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Oxford Cambridge and RSA

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Wednesday 18 November 2020 – Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 10 minutes

8170706231

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J250/02

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

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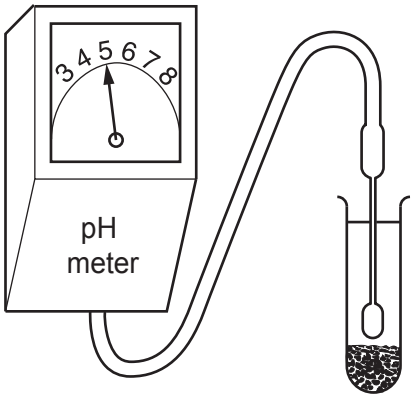
SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 Which abiotic factor is measured using this apparatus?



A Acidity levels

B Light intensity

C Moisture content

D Temperature

Your answer ☐ **[1]**

2 Why are bacteria needed to recycle nitrogen in an ecosystem?

A Bacteria are microscopic

B Bacteria decompose organic material

C Bacteria reproduce rapidly

D Bacteria respire anaerobically

Your answer ☐ **[1]**

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3 Look at the table.

	Clots blood	Makes antibodies	Transports oxygen
A	white blood cells	platelets	red blood cells
B	platelets	white blood cells	red blood cells
C	red blood cells	white blood cells	white blood cells
D	platelets	red blood cells	white blood cells

Which row in the table shows the correct function of the different parts of the blood?

Your answer ☐ **[1]**

4 Which statement about skin cells is correct?

A They are diploid cells containing one set of chromosomes.

B They are diploid cells containing two sets of chromosomes.

C They are haploid cells containing one set of chromosomes.

D They are haploid cells containing two sets of chromosomes.

Your answer ☐ **[1]**

5 Which of these will **increase** the amount of water in the soil?

A Evaporation

B Precipitation

C Translocation

D Transpiration

Your answer ☐ **[1]**

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6 Which type of medicine is used to treat HIV?

A Antibiotics

B Antigens

C Antiseptics

D Antivirals

Your answer ☐ **[1]**

7 This capture-recapture formula is used to estimate population size:

$$\text{Population size} = \frac{\text{number in first sample} \times \text{number in second sample}}{\text{number of marked individuals in second sample}}$$

The table shows the results for one estimation of a beetle population.

	Number of beetles
First sample	12
Second sample	10
Marked individuals in second sample	4

Use the capture-recapture formula to estimate the beetle population.

A 26

B 30

C 120

D 480

Your answer ☐ **[1]**

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8 Different methods are used to identify which disease an animal has.

Which method is **not** used to identify diseases?

A Analysing the DNA of the pathogen.

B Detecting antigens in the animal's blood.

C Genetically engineering the pathogen.

D Visual appearance of animal.

Your answer ☐ **[1]**

9 A scientist crossed a white flower with a purple flower.
The white flower is homozygous recessive. The purple flower is heterozygous.

The scientist uses this Punnett square to predict the expected ratio of offspring.

	P	p
p	Pp	pp
p	Pp	pp

What is the expected ratio of phenotypes in the offspring?

A 1 purple : 1 white

B 1 purple : 2 white

C 2 purple : 1 white

D 4 purple : 0 white

Your answer ☐ **[1]**

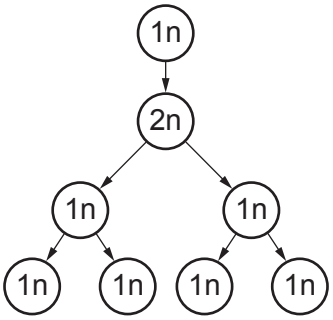
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10 Meiosis is a type of cell division that is needed to make gametes.

