Oxford Cambridge and RSA

Tuesday 16 May 2023 – Morning

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

J247/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 45 minutes

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

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

F

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 **90**.
- 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.

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Section A

You should spend a **maximum** of **30 minutes** on this section.

Write your answer to each question in the box provided.

1 A plant is placed near a window.
The plant grows towards the light.

Which hormone is responsible for this growth movement?

A Auxin

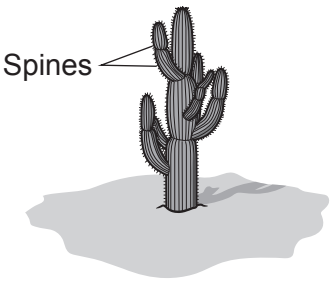
B Insulin

C Oestrogen

D Testosterone

Your answer ☐ **[1]**

2 The cactus is found in the desert. It has very small leaves called spines.



Why are spines an advantage to the cactus?

A They slow down the rate of respiration.

B They slow down the rate of transpiration.

C They stop the plant photosynthesising.

D They stop translocation in the cactus.

Your answer ☐ **[1]**

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3 In transpiration, water is lost from a plant.

Which part of a plant loses water to the surroundings?

A Guard cells

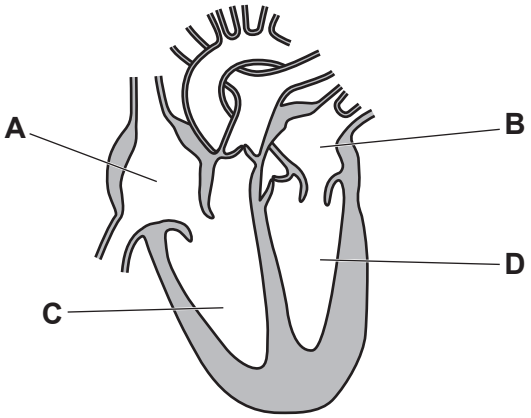
B Root hair cells

C Stomata

D Xylem

Your answer ☐ **[1]**

4 Which chamber in the human heart contracts with the **greatest** force?



Your answer ☐ **[1]**

5 Which row shows where valves in the heart are found?

	Between the atria and ventricles	**Between the ventricles and arteries**	**In the capillaries**
A	no	no	no
B	yes	yes	yes
C	no	no	yes
D	yes	yes	no

Your answer ☐ **[1]**

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6 A lizard **cannot** regulate its body temperature in the same ways as a human.

Which method can a lizard use to **increase** its temperature?

A Its blood vessels can constrict.

B It can lie in the sun.

C It can shiver.

D It can sweat less.

Your answer ☐ **[1]**

7 Which of these structures is found in the xylem?

A Cytoplasm

B Mitochondria

C Sieve pores in the end walls

D Waterproof substance called lignin

Your answer ☐ **[1]**

8 A patient is diagnosed with a detached retina.
This means that part of the retina has moved forward, away from the back of the eye.

What will the patient be **unable** to do?

A Change the shape of their lens

B Control the amount of light entering the eye

C See colours

D See objects clearly

Your answer ☐ **[1]**

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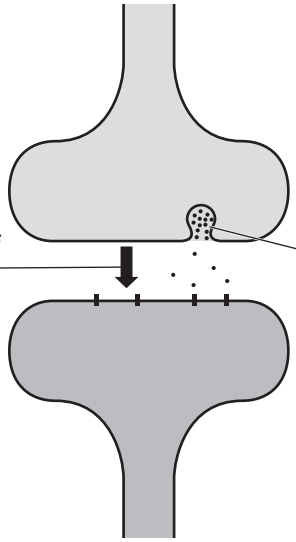
9 A person has a disease that has destroyed the motor neurones in their leg.

What is the most likely outcome for the person?

	Can move leg	Can feel foot being tickled
A	✓	✗
B	✓	✓
C	✗	✓
D	✗	✗

Your answer ☐ **[1]**

10 Synapses are junctions between neurones.
For an impulse to be generated in another neurone, a chemical must be released into the gap.



Which word describes how the chemical moves across the gap?

