Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Friday 15 May 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WBI12/01**

Biology

International Advanced Subsidiary/Advanced Level
UNIT 2: Cells, Development, Biodiversity and Conservation

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Show all your working out** in calculations and **include units** where appropriate.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In the questions labelled with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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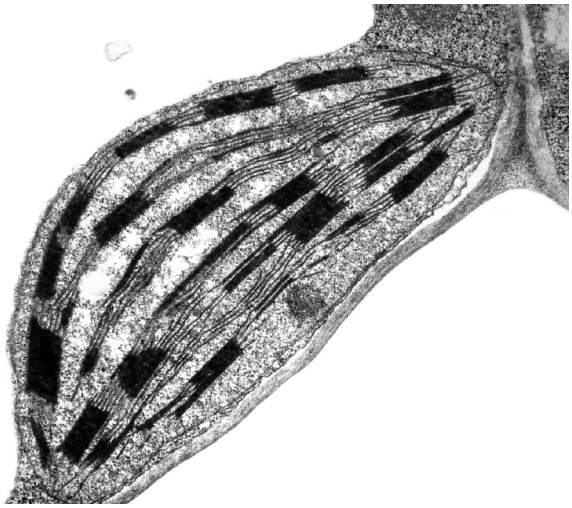
Answer ALL questions.

Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Plant cells contain starch and cellulose.

(a) The photograph shows a plant cell organelle that stores starch, as seen using an electron microscope.



(Source: © DR.JEREMY BURGESS / SCIENCE PHOTO LIBRARY)

(i) Name this organelle.

(1)

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(ii) One function of this organelle is the storage of starch.

Give **one other** function of this organelle.

(1)

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(iii) Which **other** plant structure contains starch?

(1)

☒ **A** amyloplast

☒ **B** cell membrane

☒ **C** cell wall

☒ **D** tonoplast

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(iv) Which row is correct for starch?

(1)

	contains one type of glycosidic bond only	composed of α-glucose molecules
☒ **A**	✓	×
☒ **B**	✓	✓
☒ **C**	×	✓
☒ **D**	×	×

(b) Plant cells also contain cellulose microfibrils.

Which row is correct for **cellulose microfibrils**?

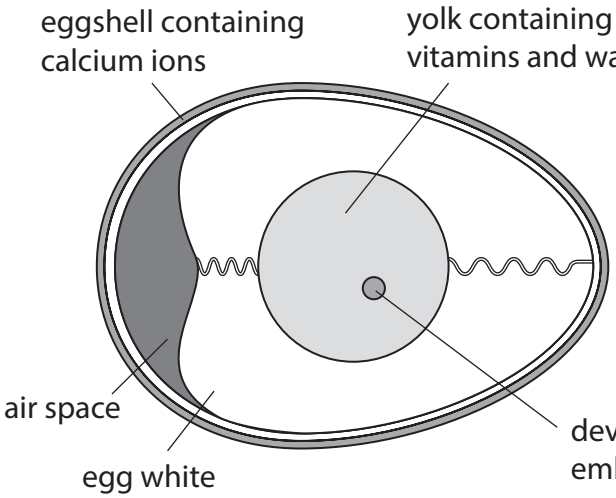
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	contain hydrogen bonds between cellulose molecules	contain glycosidic bonds between cellulose molecules
☒ **A**	✓	✓
☒ **B**	×	×
☒ **C**	×	✓
☒ **D**	✓	×

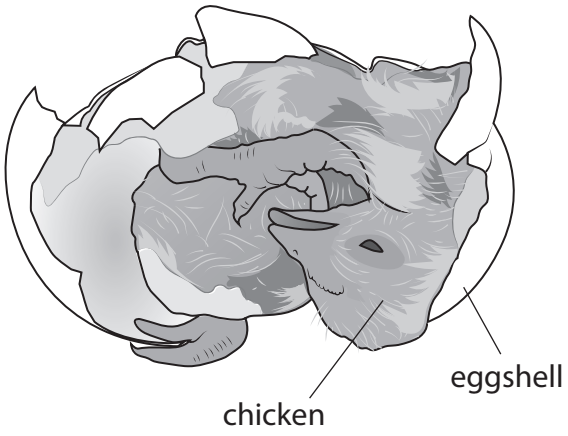
(Total for Question 1 = 5 marks)

2 Chickens develop from a fertilised egg cell that is located inside a hard eggshell.

The diagrams show a chicken egg soon after fertilisation and a chicken that has just hatched by breaking the eggshell.



