ii) State the role of primers in DNA replication during PCR and explain why two different primers are needed.

Role _____

1

Explanation _____

1

Marks

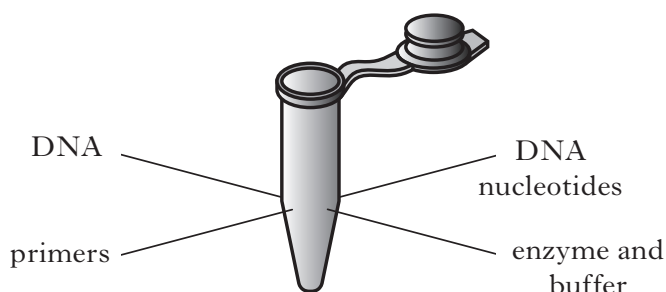
2. (continued)

- (d) The number of DNA molecules doubles each cycle of the PCR procedure.
Calculate the number of cycles needed to produce 128 copies of a single DNA molecule.

Space for calculation

_____ cycles **1**

- (e) The diagram below shows the contents of a tube used in a PCR procedure.



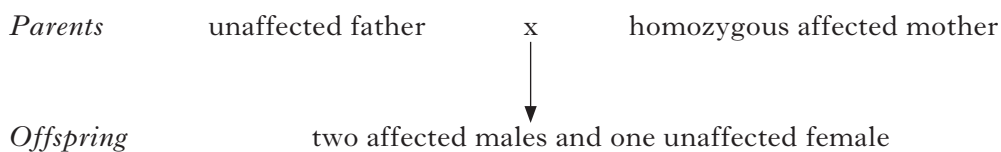
Describe the contents of a suitable control tube designed to show that DNA is needed in a PCR reaction.

1

[Turn over

Marks

3. Haemophilia B is a genetically inherited condition in humans which affects a protein required for blood clotting. The information below shows the inheritance of this condition in a family in which some of the individuals are affected by haemophilia B.



- (a) (i) State why the pattern of inheritance shown above is described as vertical.

1

- (ii) What evidence indicates that haemophilia B is caused by a recessive allele?

2

- (b) Haemophilia B can result from a point mutation in the gene which codes for the protein required for the clotting of blood.

- (i) Name a point mutation and describe how it affects the nucleotide sequence of a gene.

Name _____

Description _____

1

- (ii) Explain the effect of a point mutation on the structure of the protein produced.

2

Marks

3. (continued)

- (c) The treatment for haemophilia B involves injections of human Factor IX protein.

Human proteins can be produced by genetically modified micro-organisms and used to treat human disease.

- (i) State **one** advantage of using protein produced by genetically modified micro-organisms to treat human disease.

1

- (ii) Give **one** risk associated with using genetically modified micro-organisms to produce human protein.

1

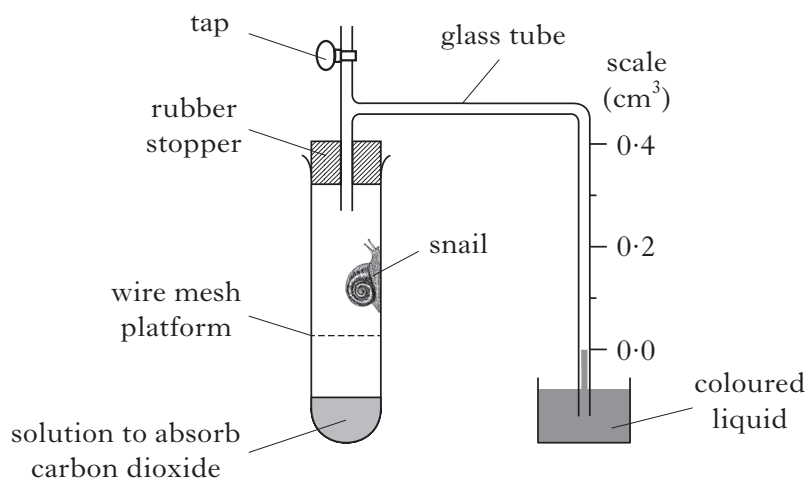
- (iii) Describe **one** ethical issue associated with genetically modifying micro-organisms.

1

[Turn over

4. In an investigation into the metabolic rate of a snail at rest, its oxygen uptake was measured using the apparatus shown in the diagram below.