A Diffusion

B Osmosis

C Respiration

D Transpiration

Your answer ☐ **[1]**

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11 Small insects feed by taking fluid from the phloem of plants.
They use the contents of this fluid for respiration.

What will the small insects take from phloem to use in respiration?

A Amino acids

B Fatty acids

C Mineral ions

D Sugars

Your answer ☐ **[1]**

12 Bacteria can get into deep wounds in the skin and cause infection.
There is little oxygen in these wounds.

How will a lack of oxygen affect the type of bacteria in these wounds?

A Bacteria that respire using anaerobic respiration will be present.

B Most bacteria will respire aerobically and some will respire anaerobically.

C Only bacteria that respire using aerobic respiration will be present.

D The bacteria will not be able to respire, so all the bacteria will die.

Your answer ☐ **[1]**

13 What is the percentage change in mass of the potato chip during an experiment?

Mass of potato chip before (g)	Mass of potato chip after (g)
5.7	5.2

A –0.5 %

B –8.8 %

C –9.6 %

D –91.2 %

Your answer ☐ **[1]**

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14 Which statement about type 1 diabetes is correct?

A It can be treated with insulin.

B It is caused by overproduction of insulin.

C It is usually detected later in life.

D It should be controlled by exercise and diet alone.

Your answer ☐ **[1]**

15 A person was in an accident and their **memory** is affected.

Which part of the brain is most likely to have been injured?

A Cerebrum

B Hypothalamus

C Medulla

D Pituitary

Your answer ☐ **[1]**

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Section B

16 **(a)** Put ticks in the table to show whether each statement is **true** or **false** about the structure of DNA.

Tick (✓) **one** box in each row.

Statement about DNA	**True**	**False**
DNA is a polymer.		
DNA is made of 4 strands.		
The strands in DNA form a double helix.		
A DNA nucleotide is made of a sugar, a phosphate group and a base.		
The 4 bases found in DNA are A, C, G and U.		

[3]

(b) DNA is found in both eukaryotic and prokaryotic cells.

Draw lines to connect the **cell type** to the **form its DNA takes** then to the **part of the cell where the DNA is found**.

Cell type	**Form its DNA takes**	**Part of the cell where the DNA is found**
eukaryote	chromosomes	cytoplasm
prokaryote	plasmids	nucleus

[2]

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(c) A light microscope is used to see structures in cells.

Complete these sentences about the parts of a light microscope.

Use words from the list.

clips	**eyepiece**	**focusing knob**	**light**
objective	**stage**	**stain**	

(i) The microscope slide is placed on the ..... of the microscope. **[1]**

(ii) The ..... lens is used to change the magnification of the object being viewed. **[1]**

(iii) The part of the microscope that moves the lens to see the image more clearly is called

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

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17 **(a)** The table lists some structures in the human body.

Identify whether each structure is:

- part of the nervous system
- part of the endocrine (hormonal) system
- **not** part of either system.

Tick (✓) **one** box in each row.

Structure	**Part of the nervous system**	**Part of the endocrine system**	**Not part of either system**
Insulin producing cells in the pancreas			
Kidney tubules			
Pituitary gland			
Spinal cord			
Temperature receptors in the skin			

[5]

(b) **(i)** Stem cells are found in human embryos.

Describe what happens to stem cells as the embryo develops into a baby.

.....

.....

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

(ii) It takes one cell 12 hours to divide to produce two cells.

Starting with one cell, calculate how many cells there will be after 2 days.

Number of cells = ... **[3]**

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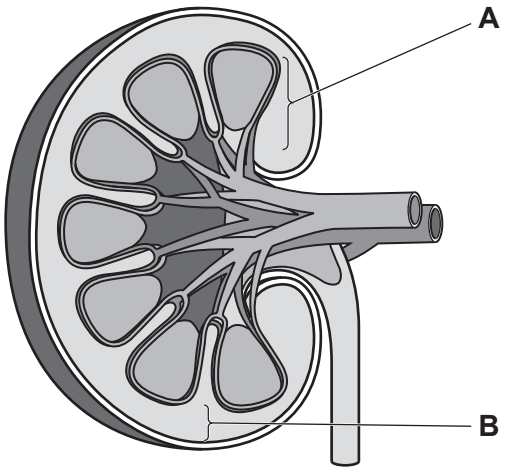
18 **(a)** The diagram shows a section through a kidney.