Chicken egg soon after fertilisation



Chicken that has just hatched

(a) (i) The developing embryo is on the surface of the yolk.

Explain why the developing embryo is on the surface of the yolk.

(2)

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(ii) An unfertilised egg consists of an eggshell, yolk and egg white.

The yolk of this egg had a mass of 18 g.

The yolk is 30% of the total mass of the egg.

The eggshell is 9% of the total mass of the egg.

Calculate the mass of the **egg white**.

(2)

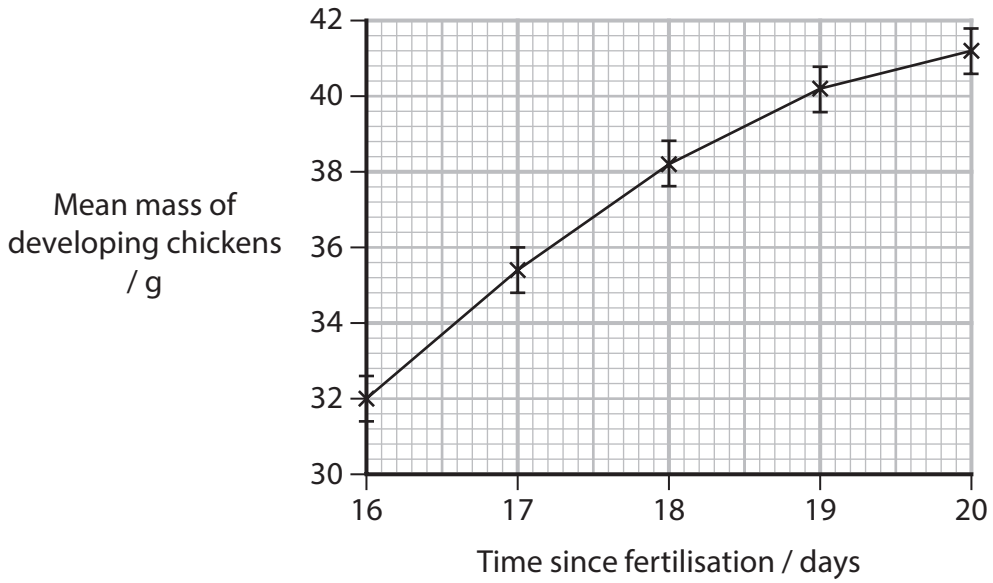
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(iii) A scientist collected data on the mass of developing chickens over time.

The graph shows this data.



Give **one** reason why the scientist would analyse these results using a correlation coefficient test.

(1)

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(b) Chicken feathers have thermal-insulating properties.

The photograph shows part of an adult chicken.



(Source: © Linas Toleikis / Alamy Stock Photo)

Waste chicken feathers are usually burnt.

Insulation made from waste feathers was found to have similar insulating properties to traditional oil-based plastic foam insulation.

Suggest **two** reasons why some people may choose to buy insulation made from waste feathers to insulate their houses, instead of using oil-based plastic foam insulation.

(2)

1 .....

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(Total for Question 2 = 7 marks)

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3 Organisms, such as plants and birds, show adaptations to their environment.

(a) The photograph shows some leaves and flowers of a Canadian plant called Jack-in-the-pulpit.



(Source: © AllCanada Photos / Alamy Stock Photo)

This plant produces male flowers that contain pollen and female flowers that contain the female gametes.

These flowers have a smell that attracts insects that lay their eggs on mushrooms.

When insects enter a male flower, they are covered in pollen as they crawl down to the exit at the bottom of the flower.

When the pollen-carrying insects enter a female flower, the pollen is transferred to a structure containing the female gametes.

