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F

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

J247/01 Paper 1, B1–B3 and B7 (Foundation Tier)

Tuesday 15 May 2018 – Afternoon

Time allowed: 1 hour 45 minutes

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

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

First name	
Last name	

Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

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 consists of **28** pages.

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SECTION A

Answer **all** the questions.

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

1 Which two substances are products of **anaerobic** respiration in **yeast**?

A Carbon dioxide and ethanol

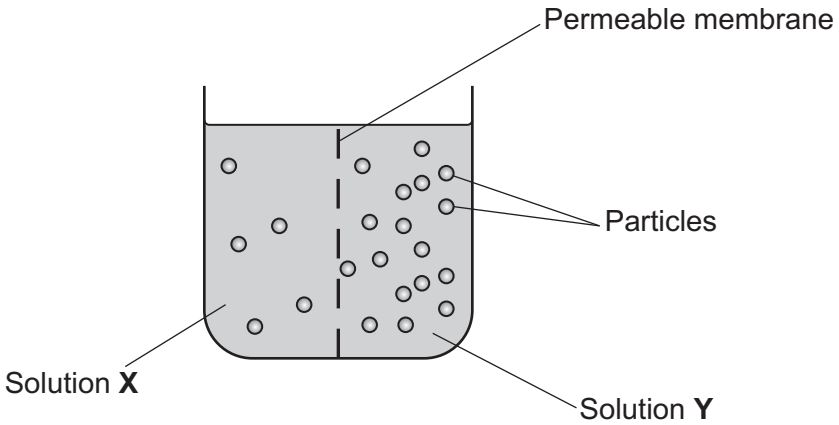
B Carbon dioxide and water

C Oxygen and ethanol

D Oxygen and water

Your answer ☐ **[1]**

2 Look at the diagram. It shows the particles dissolved in two solutions.



The particles can diffuse through the permeable membrane.

Which statement about the particles is true in this diagram?

A Particles move in both directions across the permeable membrane.

B Particles only move from **X** to **Y**.

C Particles only move from **Y** to **X**.

D Particles stop moving when the concentrations become equal.

Your answer ☐ **[1]**

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3 DNA is a polymer.

What is the name of the monomer in DNA?

A Base

B Deoxyribose sugar

C Nucleotide

D Phosphate

Your answer ☐ **[1]**

4 A student uses a microscope to look at plant cells on a slide.

Which of these methods should they use first?

A Highest power objective lens and focus moving the lens away from the slide

B Highest power objective lens and focus moving the lens towards the slide

C Lowest power objective lens and focus moving the lens away from the slide

D Lowest power objective lens and focus moving the lens towards the slide

Your answer ☐ **[1]**

5 The microscope used by the student has an eyepiece lens with a magnification of 10×.

Which objective lens would give an image magnification of 200×?

A 10×

B 20×

C 30×

D 200×

Your answer ☐ **[1]**

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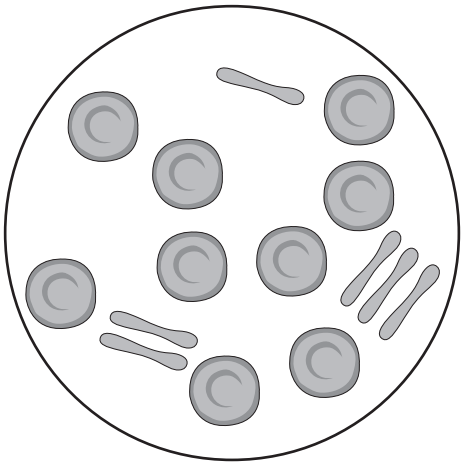
6 Which type of human cell is shown in this diagram?