(i) Name the region labelled **A**. ..... **[1]**

(ii) Name the region labelled **B**. ..... **[1]**

(iii) Which type of blood vessel brings blood to the kidney?

Put a (ring) around the correct word.

artery **capillary** **vein**

[1]

(b) The table shows the volume of water gained and lost by one person in one day.

Water gained (litres per day)		**Water lost (litres per day)**	
Food and drink	2.2	From skin and lungs	0.9
Metabolic processes	0.3	Faeces	0.1
		Urine	

(i) Calculate the volume of urine that will be produced by this person on this day.

Volume of urine = ... litres **[2]**

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(ii) The same person runs a marathon race the next day.

Explain how the kidney will maintain the water balance within this person's body during the race.

.....

.....

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.....

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

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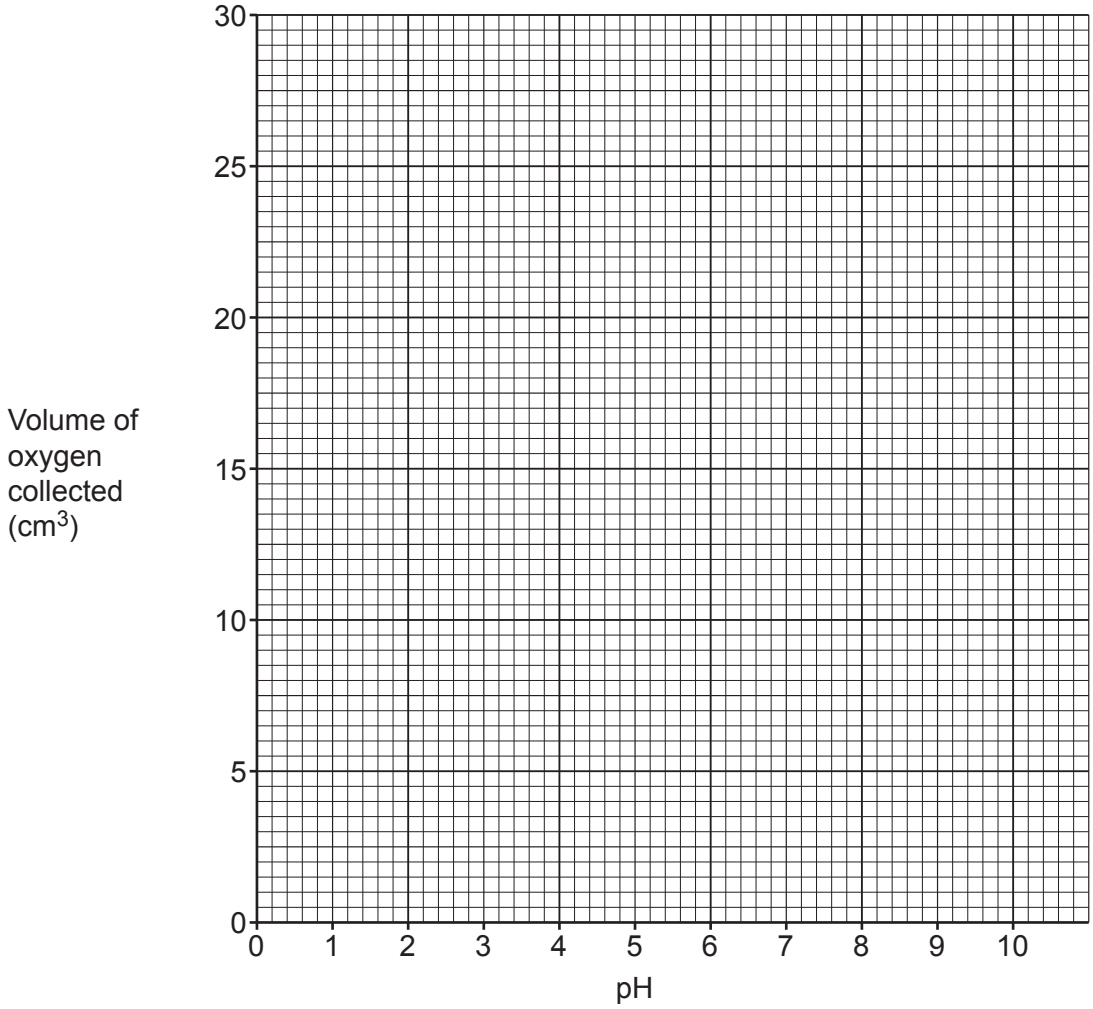
19 A student investigates the effect of pH on an enzyme called catalase.
Catalase breaks down hydrogen peroxide into water and oxygen.

