OCR
Oxford Cambridge and RSA

Friday 10 May 2024 – Morning

GCSE (9–1) Combined Science B (Twenty First Century Science)

J260/01 Biology (Foundation Tier)

Time allowed: 1 hour 45 minutes

F

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

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

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 **95**.
- 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 **28** pages.

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

1 There are receptors on the inside and outside of your body.

A receptor detects a stimulus.

(a) Receptors are found in sense organs.

Draw lines to connect each **sense organ** with the correct **stimulus**.

Sense organ	Stimulus
Ear	Chemicals in the air
Eye	Light
Nose	Sound

[2]

(b) If you touch something very hot, your hand pulls away immediately.

This is a reflex response.

(i) Reflex responses are automatic.

Write down **one other** word that describes a reflex response.

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

(ii) A reflex response is carried out by an effector.

What is the effector that pulls your hand away when you touch something hot?

Tick (✓) **one** box.

Brain ☐

Kidney ☐

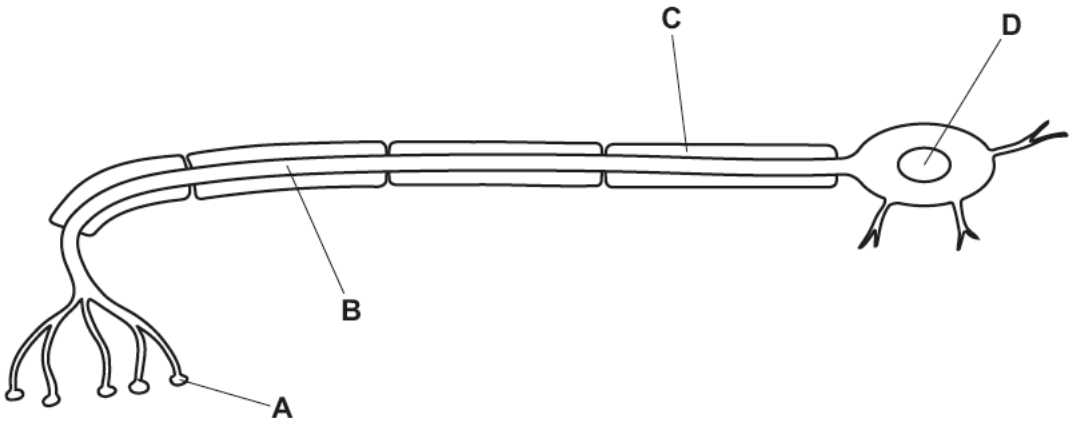
Muscle ☐

Skin ☐

[1]

(c) Reflex responses are controlled by the nervous system.

The diagram shows a cell that carries electrical impulses.



(i) What type of cell is shown in the diagram?

Tick (✓) **one** box.

Blood cell ☐

Nerve cell ☐

Sperm cell ☐

[1]

(ii) Complete the sentence to explain what would happen if structure **C** was removed from the cell.

Put a (ring) around the correct option.

The speed of nervous impulses would **decrease / increase / stay the same**.

[1]

(iii) Which part, **A**, **B**, **C** or **D**, allows impulses to be transmitted to other cells like this one?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

[1]

2 Cells contain genetic material.

(a) Which part of a plant cell is the genetic material stored in?

Tick (✓) **one** box.

Cell wall ☐

Cytoplasm ☐

Nucleus ☐

Vacuole ☐

[1]

(b) Complete the sentences about genetic material.

Put a (ring) around each correct option.

Genetic material contains **chloroplasts** / **instructions / proteins** which control how cells and organisms develop and function.

All the genetic material in a cell is called the **gene / genome / nucleotide**.

[2]

(c) Genetic material is made of DNA.

Which statements about DNA are **true** and which are **false**?