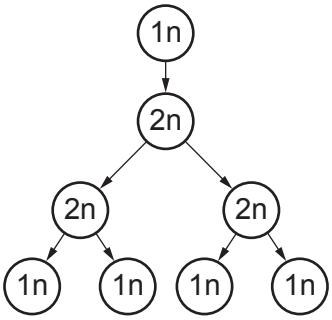
Which diagram shows meiosis?

n = number of chromosomes

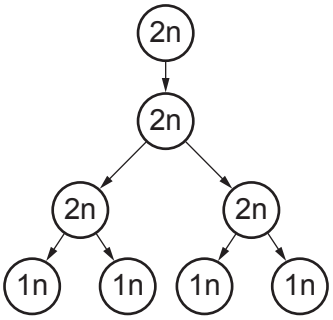
A



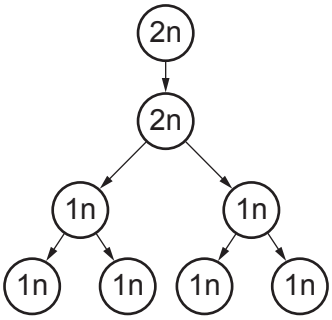
B



C



D



Your answer ☐ **[1]**

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SECTION B

Answer **all** the questions.

11 **(a)** Diseases can be communicable or non-communicable.

Which are causes of non-communicable diseases?

Tick (✓) **two** boxes.

Diet high in salt	☐
Drinking contaminated water	☐
Drinking large amounts of alcohol	☐
Eating under cooked chicken	☐
Fungal infection	☐
Unprotected sexual intercourse	☐

[2]

(b) Complete these sentences about plant diseases.

Choose words from the list.

You may use each word once, more than once, or not at all.

Gall **Leaf** **Mildew** **Spot** **Stem** **Wound**

The pathogen *Erysiphe graminis* causes powdery ..... in barley plants.

The pathogen *Agrobacterium tumefaciens* causes a tumour like growth called a

..... .

[2]

(c) Some diseases interact with each other.

Describe the interaction between HIV and tuberculosis.

.....

.....

.....

..... **[2]**

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(d) The pathogen that causes tuberculosis (TB) has cells that are different from animal cells. There are also similarities between the two types of cells.

Which structures are found in **both** the cells of the TB pathogen and animal cells?

Tick (✓) **two** boxes.

Cell membrane	☐
Chromosome	☐
Mitochondrion	☐
Nucleus	☐
Plasmid	☐

[2]

(e) Read the information in the box.

> The rod like structure of the tobacco mosaic virus is ~0.018 μm in diameter.
>
> The light microscope was developed in the 1670s. Light microscopes have a resolution of >0.2 μm.
>
> The transmission electron microscope (TEM) was developed in the 1930s. TEM has a resolution of >0.0001 μm.
>
> Scientists knew about the effects of the tobacco mosaic virus in 1800.

The structure of the tobacco mosaic virus was first observed in 1935.

Evaluate the information in the box to explain why.

.....

.....

.....

..... **[2]**

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12 A scientist investigates how the distance from a road affects the growth of lichens.

(a) At the **start** of the investigation the scientist makes this statement.

> **As the distance from a road increases, then the number of lichens will increase because there is less pollution.**

What type of statement is this?

Put a (ring) around the correct answer.

Analysis **Conclusion** **Evaluation** **Hypothesis**

[1]

(b) Read the method the scientist uses.

- Choose a site where a road is next to an area of trees.
- Use a measuring tape to choose a tree 5 m from the road.
- Place a clear plastic grid (25 × 25 cm) on the tree, 1 metre above the ground.
- With a pen, dot each 1 cm^2 grid area where there are lichens.
- Count the dots on the clear plastic grid.
- Move the clear plastic grid sideways and repeat until the whole circumference of the tree trunk is measured, and record the results.
- Repeat this on more trees at 5 m intervals, up to 25 m away from the road.

Fig. 12.1 shows their investigation.