A Egg cells

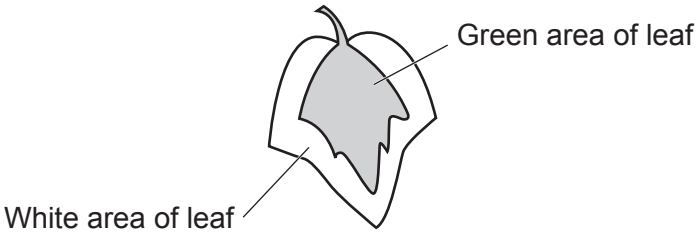
B Red blood cells

C Sperm cells

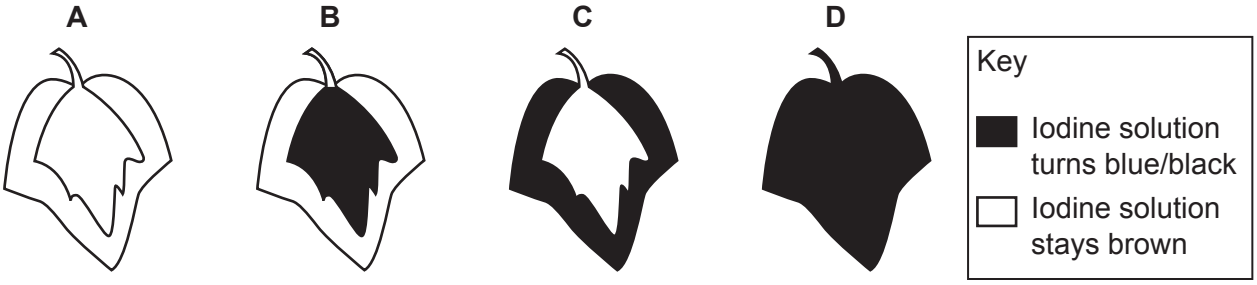
D White blood cells

Your answer ☐ **[1]**

7 The diagram shows a variegated leaf.



Which diagram shows the correct starch test results for the variegated leaf?



Your answer ☐ **[1]**

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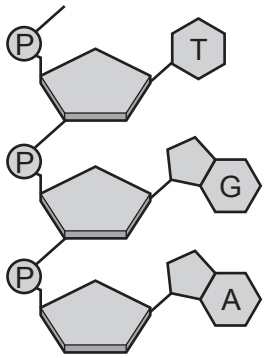
8 DNA is made of two complementary strands.

The diagram shows part of one strand of DNA.



Which base sequence would be found on the complementary strand of this DNA?

A A
C
T

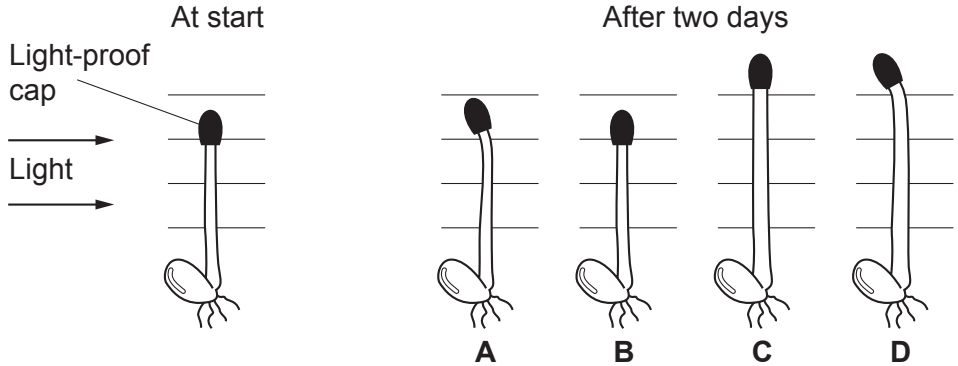
B C
A
G

C G
A
C

D T
G
A

Your answer ☐ **[1]**

9 Seedlings were grown with a light-proof cap over the tip. The seedlings had light from one direction only.



Which diagram shows the correct growth of the seedling after two days in these conditions?

Your answer ☐ **[1]**

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10 A student wants to test for **protein**.

What would they use to test for protein?

A Benedict's reagent

B Biuret reagent

C Iodine solution

D Ethanol

Your answer ☐ **[1]**

11 Which of these can be used to treat type **2** diabetes but **not** type **1**?

A Diet and exercise

B Exercise only

C Insulin and diet

D Insulin, diet and exercise

Your answer ☐ **[1]**

12 Why do plant root hair cells use active transport to take in minerals?

A Minerals are dissolved in water in the soil.

B Minerals are needed by the plant in very low concentrations.

C Minerals are present at very high concentrations in the soil.