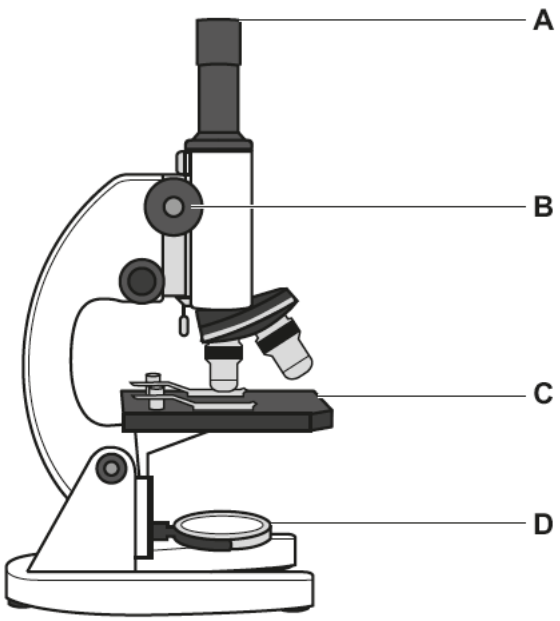
Tick (✓) **one** box in each row.

	True	**False**
DNA is a polymer.	☐	☐
DNA is a triple helix.	☐	☐
DNA is made from a chain of amino acids.	☐	☐
DNA is made of two strands.	☐	☐

[3]

(d) A student uses the light microscope in **Fig. 2.1** to look at dividing cells from an onion root.

Fig. 2.1



(i) Which part, **A**, **B**, **C** or **D**, should the microscope slide be placed on?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

[1]

(ii) Which part of the microscope, **A**, **B**, **C** or **D**, is used to focus the image?

Tick (✓) **one** box.

A ☐

B ☐

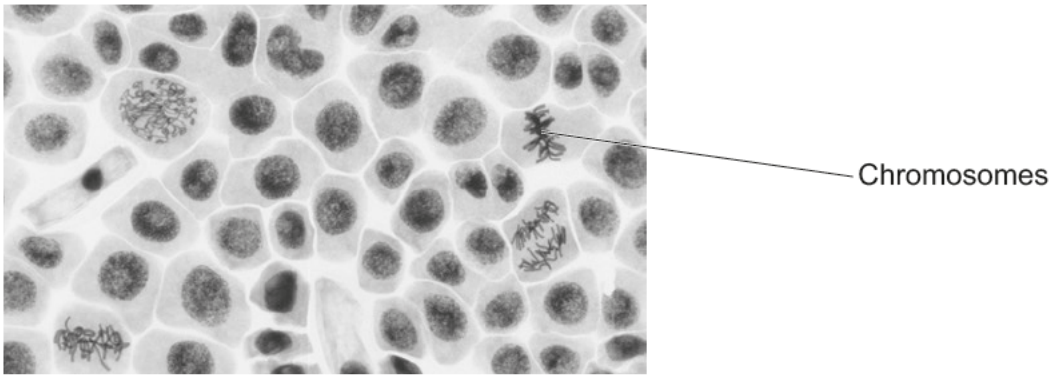
C ☐

D ☐

[1]

(iii) The image that the student sees is shown in **Fig. 2.2**.

Fig. 2.2



The cells in **Fig. 2.2** are at different stages in the cell cycle.

Statements **A** to **D** describe the cell cycle. They are **not** in the correct order.

A The nucleus divides.

B The cell grows larger, each chromosome is copied.

C The chromosome copies separate.

D The cell divides.

Write the letters in the boxes to show the correct order of the stages.

One has been done for you.

			D

[2]

3

(a) Complete the sentences to describe the levels of organisation in an ecosystem.

Put a (ring) around each correct option.

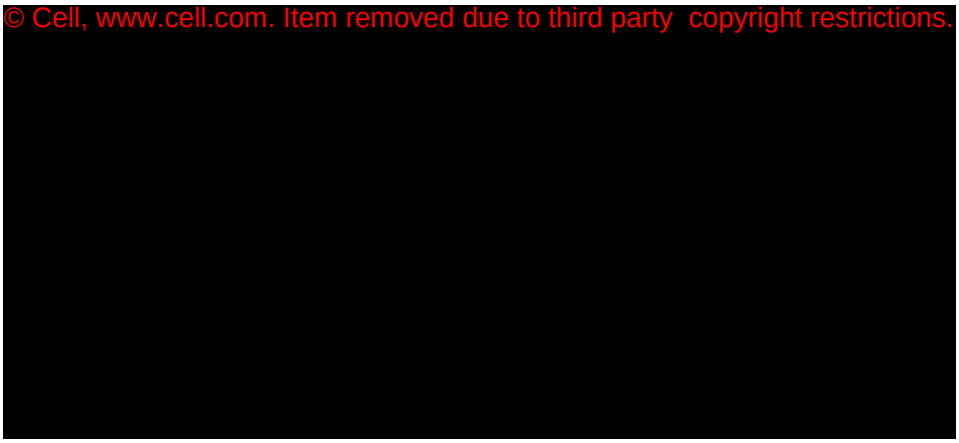
Organisms of the same type living in the same place make up **a community / an ecosystem / a population**.