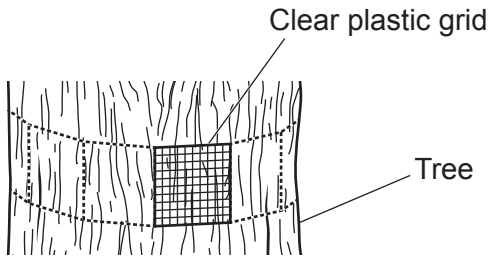


Fig. 12.1

(i) Write down **one** variable that is controlled in this investigation.

..... **[1]**

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(ii) What name describes the clear plastic grid used by the scientist?

Put a (ring) around the correct answer.

Line transect **Pitfall trap** **Pooter** **Quadrat**

[1]

(iii) How could the scientist improve their method to reduce the level of uncertainty in the results?

..... **[1]**

(c) **Fig. 12.2** shows one clear plastic grid for the tree at **5** metres.

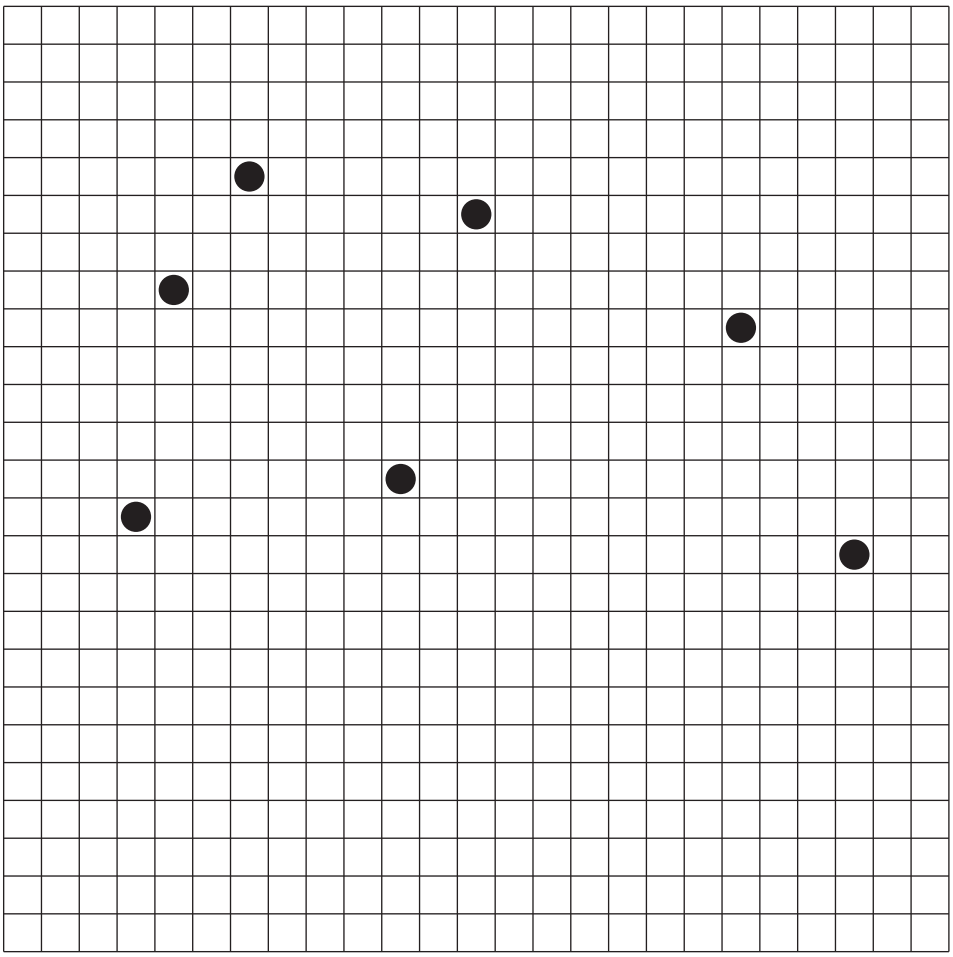


Fig. 12.2

(i) The other grids around the circumference for the tree at 5 metres had 3, 8, 3 and 6 dots.