The student collects the oxygen produced by the reaction.
The table shows their results.

pH	Volume of oxygen collected (cm^3)
2	1
4	12
6	24
8	26
10	8

(a) **(i)** Plot a graph of the results. **[2]**

(ii) Draw a line of best fit. **[1]**



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(b) Write down a conclusion for the student's results.
Include data in your answer.

.....

.....

.....

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

(c) When collecting data, it is important that it is accurate, valid and repeatable.

Draw lines to link each **improvement** the student could make to the **effect** this improvement has on the data.

Improvement	Effect
The experiment is completed three times for each pH.	makes the data more accurate
Use a measuring cylinder, not a beaker, to measure the volume of enzyme.	allows the identification of any anomalous results
Place the mixture of catalase and hydrogen peroxide in a waterbath. This will keep the temperature the same for each pH.	makes the data more valid

[2]

(d) The student wants to increase their confidence in finding the correct optimum pH for catalase.

What should the student do?

Tick **(✓) one** box.

Repeat the experiment at a higher temperature. ☐

Repeat the experiment using less enzyme. ☐

Repeat the experiment using pH 1, 3, 5, 7, 9 and 11. ☐

Repeat the experiment using pH 6.5, 7, 7.5, 8 and 8.5. ☐

[1]

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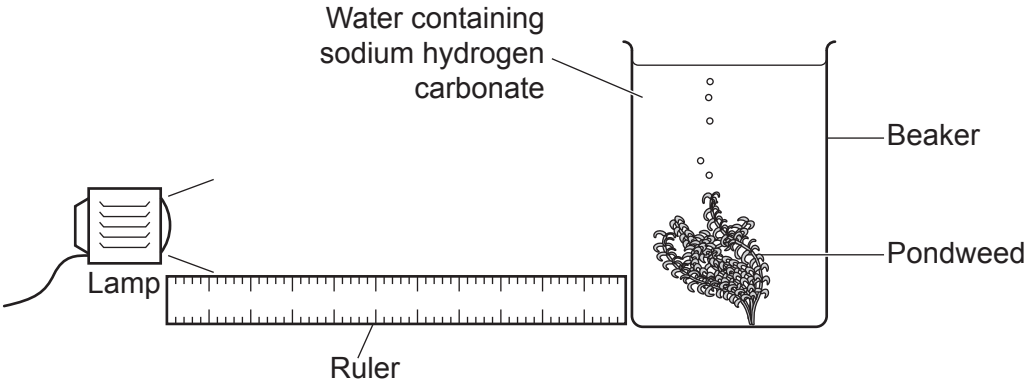
20* A student plans to investigate photosynthesis using this apparatus.



Describe how the student could use this apparatus to investigate the effect of light intensity on the rate of photosynthesis.

In your answer you should include:

- how to change the light intensity
- the variables that need to be kept constant
- the measurements that should be taken.

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

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21 (a) To try to lose weight some people go on a type of diet called a ketogenic diet.

In a ketogenic diet, a person eats food that is high in fat and protein but low in carbohydrates.

Complete each sentence about this diet.

Use the words from the list.

amino acids	**enzymes**	**fatty acids**	**glycerol**
glycogen	**homeostasis**	**respiration**	**sugar**

Proteins in the food are broken down to smaller molecules called

..... .

These smaller molecules are used to make more proteins in the body, such as

..... .

Fats in the food are broken down into ..... and ..... .

These are then used by the body to make lipids.

As the diet is low in carbohydrates such as starch, the person will have less

..... dissolved in their blood.

This means that the body will need to use some of its fat reserves to produce ATP by

..... .