A community interacting with its environment is **an ecosystem / a food web / a population**.

[2]

(b) **Fig. 3.1** shows a food web diagram. It includes more than one food chain.

Fig. 3.1



(i) Explain what would happen to the Blackbird population if most of the squirrels died from a disease, using **Fig. 3.1**.

.....

.....

.....

.....

.....

..... **[3]**

(ii) Food chain and food web diagrams help us understand ecosystems.

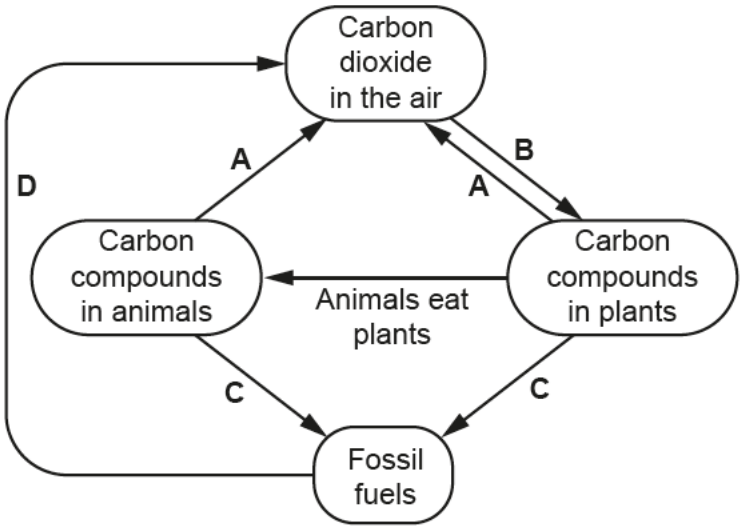
Suggest **one** benefit of drawing a food web diagram instead of many different food chain diagrams.

.....

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

(c) **Fig. 3.2** shows a simple diagram of the carbon cycle.

Fig. 3.2



(i) Draw lines to connect each **letter** from the diagram with the correct **process**.

Letter	Process
A	Combustion
B	Decomposition
C	Photosynthesis
D	Respiration

[3]

(ii) Carbon is cycled through abiotic and biotic components of an ecosystem.

Which components of an ecosystem are **abiotic** and which are **biotic**?

Tick (✓) **one** box in each row.

	Abiotic	Biotic
Air	☐	☐
Animals and plants	☐	☐
Fossil fuels	☐	☐

[2]

(d) Producers use carbon compounds to make fatty acids and amino acids.

Complete the sentences to explain what fatty acids and amino acids are then used to make.

Use words from the list.

carbohydrates	**lipids**	**proteins**	**water**

Fatty acids are used to make ..... .

Amino acids are used to make ..... .

[2]

4

(a) Complete the table to compare aerobic and anaerobic respiration.

	Aerobic respiration	**Anaerobic respiration**
Conditions under which it happens	.....	Low or no oxygen
Amount of ATP produced	High	.....

[2]

(b) Explain why cellular respiration takes place continuously in living cells.

.....

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

(c) A baker mixes flour, yeast and water together to make bread.

Anaerobic cellular respiration takes place in the yeast in the mixture.

(i) Anaerobic respiration is exothermic.

Predict what will happen to the temperature of the mixture over time.

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

(ii) Bubbles of gas appear in the mixture due to anaerobic respiration in the yeast.

What is the name of the gas?

Tick (✓) **one** box.