Find the **median** for lichens found at 5 metres. Include the result in **Fig. 12.2**.

Median = ... **[2]**

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(ii) **Fig. 12.3** is a scatter diagram of some of the scientist's results.

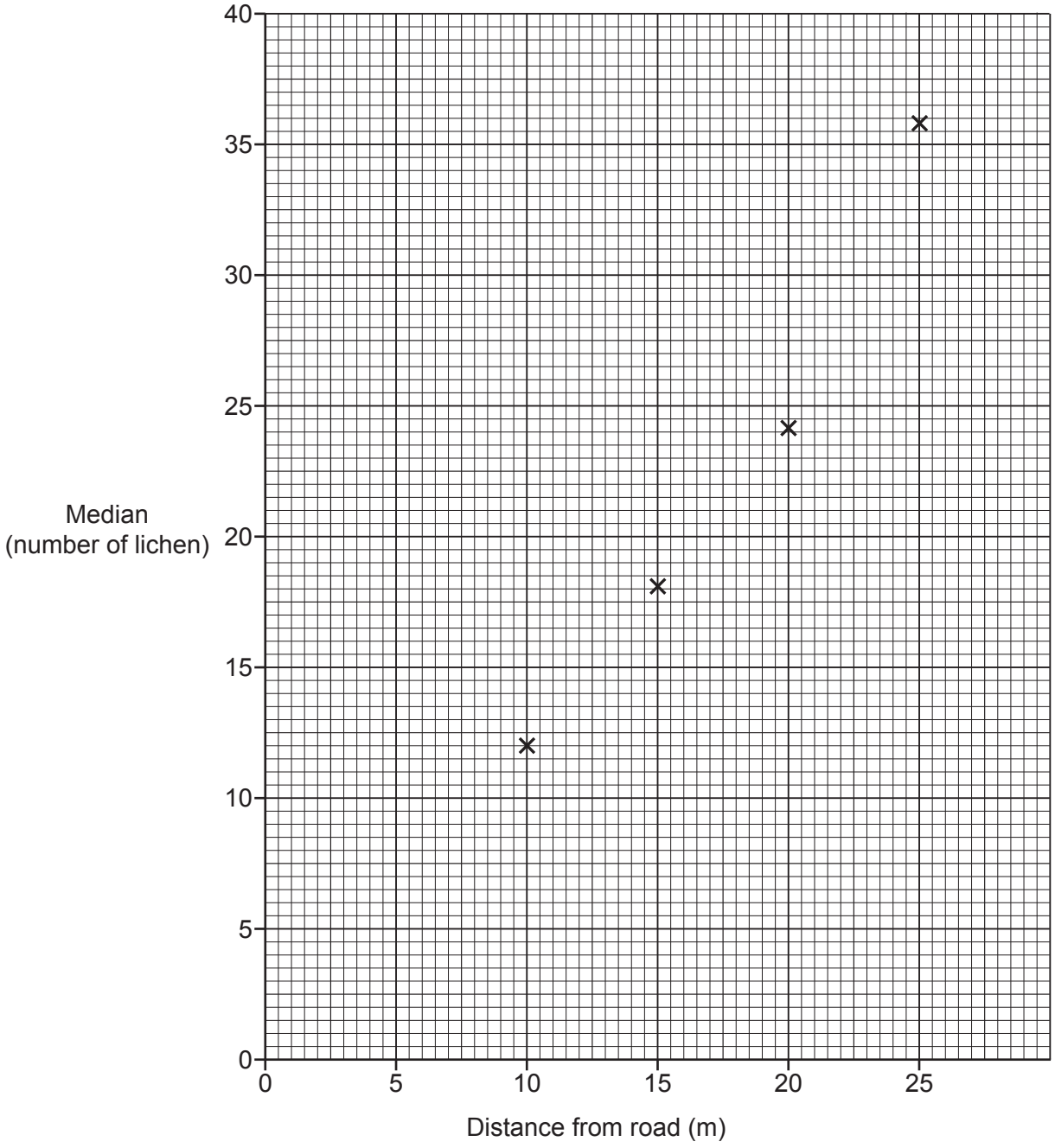


Fig. 12.3

Explain the results seen in **Fig. 12.3**.