D Minerals are present at very low concentrations in the soil.

Your answer ☐ **[1]**

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13 Which one of these stages comes **first** during mitosis?

A The nuclear membrane forms.

B The nuclear membrane breaks down.

C Chromosomes separate.

D Chromosomes line up on the equator.

Your answer ☐ **[1]**

14 Plant roots respond to gravity by growing downwards.

What is this response called?

A Negative gravitropism

B Negative phototropism

C Positive gravitropism

D Positive phototropism

Your answer ☐ **[1]**

15 Transpiration has a cooling effect on the leaves of plants.

Which statement **best** describes how this happens?

A Evaporation of water from the leaf removes heat energy.

B Water entering the stomata takes heat energy from the leaf surface.

C Water dripping off the leaf causes heat energy to be lost.

D Water falling on the leaf removes heat energy.

Your answer ☐ **[1]**

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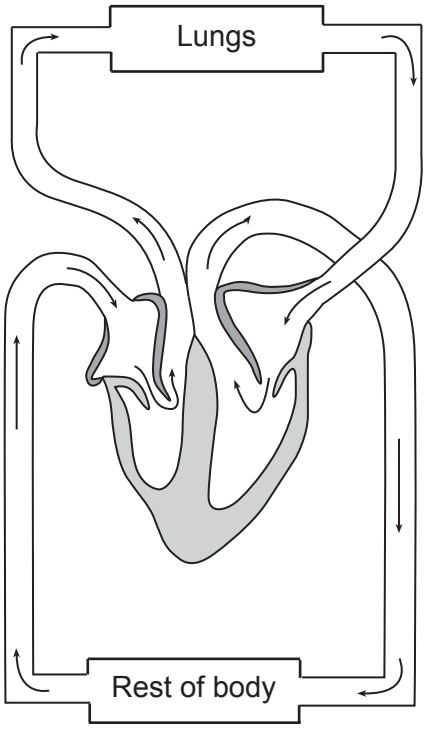
SECTION B

Answer **all** the questions.

16 Look at the diagram of the human circulatory system.



(a) **(i)** Write the letter **X** on the diagram to show the position of the left ventricle. **[1]**

(ii) Complete the sequence to show the flow of blood through the circulatory system.

Left side of heart ↓
.....
Rest of body ↓
Veins ↓
Right side of heart ↓
Artery ↓
.....
Vein ↓
Left side of heart ↓

[2]

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(b) The blood travels through the heart twice on one complete circuit of the body.

(i) What is the name of this type of circulation?

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

(ii) Suggest **two** advantages of blood travelling through the heart twice in each complete circuit of the body.

1 .....

.....

2 .....

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

(c) How is the **thickness** of the heart wall on the left side different to the right side?

Write down **two** reasons for the difference.

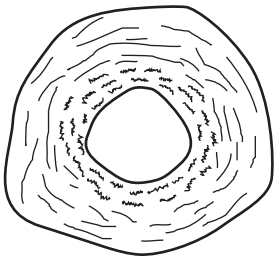
.....

.....

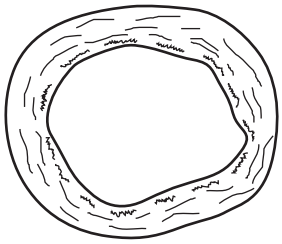
..... **[2]**

(d) Look at the diagram.

It shows a section of an artery and a vein.



Artery



Vein

(i) Describe **two** differences in structure between the artery and the vein shown in the diagram.

1 .....

.....

2 .....

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

(ii) Write down **one** difference between arteries and veins that is **not** shown in the diagram.