There is no exit for the insects at the bottom of the female flower.

(i) Suggest the smell produced by these flowers.

(1)

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(ii) Suggest **one** advantage to the plant of having no exit for the insects at the bottom of the female flower.

(1)

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(iii) A pollen tube develops when a pollen grain is transferred to the stigma of the female flower.

Describe the role of a pollen tube.

(2)

(b) The satin bowerbird and the spotted bowerbird are two of eight **species** of bowerbird found only in Australia.

A bower is a structure made of sticks and grass that is used to attract female bowerbirds.

The photograph shows an Australian male satin bowerbird and his decorated bower.



(Source: © blickwinkel / Alamy Stock Photo)

Adult male bowerbirds collect blue objects to decorate their bower to attract a female.

(i) Collecting blue objects is which type of adaptation?

(1)

- ☒ **A** anatomical
- ☒ **B** behavioural
- ☒ **C** epigenetic
- ☒ **D** physiological

(ii) Which term is used to describe that the satin bowerbird is found only in Australia?

(1)

- ☒ **A** biodiversity
- ☒ **B** endemism
- ☒ **C** sustainability
- ☒ **D** variation

(c) Male **satin** bowerbirds can also attract a female through a courtship dance.

This dance does not attract **spotted** bowerbird females.

Suggest why a male **satin** bowerbird does not attract a **spotted** bowerbird female with his courtship dance.

(2)

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(Total for Question 3 = 8 marks)

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4 Millipedes have evolved and occupy specific niches.

The photograph shows a millipede that can produce chemicals called benzoquinones.



(Source: Micha Klootwijk / Alamy Stock Photo)

Benzoquinones can increase the chances of survival of the millipede because they:

- have antimicrobial properties
- can be poisonous to other organisms.

(a) Explain why these chemicals can increase the chances of survival of the millipede.

(3)

*(b) The photograph shows a Venezuelan wedge-capped capuchin monkey.



(Source: © Danny Ye / Alamy Stock Photo)

These monkeys collect millipedes, bite them and rub the benzoquinones onto their fur.

They do this for two reasons:

1. These monkeys have nematode worm parasites that live inside their intestines.

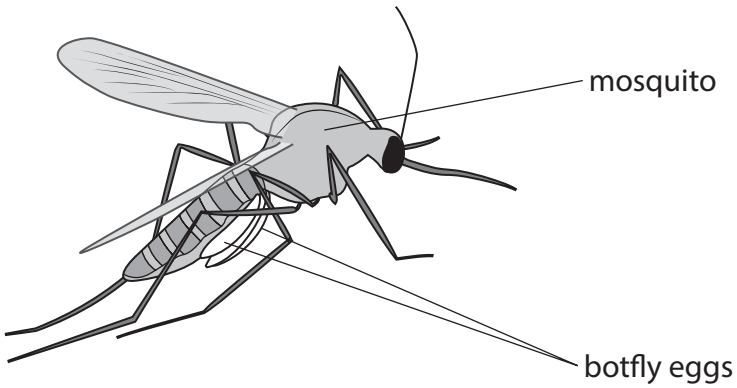
   These worms come out of the intestines and lay their eggs on the monkeys' skin. The monkeys rub the benzoquinones around these areas.

2. To stop mosquitoes from biting the monkeys.

   The mosquitoes carry botfly eggs that are transferred to the fur of the monkey.

   The botfly maggots that then hatch from the eggs enter the bite wounds and infect the skin.

The diagram shows a mosquito carrying botfly eggs.