.....

.....

.....

..... **[2]**

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(d) Lichens are made up of algae and a fungus living together.

Algae are single celled organisms that photosynthesise. The fungus produces a threadlike structure that spreads to protect the algae.

What name describes the type of interdependence shown by the algae and the fungus? Write down **one** reason for your answer.

Type of interdependence .....

Reason .....

.....

..... **[2]**

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13 Myostatin is a protein that animals produce to stop muscle development.

A gene controls the production of myostatin. This gene is mutated in the Belgian Blue breed of cattle.

Belgian Blue cattle have more muscle compared with other cattle.

(a) (i) Belgian Blue cattle have a different muscle **phenotype** than other cattle.

What is meant by the term phenotype?

..... **[1]**

(ii) Explain why Belgian Blue cattle have a different muscle phenotype.

.....

.....

.....

..... **[2]**

(iii) The Belgian Blue cattle were produced by selective breeding.

It is unlikely that the Belgian Blue cattle would have developed by natural selection.

Explain why.

.....

.....

.....

..... **[2]**

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***(b)** Describe the process of selective breeding Belgian Blue cattle and explain the impact of this on the farming industry.

Include both the benefits and risks of selective breeding in your answer.

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..... **[6]**

(c) Selective breeding is one way the genome can be modified to produce desired characteristics.

Write down **one** other way the genome can be modified to produce desired characteristics.

..... **[1]**

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14 Look at the picture of an African ecosystem called a savannah.



(a) Describe the levels of organisation in the savannah.

Complete the missing parts of the table.

Part of savannah	Level	Description
giraffes **elephants** **zebras** **trees** **grasses** **weather** **soil** **atmosphere**	.....	The living organisms in an area, together with the non-living components of the environment.
giraffes **elephants** **zebras** **trees** **grasses**	.....	....
zebras	.....	....
zebra	organism	individual

[3]

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(b) Elephants have evolved large, very thin ears. This adaptation helps them to survive the effects of one abiotic factor affecting their population.

Complete the sentences about the adaptations in elephants.

The elephants have adapted to survive in high ..... .

The elephant ears have a ..... surface area.