Marks



The apparatus was kept at 10 °C with the tap open for 15 minutes. To start the experiment, the tap was closed and the reading on the scale recorded.

Every 2 minutes for 10 minutes, the oxygen uptake was recorded by taking readings from the scale.

The results are shown in the table below.

<i>Time after tap closed</i> (minutes)	<i>Oxygen uptake</i> (cm ³)
0	0.00
2	0.04
4	0.08
6	0.12
8	0.18
10	0.20

- (a) (i) Explain why the apparatus was left for 15 minutes with the tap open before readings were taken.

1

- (ii) To ensure validity, identical apparatus was set up without the snail. Explain why this ensures valid results.

1

- (b) (i) Identify the dependent variable in this investigation.

1

4. (b) (continued)

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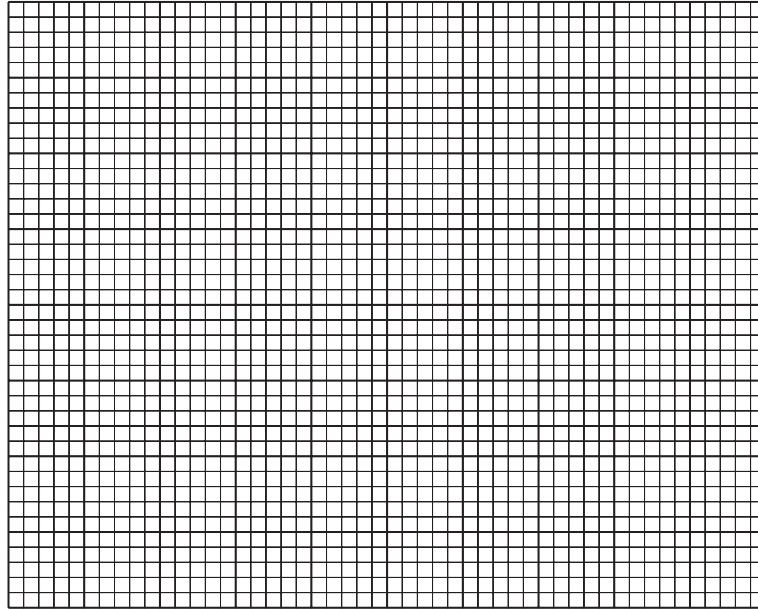
- (ii) To increase the reliability of results, the experiment was repeated several times.

Marks

Identify **one** variable, **not already mentioned**, which would have to be kept the same each time to ensure that the procedure was valid.

1

- (c) On the grid below, draw a line graph to show the oxygen uptake against time.
(Additional graph paper, if required, will be found on *Page thirty-six*.)



2

- (d) The mass of the snail was 5.0 g.

Use the results in the table to calculate the average rate of oxygen uptake per gram of snail per minute over the 10 minute period.

Space for calculation

_____ cm³ per gram per minute

1

- (e) Predict the effect of an increase in temperature to 15 °C on the oxygen uptake by the snail and justify your answer.