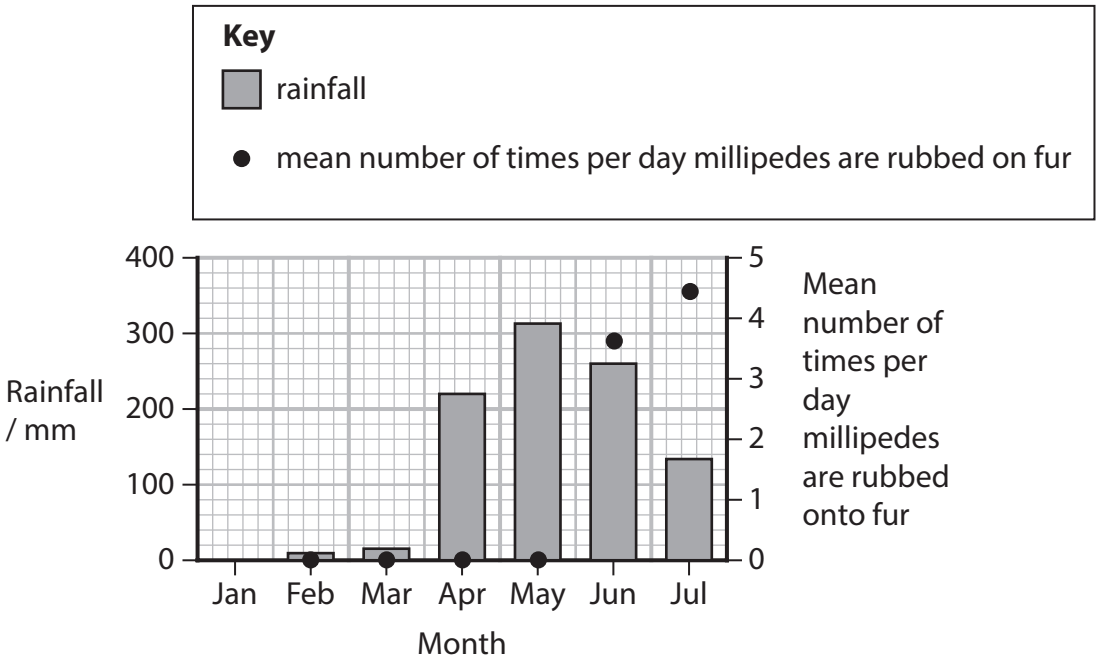
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Female mosquitoes lay their eggs in pools of water.

The relationship between the frequency of the wedge-capped capuchin rubbing millipedes on their fur and rainfall was investigated.

The graph shows the results of this investigation.



Discuss the advantages **and** disadvantages of the behavioural adaptations to the **botfly** and the **wedge-capped capuchin**.

(6)

(Total for Question 4 = 9 marks)

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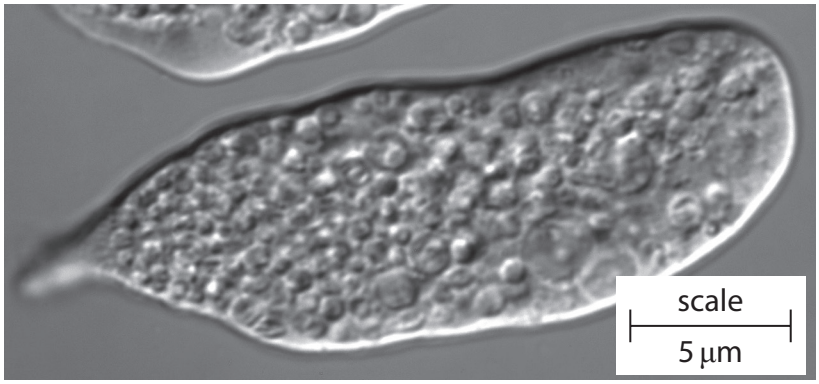
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5 The domain Eukarya contains many taxonomic groupings.

(a) One of these taxonomic groupings is Protozoa.

These are single-celled organisms.

The photograph shows a protozoan, as seen using a microscope.



(Source: © SINCLAIR STAMMERS / SCIENCE PHOTO LIBRARY)

(i) Calculate the magnification of this photograph.

(2)

Answer ×.....

(ii) This protozoan contains more than one nucleus.

Draw a diagram to show the detailed structure of a nucleus and label **two** of the structures.

(3)

(iii) Which row shows the structures present in a cell of an organism in the domain Eukarya?