The diet is only recommended to be used for a short period of time to lose excess fat.

[5]

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(b) Three people each make a comment about this diet.

Person **A**: People who are very overweight could lose weight if they went on this diet and this may make them feel better about themselves.

Person **B**: This diet could be harmful to people with underlying health conditions, such as diabetes.

Person **C**: There are dangers to following this diet but being very overweight also causes many health issues.

Which person is discussing both the risks **and** benefits of following this diet?
Explain your answer.

Person .....

Explanation .....

.....

.....
[3]

(c) A class is discussing how to test food to see if it contains carbohydrates.
A student says 'You need to do **two** different named tests to see if carbohydrates are present'.

Explain why this student is **correct**.

.....

.....

.....

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

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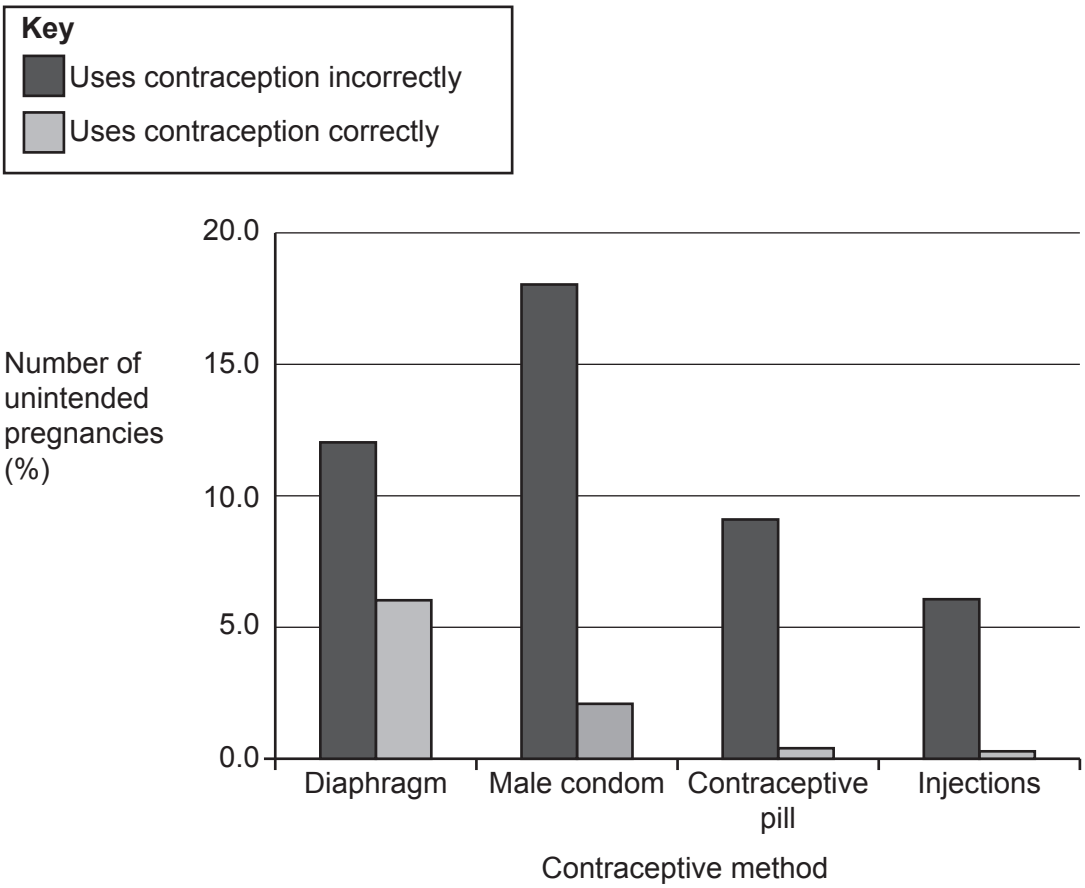
22 The graph shows the percentage of unintended pregnancies while using different types of contraception.



(a) Compare the effectiveness of the different types of contraception in preventing pregnancies. Include data from the graph.

.....

.....

.....

.....

.....

.....