Carbon dioxide ☐

Hydrogen ☐

Nitrogen ☐

Oxygen ☐

[1]

(iii) Flour contains starch, which is made from glucose.

Explain why the flour enables respiration to take place in the yeast.

.....

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

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE
Turn over for the next question

5

(a) Complete the table to show which things are part of the biodiversity of an area.

Tick (✓) **one** box in each row.

	Part of biodiversity	**Not** part of biodiversity
abiotic factors		
genes that living organisms have		
living organisms		
rocks		
water supply		

[3]

(b) Humans introduced goats to the Galápagos Islands, where they are kept for their meat and milk.

On one of the islands:

- Some of the goats escaped and now live in the forest.
- This has caused the area covered by forest to decrease.
- This has reduced the biodiversity of the island.

The forest provides food, shade and water for Galápagos tortoises.

(i) Suggest why the tortoise population size decreased after the introduction of the goats.

Tick (✓) **two** boxes.

The tortoises became too hot. ☐

The tortoises' habitat increased. ☐

There was too much water. ☐

There were fewer plants for the tortoises to eat. ☐

There were fewer predators of the tortoises. ☐

[2]

(ii) Riley works in conservation on the Galápagos Islands.

Riley wants to encourage local people to stop keeping goats.

Suggest **one** reason why this may be a challenge.

.....

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

(iii) Protecting the biodiversity of the forest helps the Galápagos tortoises to survive.

Write down **one other** benefit of protecting biodiversity.

.....

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

(c) Riley wants to estimate the population size of the goats on the island.

A capture-mark-recapture method is used.

Statements **A** to **E** describe the steps in the method. They are **not** in the correct order.

A Catch a sample of individual goats.

B Release the marked individuals.

C Count the number of marked goats in the second sample.

D Mark the goats in the sample so they can be recognised.

E Catch a second sample of individual goats.

Write the letters in the boxes to describe the correct order. One has been done for you.

		B		

[3]

(d) Write down **one** reason why Riley takes a sample instead of counting the whole population.

.....

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

(e) The table shows Riley's results:

Number of goats in sample 1	10
Number of goats in sample 2	14
Number of marked goats recaptured in sample 2	7

Calculate the estimated population size of the goats.

Use the equation: $\text{Population size} = \dfrac{\text{number of goats in sample 1} \times \text{number of goats in sample 2}}{\text{number of marked goats recaptured in sample 2}}$

Population size = ... goats **[2]**

(f) Describe **one** way Riley can change their approach to be more confident in their estimate of the population size.

.....

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

6 The health of most organisms is affected by disease.

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

Complete the table to describe the possible causes of each type of disease.

Tick (✓) the correct boxes in each row.

	Can be caused by		
Type of disease	**Genetic factors**	**Lifestyle factors**	**Pathogens**
Communicable			
Non-communicable			

[2]

(b) These four statements explain how pathogens can be spread:

1. Humans eat food which is contaminated with the pathogen.

2. The pathogen contaminates a surface. Humans touch the surface.

3. Humans inhale droplets which contain the pathogen.

4. A mosquito bite introduces saliva into a human's blood. It contains the pathogen.

(i) Which statement explains how the **Athlete's foot** pathogen is spread?

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

[1]

(ii) Which statement explains how the **Salmonella** pathogen is spread?