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

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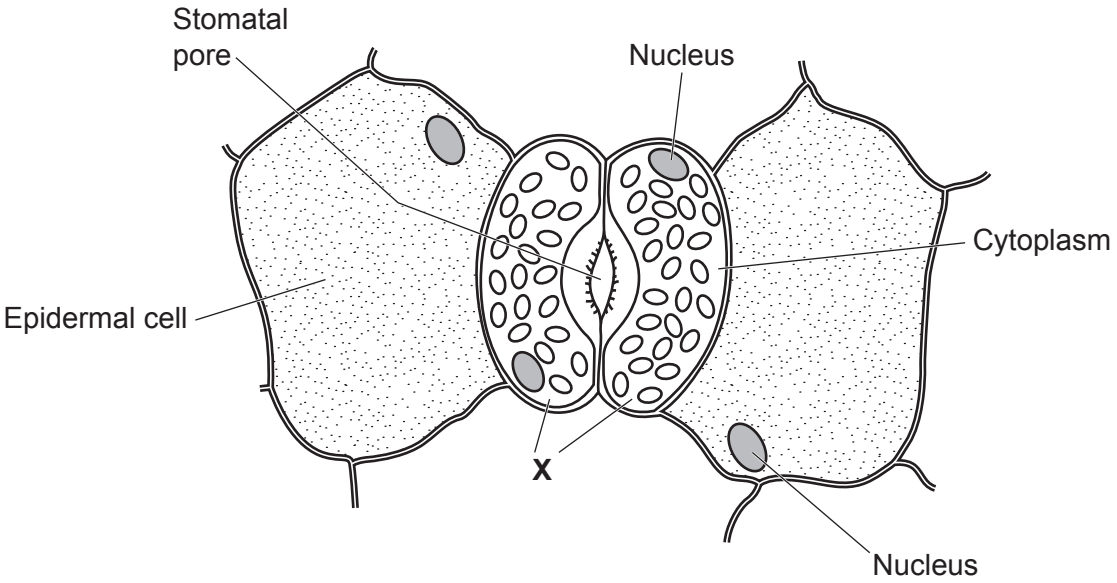
17 Stomata are found on the surface of leaves.

The diagram shows some of the surface cells of a leaf.



(a) **(i)** Write down the name of the cell labelled **X**.

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

(ii) Describe **two** functions of stomata.

.....

.....

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

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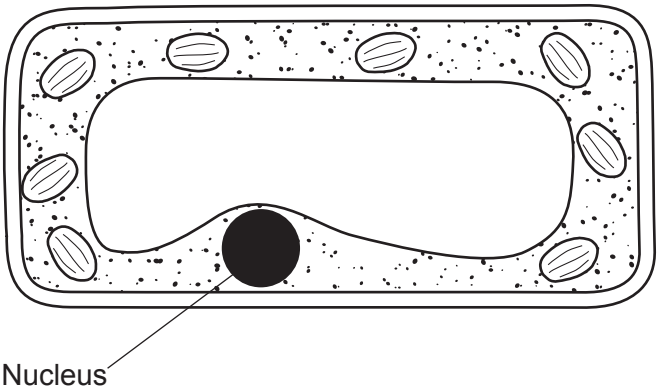
(b) Look at the diagram showing a plant cell.



(i) The diameter of the nucleus in the diagram is 10 millimetres. The actual size of the nucleus is 10 **micrometres**.

Calculate the magnification of the diagram.