Prediction _____

Justification _____

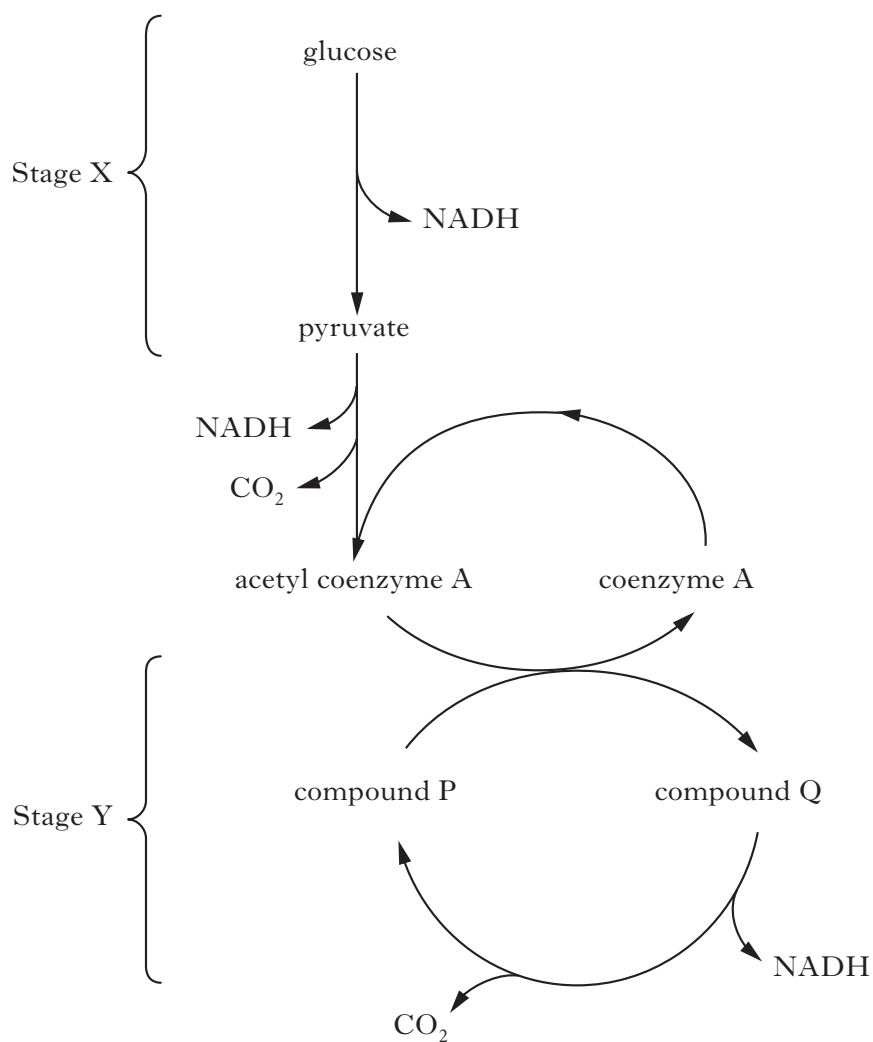
1

- (f) Explain how the respiration of the snail and the presence of the solution in the test tube results in the movement of liquid on the scale.

2

Marks

5. The diagram below shows parts of two stages in the aerobic respiration of glucose.



(a) Name stages X and Y.

X _____

Y _____

1

(b) Name compounds P and Q.

P _____

1

Q _____

1

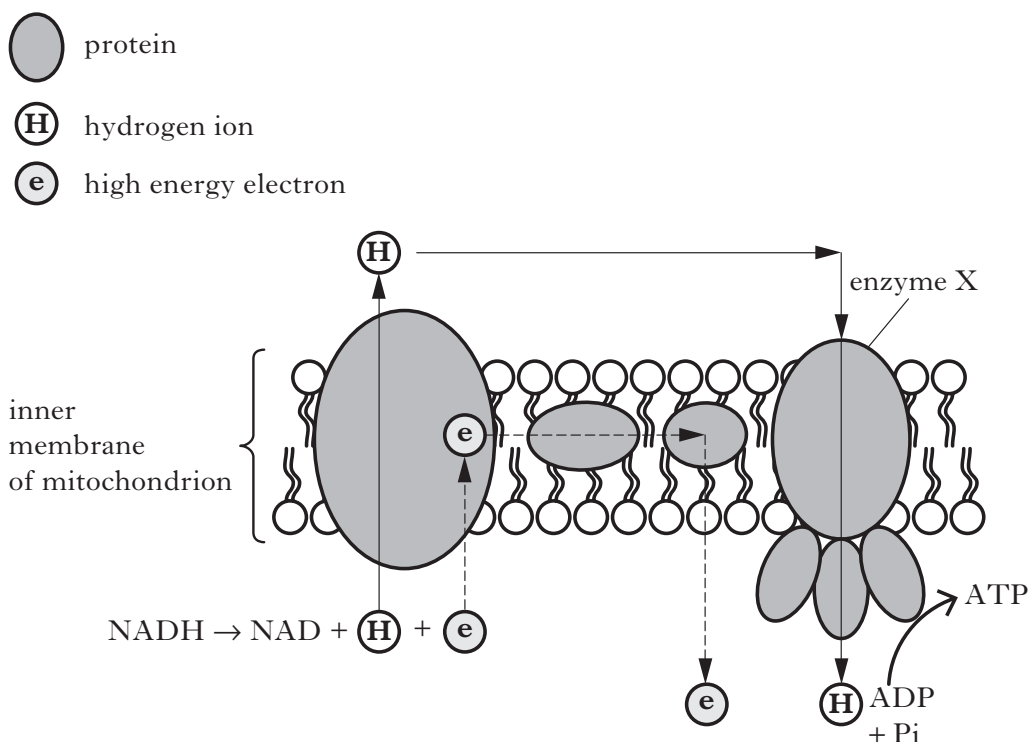
5. (continued)

Marks

(c) Describe the role of the dehydrogenase enzymes in stages X and Y.