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

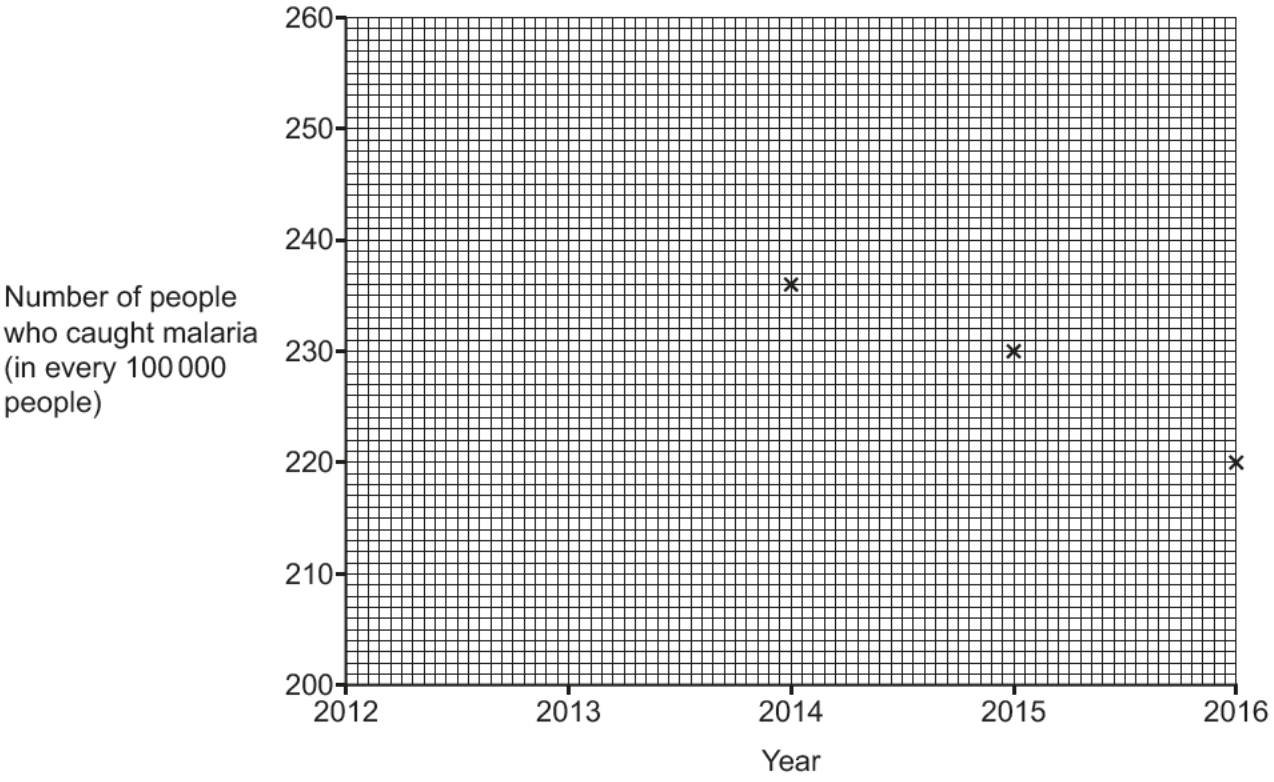
[1]

(c) Malaria is a common communicable disease.

The table shows the number of people who caught malaria in Southern Africa between 2012 and 2016.

Year	Number of people who caught malaria (in every 100 000 people)
2012	254
2013	245
2014	236
2015	230
2016	220

(i) Plot the data for 2012 and 2013 on the graph.



[2]

(ii) Describe the trend in the data.

.....

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

(iii) Calculate the percentage decrease in the number of people who caught malaria between the years 2012 and 2016.

Give your answer to **1** decimal place.

Percentage decrease = ...% **[3]**

(d)

(i) Some people in Southern Africa use anti-malarial paint to decorate their house.

The anti-malarial paint contains a chemical that kills insects.

Suggest why the paint can help stop the spread of malaria.

.....

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

(ii) In 2019, the first ever malaria vaccine was produced.

Statements **A** to **D** explain how vaccines work. They are **not** in the correct order.

A Inactive pathogens from the vaccine enter the blood.

B White blood cells destroy the pathogens.

C Memory cells stay in the blood, creating immunity to the pathogen.

D White blood cells make antibodies against the pathogen's antigens.

Write the letters in the boxes to show the correct order.

One has been done for you.

A			

[2]

(iii) Use the data to estimate how many people caught malaria (in every 100 000 people) in 2020.

Assume a lot of people had the malaria vaccine in 2019.

Put a (ring) around the correct option.

350 **254** **220** **180**

[1]

7 A farmer in Africa grows pumpkins.

(a) There is variation between the four pumpkins shown:

(i) Describe **one** visible example of variation between the pumpkins.

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

(ii) The environment may cause some of this variation.

State **one other** possible cause of the variation between the pumpkins.

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

(b) The farmer collects 100 seeds from the largest pumpkins.