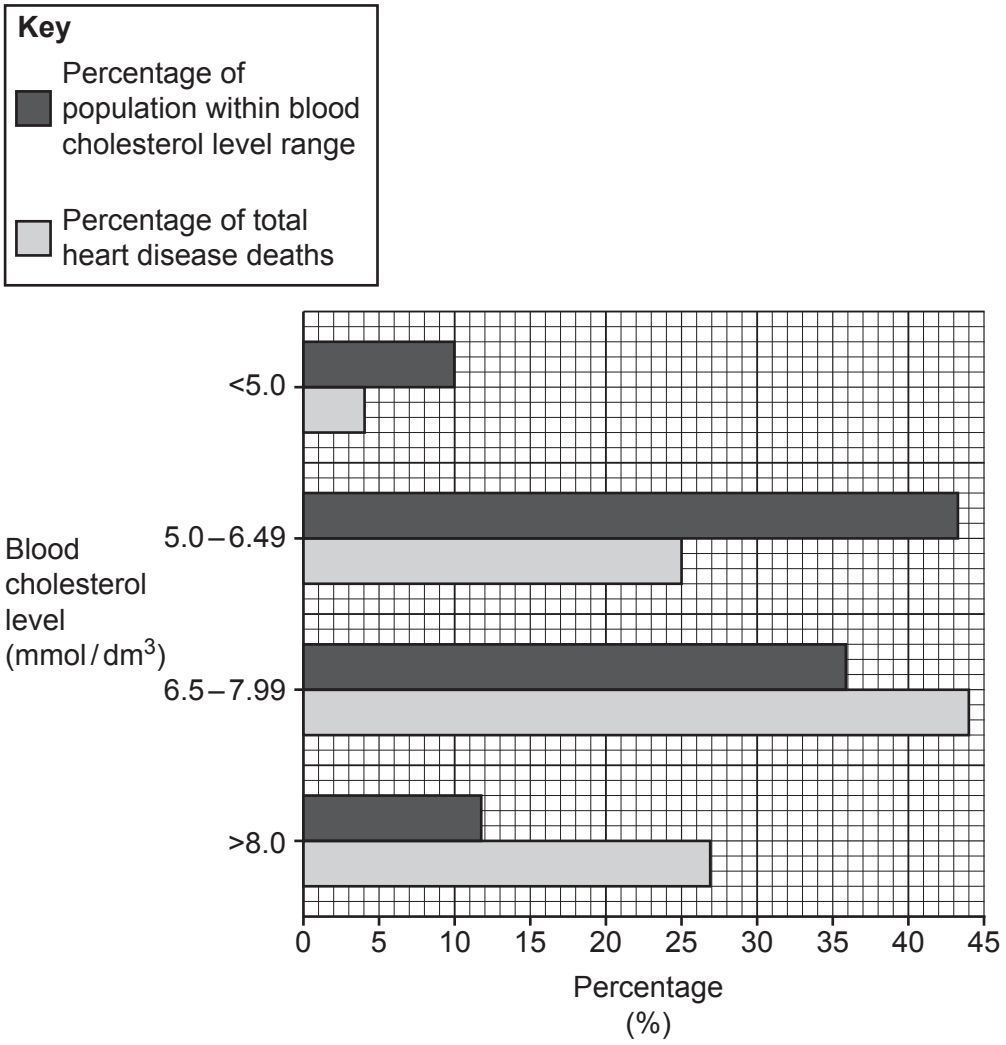
This helps them to ..... heat from the skin surface.

[3]

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15 Scientists studied a population of men. They grouped the men by their blood cholesterol levels.

The chart shows the percentage of the population in each blood cholesterol level group. It also shows the men in each group that died from heart disease as a percentage of the whole population that died from heart disease.



(a) (i) What conclusions can be made from the data in the chart?

.....

.....

.....

.....

..... **[2]**

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(ii) Calculate the ratio for percentage of total heart disease deaths for blood cholesterol <5.0 mmol / dm^3 compared to those 5.0 mmol / dm^3 or greater.

Ratio = ... **[2]**

(iii) Health experts encourage people to lower their blood cholesterol to 5.0 mmol / dm^3 or less.

Analyse evidence in the chart to justify the reason for this.

.....

.....

.....

..... **[2]**

(b) (i) Hormone replacement therapy (HRT) involves giving oestrogen to women.

A group of scientists did a double-blind study of 643 women given either HRT or a placebo.

The study followed-up these women after five years. It showed reduced build-up of cholesterol in the arteries of women given HRT.

The scientists made this conclusion:

Women on HRT may be at **less** risk from heart disease.

Explain why HRT could reduce the risk of heart disease.

.....

.....

..... **[2]**

(ii) The reduced build-up of cholesterol observed during the study might not be large enough to have an impact on a person's risk from heart disease.

What change could be made to the study to gain enough evidence to support the conclusion?

.....

..... **[1]**

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(iii) Oestrogen is known to interfere with the cell cycle, increasing the rate of mitosis.

Suggest why HRT might increase the risk of breast cancer.

.....

.....

..... **[2]**

(c) Name **one** lifestyle change someone could make that could also **reduce** the risk of heart disease.

..... **[1]**

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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