2

(d) The diagram below shows part of the electron transport chain attached to the inner membrane of a mitochondrion.



(i) In this system, hydrogen ions are pumped across the inner mitochondrial membrane as shown in the diagram.

Describe the source of energy required for this process.

1

(ii) The return flow of hydrogen ions drives enzyme X which results in the production of ATP.

Name enzyme X.

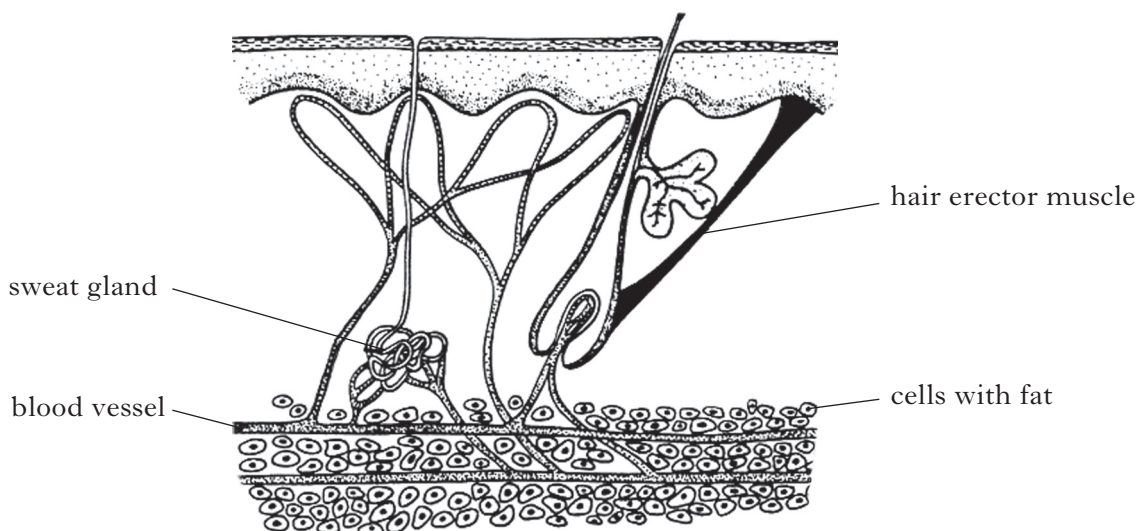
1

(iii) State the role of oxygen in the electron transport chain.

1

Marks

6. The diagram below represents a section through the skin of a mammal.



(a) Select **one** structure labelled in the diagram and explain how it responds to a **decrease** in temperature to bring about a correction in body temperature.

Structure _____

Explanation _____

2

(b) (i) Explain the importance of thermoregulation to mammals.

2

(ii) Reptiles have behavioural adaptations to help them to thermoregulate.
Give **one** example of this.