Answer = ... × **[2]**

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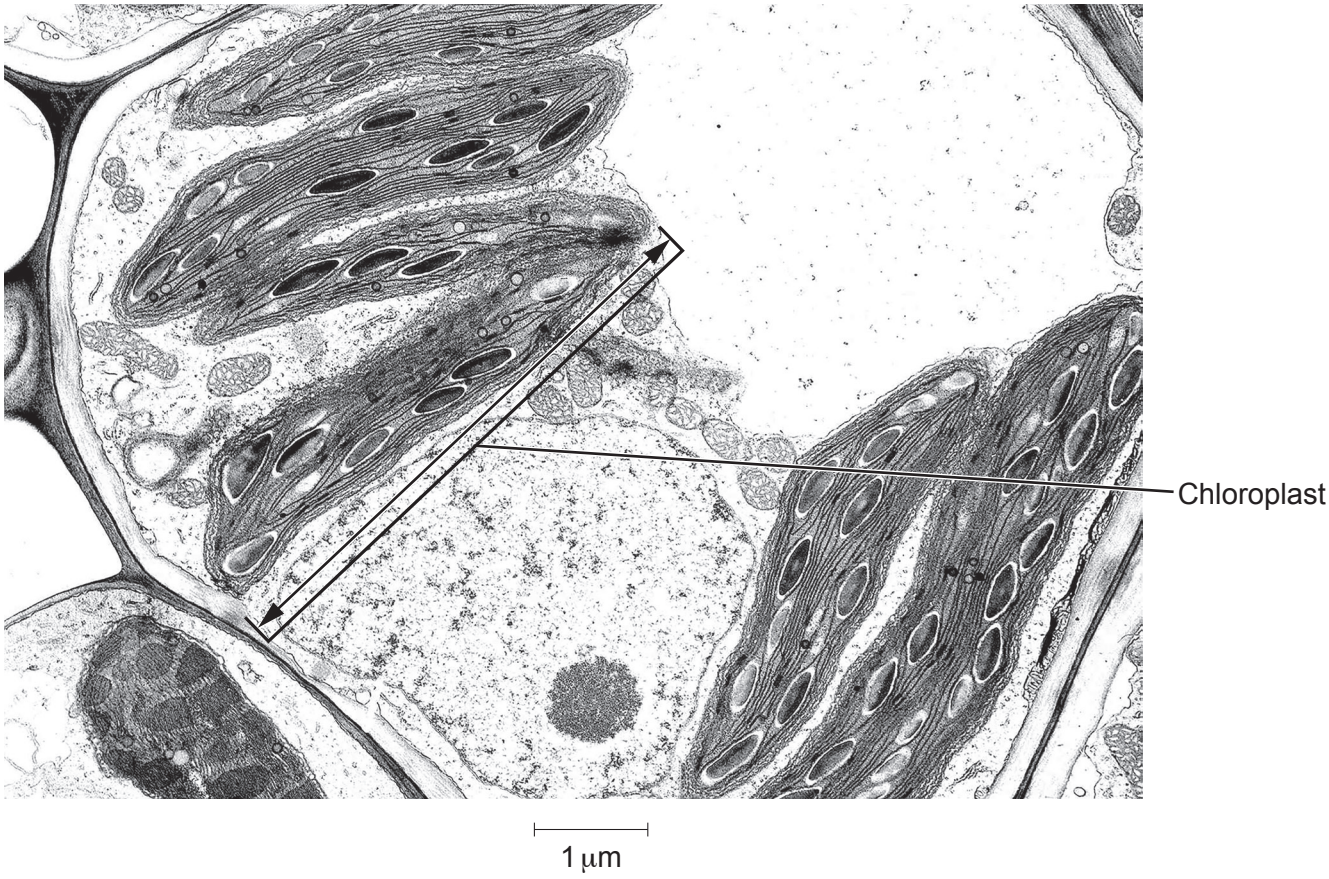
(ii) Look at the picture of part of a plant cell.



Use the arrow on the picture and the scale to estimate the length of the chloroplast.

Answer = ... μm **[1]**

(c) Photosynthesis takes place inside chloroplasts.

(i) Complete the chemical equation for photosynthesis.

$6CO_2$ + ... → $C_6H_{12}O_6$ + ... **[2]**

(ii) Energy is taken in from the surroundings for photosynthesis to take place.

What name is used to describe reactions that take in energy?