Next year, the farmer will use these seeds to grow more pumpkin plants.

The farmer predicts that next year's pumpkin plants will produce a higher number of large pumpkins.

(i) Explain why this prediction could be **correct**.

.....

.....

.....

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

(ii) Explain why this prediction could be **incorrect**.

.....

.....

.....

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

(c)* Giraffes live on the land around the farm. A few of the giraffes have shorter necks, but most of them have long necks.

The farmer's son thinks giraffes with long necks became more common because they stretched up to eat the leaves on trees. The farmer knows this is **incorrect**.

Explain how natural selection led to giraffes with long necks becoming more common over many generations.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

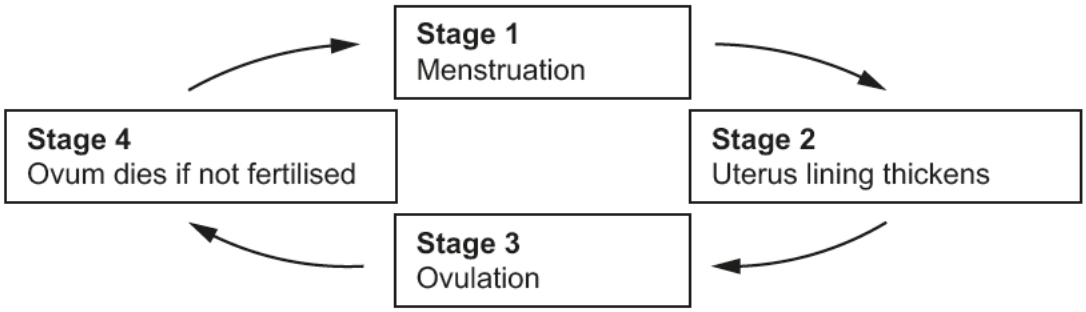
8 Charlie knows that hormones are important in human reproduction.

(a) Describe **one** role of hormones in human reproduction.

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

(b)

(i) The diagram shows four stages in the menstrual cycle.



Charlie has a contraceptive implant under their skin. The implant releases hormones.

Complete the sentence to explain why the hormones released by the implant disrupt the menstrual cycle.

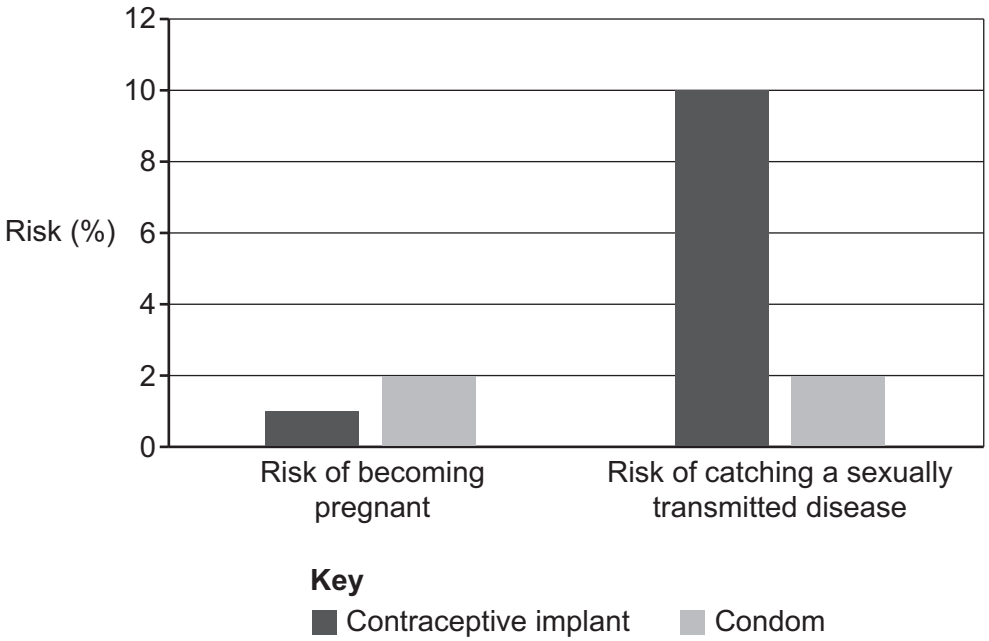
Put a (ring) around the correct option.