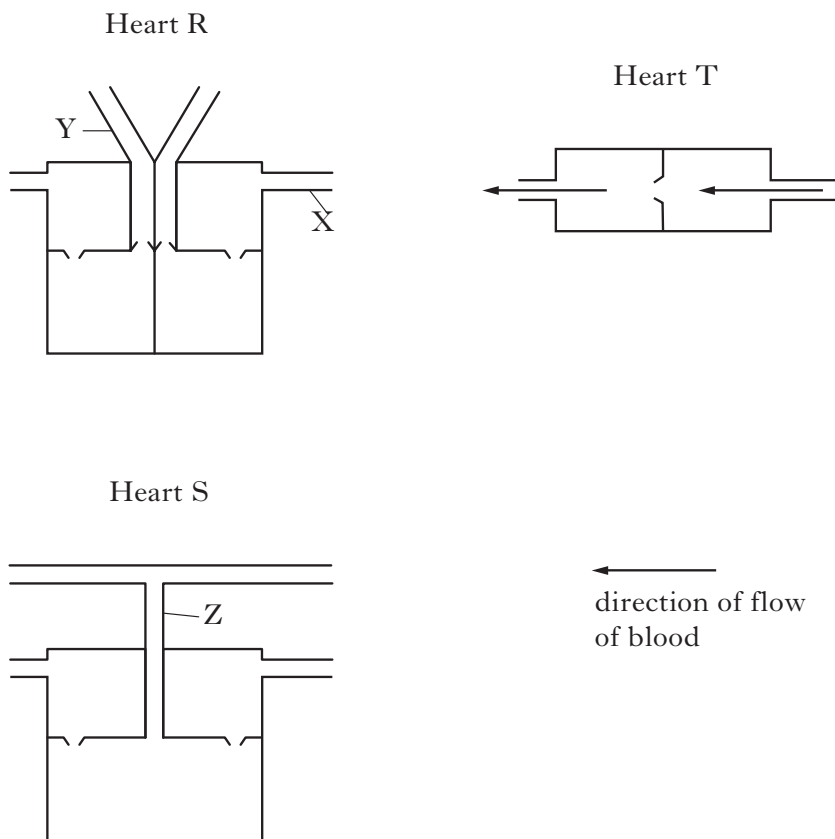
1

(c) Name **one** external abiotic factor, other than temperature, which can affect the ability of an organism to maintain its metabolic rate.

1

Marks

7. The following diagrams represent the structures of fish, mammal and amphibian hearts.



- (a) Complete the table below by inserting the correct letters, animal group and type of circulation.

Heart	Animal group	Type of circulation (single, incomplete double or complete double)
		single
	mammal	
S		

- (b) Add arrows in the vessels X, Y and Z on the diagrams to indicate the direction of flow of blood within them.
- (c) Explain how heart R is better adapted than heart S to allow a high metabolic rate in the cells which it supplies with blood.

2

1

2

Marks

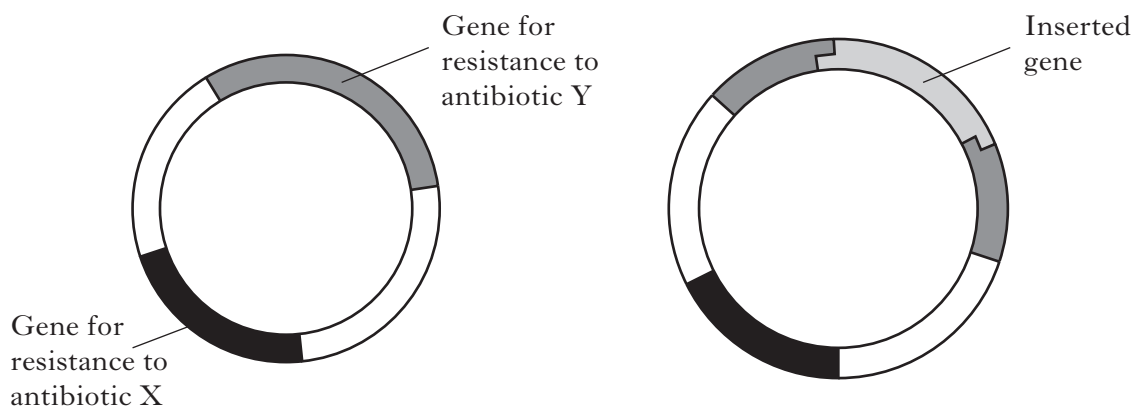
8. **Diagram 1** below shows a plasmid that contains two genes for antibiotic resistance. **Diagram 2** shows the same plasmid after modification by the insertion of a gene from another organism.

Diagram 1

Plasmid before modification

Diagram 2

Plasmid after modification



- (a) Two different enzymes are required to produce the modified plasmid.

Complete the table below by:

- | | |
|--|----------|
| (i) naming the enzyme which cuts plasmids at specific restriction sites; | 1 |
| (ii) naming the second enzyme required to modify plasmids; | 1 |
| (iii) describing the function of the second enzyme. | 1 |

<i>Enzyme required to produce modified plasmids</i>	<i>Function of enzyme in the modification process</i>
	Cuts plasmids at specific restriction sites

- (b) Bacteria took up the modified plasmids.

Explain why these bacteria will not have resistance to antibiotic Y.