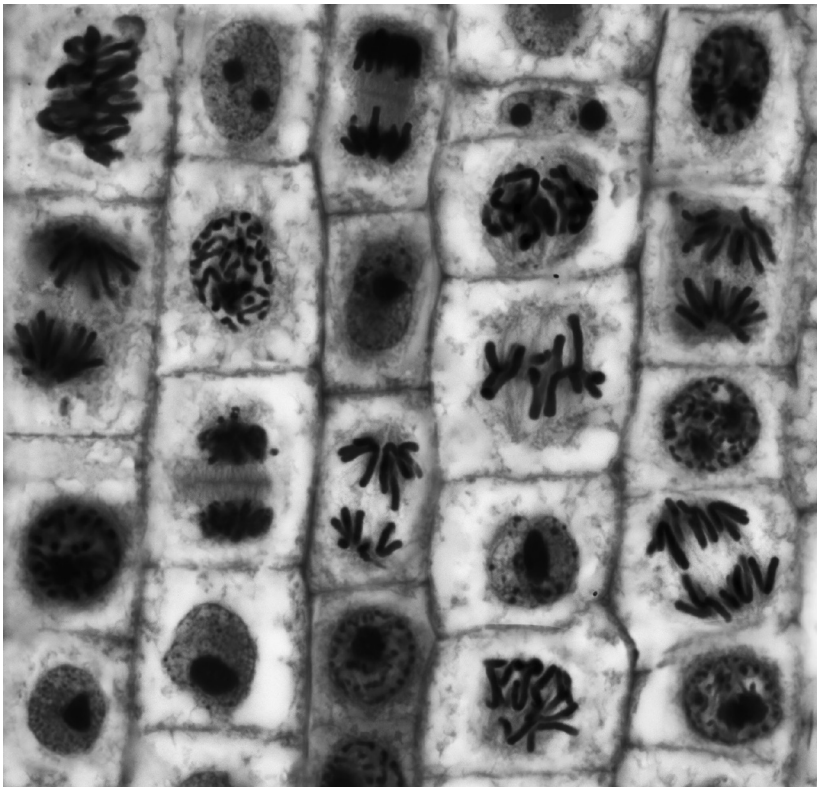
(1)

		cytoplasm	pili	mitochondria
☒	**A**	✓	✓	×
☒	**B**	✓	×	✓
☒	**C**	×	✓	✓
☒	**D**	×	×	×

(b) Plants are another Eukarya taxonomic grouping.

Plant root tip cells contain a nucleus.

The photograph shows some root tip cells, as seen using a light microscope.



(Source: © STEVE GSCHMEISSNER / SCIENCE PHOTO LIBRARY)

(i) Label the diagram to show the following stages of mitosis:

(2)

- use a line labelled M to show **one** cell in metaphase
- use a line labelled T to show **one** cell in telophase.

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(ii) State why these cells have to be stained in order to study mitosis.

(1)

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(iii) Three photographs were taken from different areas of one root tip tissue.

The table shows the number of cells in each stage of the cell cycle counted in each photograph.

Stage of cell cycle	Number of cells in photograph			
	A	B	C	Total
Anaphase	3	3	4	10
Interphase	23	38	27	88
Metaphase	2	3	0	5
Prophase	5	9	7	21
Telophase	7	8	10	

Calculate the mitotic index of this root tip tissue.

Give your answer to **two** significant figures.

(2)

Answer .....

(Total for Question 5 = 11 marks)

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6 Water and inorganic ions are important to plants.

Low rainfall can cause land to turn into desert.

This occurs when soil is lost by erosion. It can be blown away by the wind or washed away when it rains.

The photograph shows a herd of cows in a desert in Burkina Faso.



(Source: © JJ pixs / Alamy Stock Photo)

Farmers in Burkina Faso have protected their soil from erosion by building low stone walls around their fields.

They have also dug large pits to store rainwater for their crop plants.

(a) Describe **three** roles of water in plants.

(3)

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2 .....

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3 .....