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

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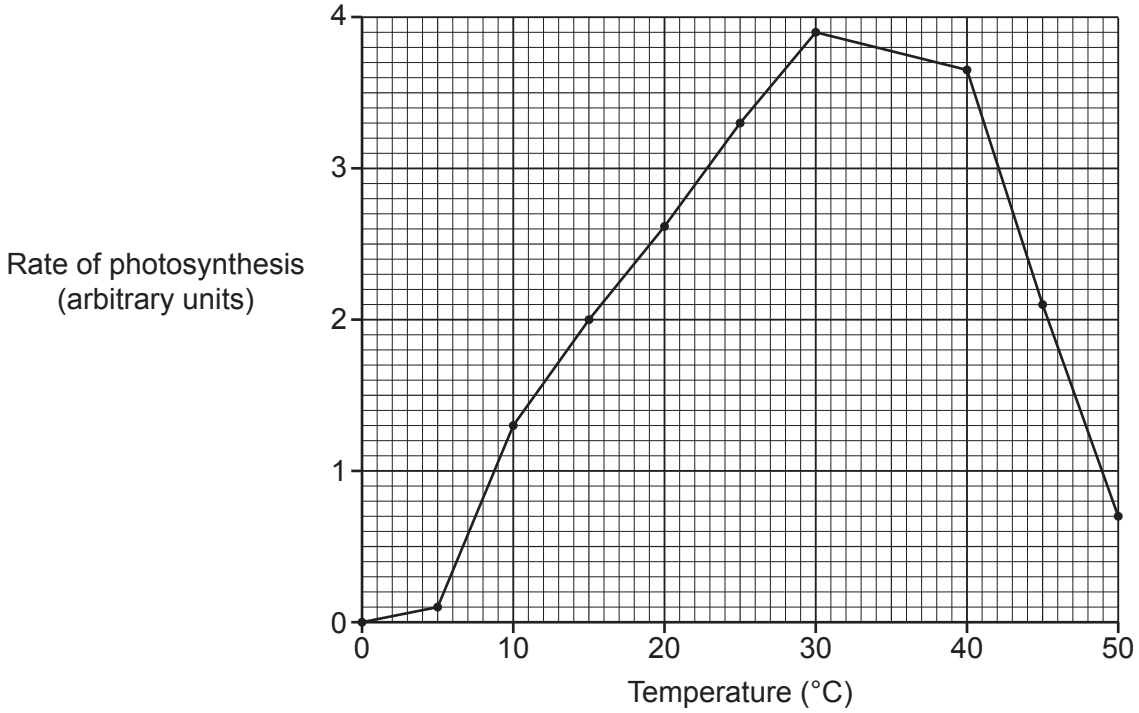
(d) The graph is from an experiment to show the effect of temperature on the rate of photosynthesis.



(i) What is the optimum temperature for photosynthesis in this experiment?

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

(ii) The rate of photosynthesis was recorded in 5 °C intervals.

The experiment could be improved to get a more **precise** value for the optimum temperature.

Explain how.

.....

.....

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

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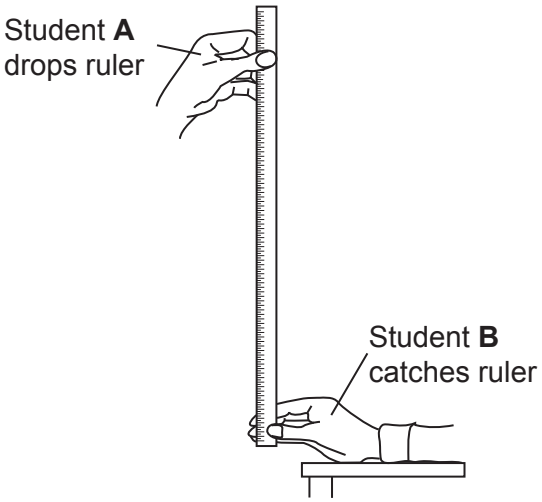
18 A class of students investigate reaction time.

Student **A** drops a ruler while student **B** catches it.

They then measure the position of student **B**'s thumb on the ruler, this is the drop distance.

The diagram shows how the measurements were taken.



The drop distance is converted into a reaction time. The reaction time in seconds for each hand is recorded.

The table shows the results for ten **right-handed** students in the class.

Reaction time(s)	
Left non-dominant hand	**Right dominant hand**
0.22	0.28
0.23	0.25
0.27	0.23
0.24	0.24
0.25	0.24
0.25	0.25
0.25	0.26
0.25	0.26
0.25	0.26
0.27	0.23
Mean = 0.25	Mean = 0.25

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(a) **(i)** Calculate the **mode** for the right dominant hand.

Answer = ... seconds **[1]**

(ii) The mean and mode for the left non-dominant hand are identical.

What **other** conclusions can be made about reaction times in these ten students?

.....

.....

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

(b) How could these students improve the recording of their results?

.....

.....

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

(c) The students want to investigate reaction times to see if left-handed people are faster than right-handed people.

How could they develop the experiment to test this?

.....

.....

.....

.....

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

(d) The reaction in the experiment involves a **stimulus**.

What is the stimulus in the reaction involving catching the ruler?

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

(e) Complete the sequence of a reflex arc.