1

[Turn over for Question 9 on *Page twenty-four*

9. Human food production can be increased by the use of fertiliser which improves crop growth.

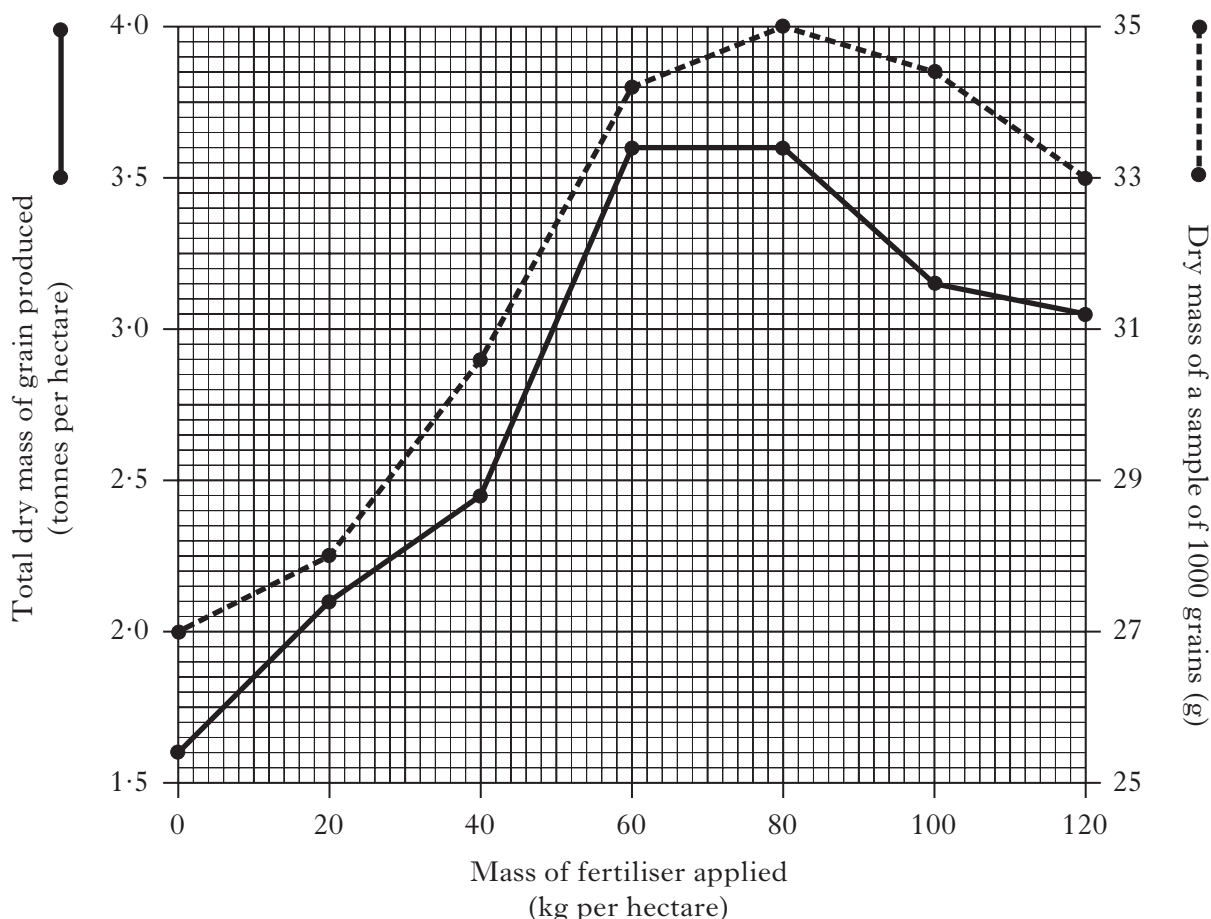
Marks

A field trial was carried out to show how the mass of fertiliser applied per hectare affected the growth of a wheat crop and to determine the level of fertiliser which should be recommended for use with this crop.

After the harvest of the wheat at each fertiliser level the following measurements of plant growth were made.

- Total dry mass of grain produced per hectare
- Dry mass of a sample of 1000 grains

The results are shown in the graph below.



- (a) (i) Use values from the graph to describe the changes in the total dry mass of grain produced as the fertiliser application increased from 40 kg to 120 kg per hectare.

2

- (ii) Calculate the average increase in total dry mass of grain produced for every additional kg of fertiliser applied from 0 kg to 80 kg per hectare.