..... **[4]**

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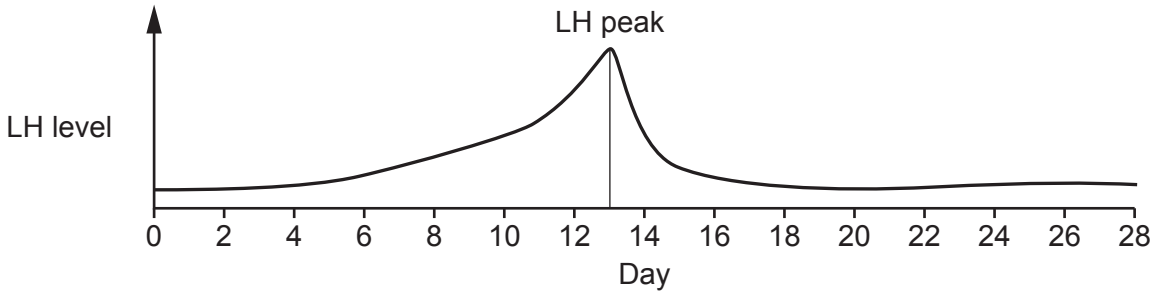
(b) A female is trying to get pregnant.

High levels of a hormone called LH stimulate ovulation.

The graph shows the levels of LH throughout the female's menstrual cycle.



When is the female most likely to get pregnant?
Explain your answer.

.....

.....

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

(c) Some females produce low levels of progesterone after an egg has been fertilised.

Suggest how this may affect the uterus lining.

.....

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

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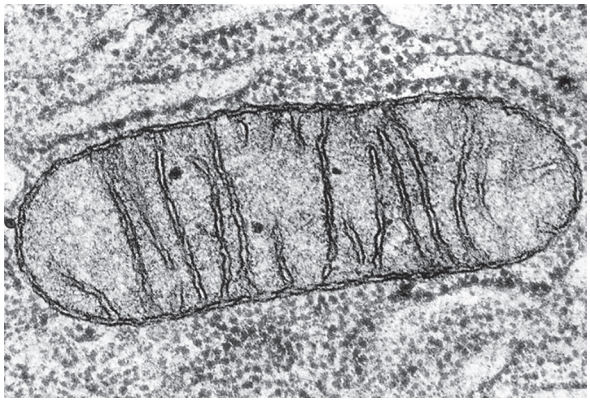
23 **(a)** The contents of sub-cellular structures found in eukaryotic cells enable the structure to perform its function.

Draw lines to connect each **sub-cellular structure** to its **contents**.
Then draw lines to join each of the **contents** to its correct **function** within the cell.

Sub-cellular structure	Contents	Function
cell membrane	chlorophyll	allows communication with other cells
chloroplast	enzymes	catalyses reactions in aerobic respiration
mitochondria	receptors	needed for photosynthesis

[4]

(b) The image is of a mitochondrion.



(i) Draw the mitochondrion in the box. Your drawing should be a scientific drawing.

[2]

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(ii) What type of microscope was used to create the image of the mitochondrion?

Explain your answer.

Type of microscope .....

Reason .....

.....

[2]

(c) Name **one** structure found in both an animal cell and a prokaryotic cell.

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

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24 **(a)** Arteries, capillaries and veins are blood vessels found in the human circulatory system.

Put ticks (✓) in each row to identify which blood vessels have each feature.

Feature	**Arteries**	**Capillaries**	**Veins**
Have valves along their length			
Have a very thick muscle wall			
Have a wide lumen			

[3]

(b) Chronic venous insufficiency (CVI) is a condition caused by faulty valves found in some blood vessels in the legs.

Describe how CVI will affect the person's blood circulation.
Suggest **one** symptom of this condition.

Effect on blood circulation .....

.....

Symptom .....
[2]

(c) The volume of blood pumped from the left ventricle into the aorta during one contraction is 70 ml.

Calculate the volume of blood that will be pumped into the aorta in one hour if a person has a resting heart rate of 76 beats per minute.

Volume = ... ml / hour **[2]**

(d) Red blood cells contain haemoglobin to transport oxygen.

Give **one** other feature of red blood cells.
How does this other feature allow the cell to perform its function?

.....

.....

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

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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