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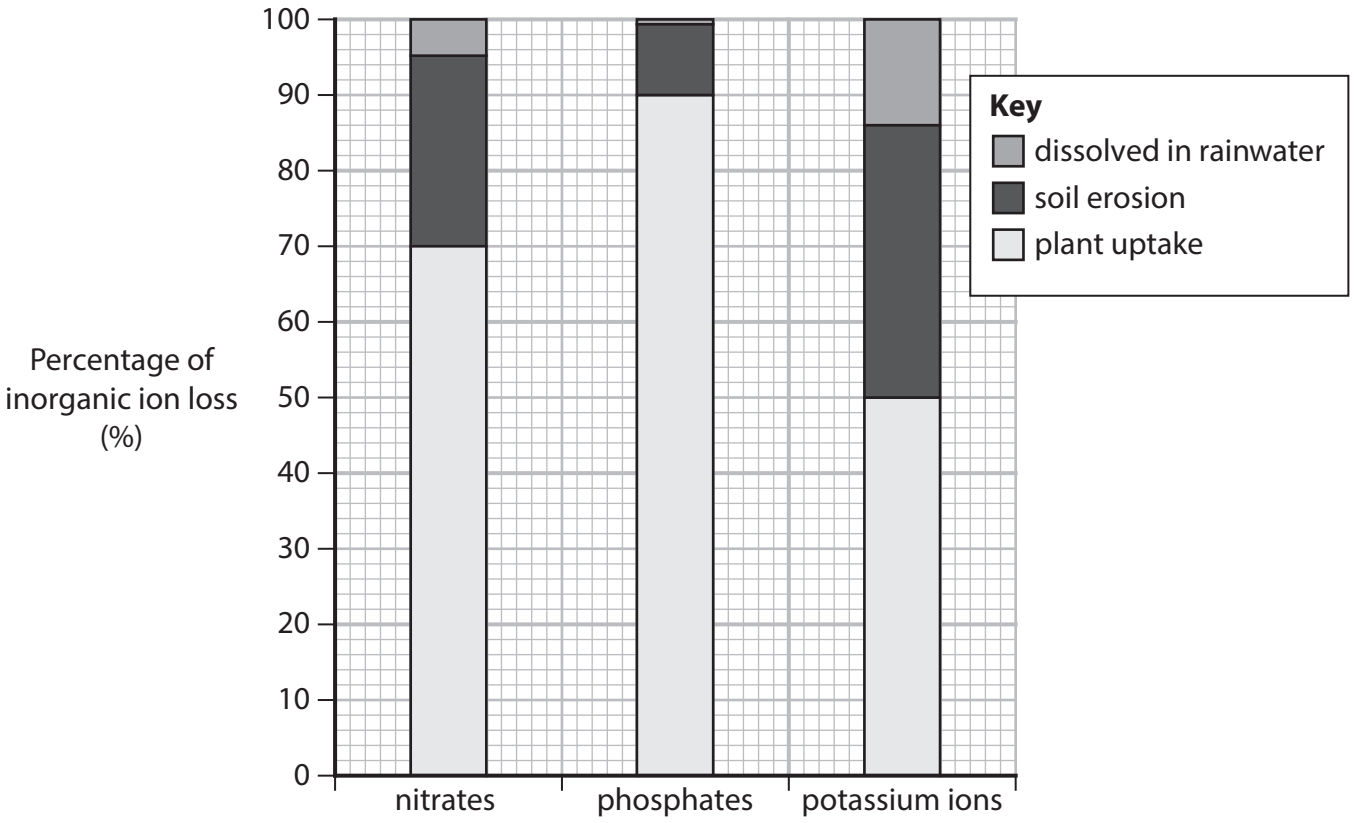
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(b) The loss of three inorganic ions from soil due to dissolving in rainwater, soil erosion and plant uptake was investigated in **one** field.

Phosphates are needed to synthesise ATP and DNA molecules.

Potassium ions are needed to help the translocation of organic solutes.

The graph shows the results of this investigation.



(i) Which is the ratio of the loss of nitrates : phosphates : potassium ions due to plant uptake?