Space for calculation

_____ tonnes per hectare

1

9. (continued)

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- (b) (i) Calculate the simplest whole number ratio of the dry mass of 1000 grains produced at 0 kg fertiliser per hectare to that at 120 kg fertiliser per hectare.

Marks

Space for calculation

_____ : _____
At 0 kg per hectare At 120 kg per hectare

1

- (ii) Calculate the **percentage increase** in the dry mass of 1000 grains when the fertiliser level was increased from 20 kg to 80 kg per hectare.

Space for calculation

_____ %

1

- (c) At which fertiliser level is the average dry mass of an individual wheat grain the greatest.

Tick (✓) the correct box.

60 kg per hectare	80 kg per hectare	100 kg per hectare	120 kg per hectare
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1

- (d) The table below shows information about fertiliser level and yields of the wheat crop.

Complete the table by:

- (i) inserting the missing term to complete the column heading; 1
- (ii) inserting the missing fertiliser level using information from the graph; 1
- (iii) calculating and inserting the missing harvest index. 1

Space for calculation

<i>Fertiliser level</i> (kg per hectare) <i>(total plant biomass)</i> (tonnes per hectare)	<i>Economic yield</i> <i>(total dry mass of grain)</i> (tonnes per hectare)	<i>Harvest index</i>
	4.0	3.0	0.75
60	4.5	3.6	

- (e) As a result of the field trial, the recommended level of fertiliser was 60 kg per hectare.

Suggest **two** reasons why this level was recommended.