The hormones prevent stage **1 / 2 / 3 / 4** from taking place. **[1]**

(ii) A clinical trial compared the contraceptive implant with a condom.

The trial compared:

- the risk of becoming pregnant
- the risk of catching a sexually transmitted disease.



Charlie looks at the chart and decides to use a condom instead of the contraceptive implant.

Evaluate Charlie's decision, using the information from the chart.

.....

.....

.....

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

(iii) Suggest why the risk of becoming pregnant and the risk of catching a sexually transmitted disease are equal when using a condom.

.....

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

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

9 Alex has cereal for breakfast.

(a)

(i) The cereal is made of carbohydrate.

Which small molecule does the body get by breaking down the carbohydrate from the cereal?

Put a (ring) around the correct option.

Amino acid **Fatty acid** **Glycerol** **Sugar**

[1]

(ii) Small molecules are used by cells in aerobic respiration.

Complete the table.

Tick (✓) **one** box in each row.

Small molecule	**Needed** for aerobic respiration	**Produced** by aerobic respiration	**Not** needed for or produced by aerobic respiration
Oxygen			
Urea			
Water			

[2]

(b) Explain how the partially-permeable cell membrane controls movement of small molecules into and out of a cell.

Put a (ring) around each correct option.

Gases such as oxygen and carbon dioxide move across the cell membrane by **active transport / diffusion / osmosis**.

When water moves across the cell membrane by diffusion, we call it **active transport / osmosis / translocation**.

Molecules can be moved against a concentration gradient using energy in a process called **active transport / diffusion / osmosis**.

[3]

(c) Small molecules move into and out of the blood.

Which statements about how this happens are **true**, and which are **false**?

Tick (✓) **one** box in each row.

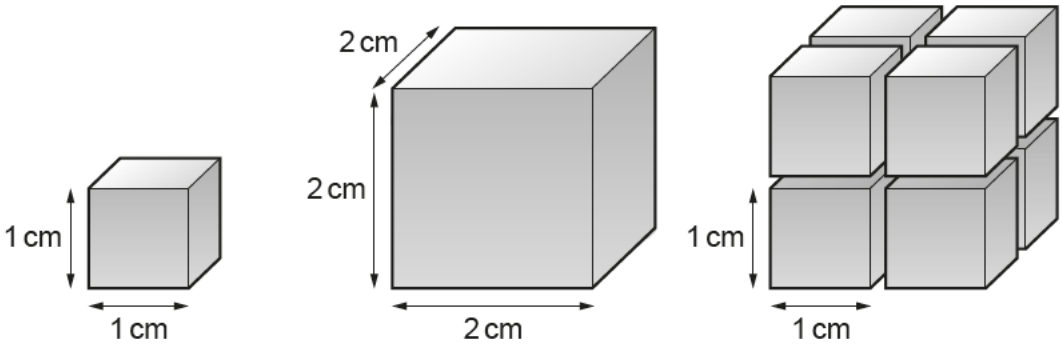
	True	False
Carbon dioxide and urea move out of cells into the blood.	☐	☐
Oxygen and carbon dioxide move between blood in capillaries and air in alveoli.	☐	☐
Urea is filtered into the blood by the kidneys.	☐	☐
Water and food molecules are absorbed from the digestive system into blood in capillaries.	☐	☐

[3]

(d) Exchange surfaces affect the surface area:volume ratio of multicellular organisms.

Alex uses cubes as models for different organisms.

Organism **A** represents a small organism.
Organism **B** represents a large organism **without** exchange surfaces.
Organism **C** represents a large organism **with** exchange surfaces.



A **B** **C**

(i) Calculate the surface area:volume ratio of organism **B**.

Give your answer in its simplest form.

Surface area:volume ratio = ... : ..... **[4]**

(ii) The surface area:volume ratio of organism **A** is 6:1.

Explain why the surface area:volume ratio of organism **C** is also 6:1.

.....

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

END OF QUESTION PAPER

EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.