(1)

☒ **A** 1.0 : 1.4 : 1.8

☒ **B** 1.0 : 1.8 : 1.4

☒ **C** 1.4 : 1.8 : 1.0

☒ **D** 1.8 : 1.4 : 1.0

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(ii) Comment on the results of this investigation.

Include **one** comment on the methodology of this investigation in your answer.

(4)

*(iii) Animal waste and plant waste contain many different **inorganic ions**.

A farmer in Burkina Faso investigated ways to improve the growth of their crop plants.

Rainwater was stored in two pits on the farm.

Animal waste and plant waste were added to the water in pit 1.

Nothing was added to the water in pit 2.

After three months, the farmer used the water from the pits to water eight fields of the same species of crop plant:

- group A had four fields that used water from pit 1
- group B had four fields that used water from pit 2.

The farmer decided that more money could be made if animal waste and plant waste were added to the water in **both** pits.

Explain why better plant growth would be expected and more money would be made using this method.

Use all of the information in Question 6 and your own knowledge to support your answer.

(6)

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(Total for Question 6 = 14 marks)

7 Biodiversity can be measured by analysing genetic variation within a species.

(a) Allele frequency can change in a population over time.

(i) State what is meant by the terms **allele** and **allele frequency**.

(2)

allele

allele frequency

(ii) Changes in allele frequency can arise due to natural selection.

State **one other** factor that can result in changes in allele frequency.

(1)

(iii) Explain how natural selection could result in a change in allele frequency.

(3)

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(b) The photograph shows a hummingbird feeding from flowers on a scarlet gilia plant.



(Source: © Nature Picture Library / Alamy Stock Photo)

There are two alleles for the gene controlling the flower colour in scarlet gilia: R and r.

The table shows some information about one population of scarlet gilia.

Flower colour	red	red	white
Genotype	RR	Rr	rr
Frequency of genotype in the population	0.49	0.42	

(i) Calculate the frequency of **genotype rr** and **allele R** in this population.

(1)

Frequency of genotype rr .....

Frequency of allele R .....

(ii) A field contained 10 000 scarlet gilia plants.

Estimate how many of these plants would have red flowers.

(1)

Answer .....

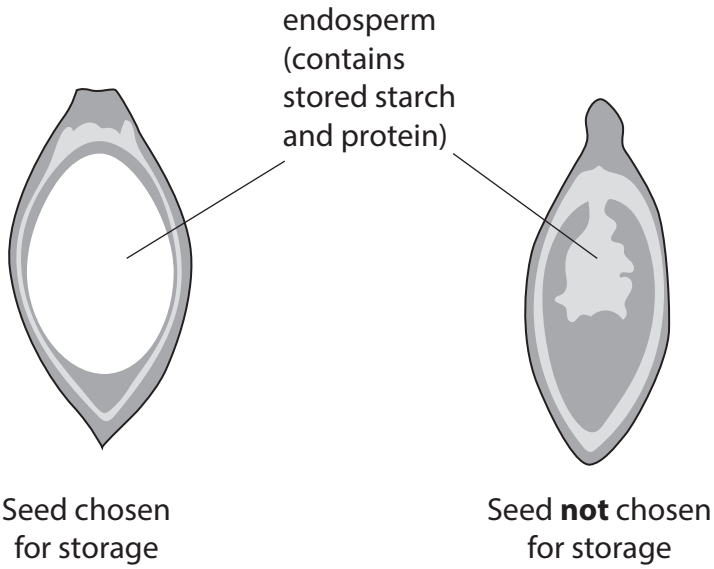
(c) Seed banks assess the genetic material and viability of the seeds they collect.

The number of different alleles for certain genes in seed samples is compared with the number of different alleles for the same genes in the wild plant population.

More seeds would need to be collected and analysed if rare alleles from the wild plant population are not found in the stored seed collection.

One method to assess seed viability is to X-ray the collected seeds.

The diagrams show the results of two seeds that have been X-rayed.



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Explain the advantages of assessing the genetic material and the X-ray analysis of the collected seeds.