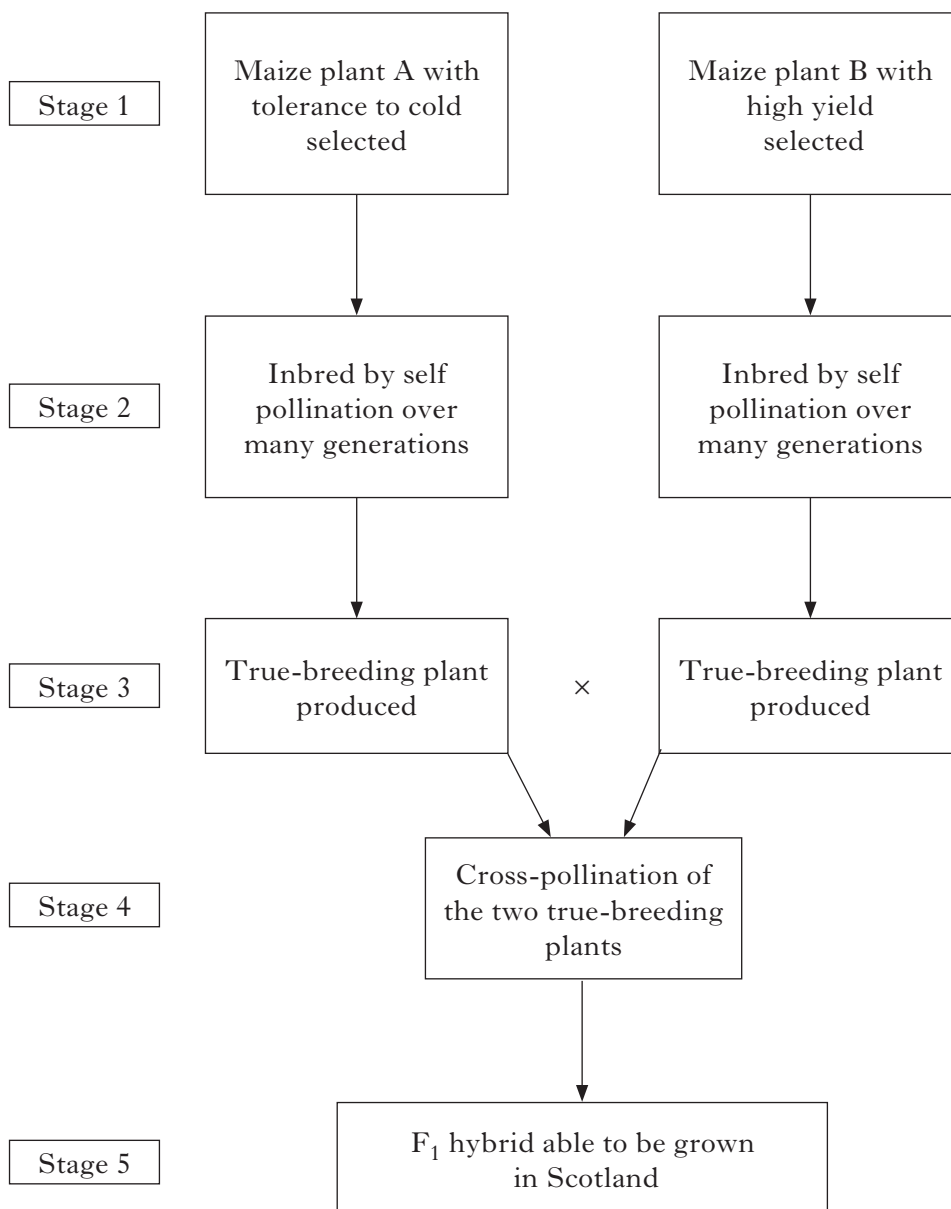
1 _____ 1

2 _____ 1

Marks

10. Maize is a naturally self-pollinating crop plant native to the warmer areas of the USA.

An outline of the stages in the breeding of a hybrid plant with high yield which can be grown in the colder environment of Scotland is shown below.



(a) Explain why inbreeding depression would be unlikely to occur during Stage 2.

1

Marks

10. (continued)

- (b) Identify the test cross that the breeder should carry out to confirm that the Stage 3 plants were true-breeding.

Tick (✓) the correct box.

<i>Test cross</i>	<i>Tick (✓)</i>
Stage 3 plant crossed with a heterozygous plant.	
Stage 3 plant crossed with a homozygous dominant plant.	
Stage 3 plant crossed with a homozygous recessive plant.	

1

- (c) State **two** characteristics of the F₁ hybrid at Stage 5 that would be beneficial to the breeder.

1 _____

2 _____

1

- (d) The F₁ hybrids can be grown in Scotland and can be crossed with each other to produce an F₂ generation.

- (i) Describe why some F₂ plants produced from this cross may not grow successfully in Scotland.

1

- (ii) Give an advantage to breeders of producing an F₂ generation in this case.

1**[Turn over**

Marks

11. Baboons are social primates which live in large groups.

Within a group, individuals are ranked in a social hierarchy and have complex social behaviours.

(a) Some individual baboons form alliances with others in their group to increase their social status.

Give an example of how increased social status can benefit an individual baboon.

1

(b) Baboons use appeasement behaviour to reduce unnecessary conflict within the group.

Give **one** example of this type of behaviour.

1

(c) Give **one** feature of parental care in primates which allows complex social behaviour to be learned.

1

Marks

12. The New Zealand flatworm is a soil-living species which was introduced to Scotland in the 1960s.

(a) The flatworm has now become naturalised in Scotland.

State what is meant by the term naturalised.

1

(b) The flatworm population has increased more rapidly than would have been expected in its native habitat.

Give **one** reason to explain why this happened.

1

(c) The flatworm is now classed as an invasive species.

Give **one** reason why the population of an invasive species may increase at the expense of the native species.

1

[Turn over for Section C on Page thirty

SECTION C

Both questions in this section should be attempted.

Note that each section contains a choice.

Questions 1 and 2 should be attempted on the blank pages, which follow.

Supplementary sheets, if required, may be obtained from the Invigilator.

Labelled diagrams may be used where appropriate.

1. Answer either A or B.

A. Write notes on stem cells under the following headings:

(i) differentiation of stem cells;

7

(ii) research into stem cells and their therapeutic value.

3

OR

(10)

B. Write notes on evolution under the following headings:

(i) natural selection;

7

(ii) genetic drift.

3

(10)

In question 2, ONE mark is available for coherence and ONE mark is available for relevance.

2. Answer either A or B.

A. Give an account of the capture of light energy and its conversion into chemical energy in the light dependent stage of photosynthesis.

(10)

OR

B. Give an account of parasitism and mutualism as types of symbiosis.

(10)

[END OF QUESTION PAPER]

SPACE FOR ANSWERS

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SPACE FOR ANSWERS

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SPACE FOR ANSWERS

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SPACE FOR ANSWERS

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SPACE FOR ANSWERS

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SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER OR QUESTION 4 (c)