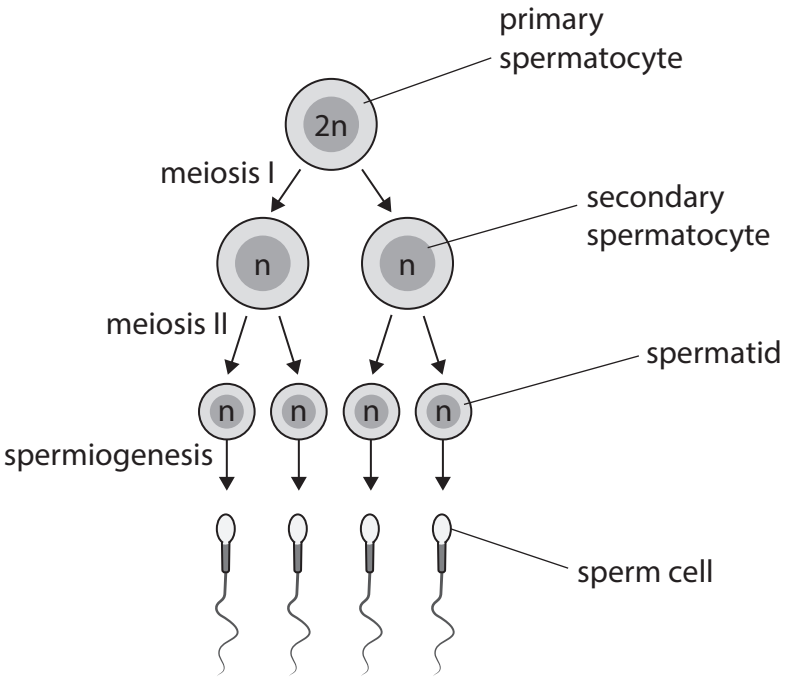
Use the diagrams to support your answer.

(4)

(Total for Question 7 = 12 marks)

8 Sperm cells are specialised for their function.

(a) The diagram shows some stages in the production of sperm cells by meiosis.



The primary spermatocyte contains two copies of each chromosome (2n).

(i) Explain why the numbers of chromosomes would change during the production of a sperm cell from a primary spermatocyte.

Use the diagram to support your answer.

(3)

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(ii) During spermiogenesis a mature sperm cell forms from a spermatid as shown in the diagram.

Describe how the process of spermiogenesis would result in the production of a **specialised** sperm cell.

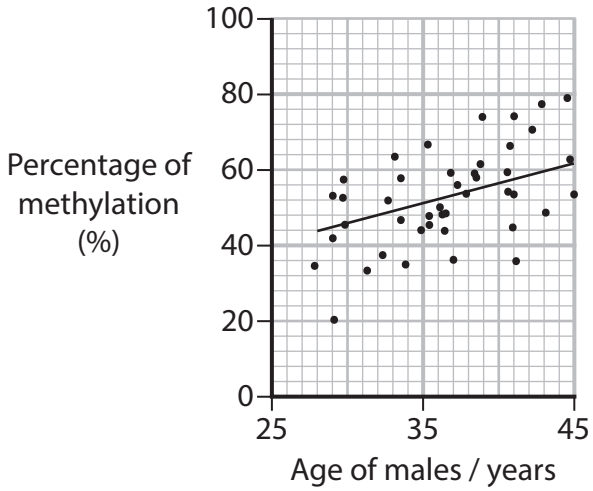
Use the diagram to support your answer.

(4)

(b) The genes of sperm cell chromosomes may be methylated.

The effect of age on the percentage of methylation of eight genes on one chromosome in sperm cells was investigated.

The graph shows the result of this investigation.



(i) Which name is given to the position of one of these genes on the chromosome?

(1)

- ☒ **A** centriole
- ☒ **B** genotype
- ☒ **C** linkage
- ☒ **D** locus

(ii) Give **one** conclusion that can be made from these data.

(1)

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(iii) Describe how methylation of genes can occur.

(2)

(iv) Explain how methylation could alter the activation of these genes.

(2)

(v) State how methylation can be passed on during **mitotic** cell division.

(1)

(Total for Question 8 = 14 marks)

TOTAL FOR PAPER = 80 MARKS

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