Stimulus→	.....	Sensory neurone→	CNS→	....	Effector→	Response

[2]

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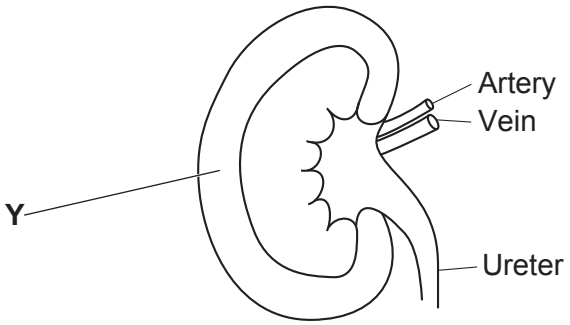
19 Look at the diagram.

It shows a vertical section through a kidney.



(a) **(i)** What is the name of part **Y**?

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

(ii) Which liquid flows through the ureter?

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

(iii) Draw an arrow in the ureter showing the direction that this liquid flows.

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

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(b) The kidney is important for water balance.

The table shows the measurements of water balance for two patients in hospital.

	Volume of water (ml)	
	Patient A	**Patient B**
Water taken into body in food and drinks	2500	2500
Water made in the body during respiration	200	200
Total input =	2700	2700
Water lost from kidneys in the form of urine	1900	1700
Water lost through skin, lungs and digestive system	1000	1000
Total output =	.....	.....

(i) Calculate the total output for Patient A and Patient B.

Patient A .....

Patient B .....

[1]

(ii) Which patient needs treatment for their kidneys?

Explain the reasons for your choice.

.....

.....

.....

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

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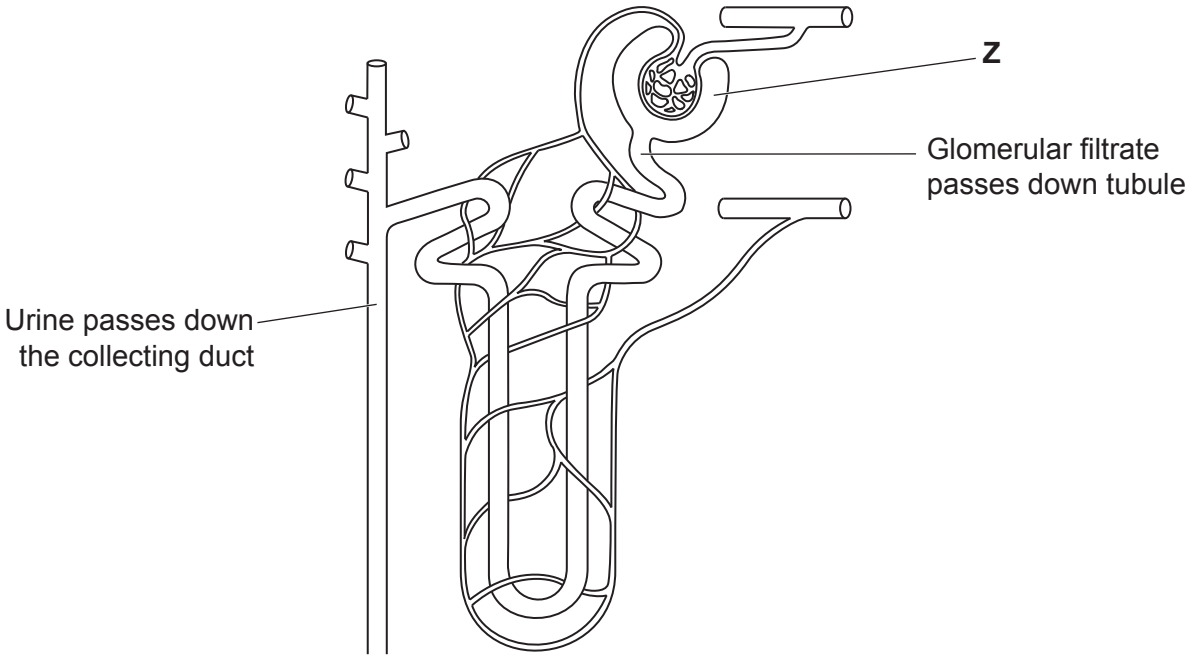
(c) Look at the diagram. It shows a kidney tubule (nephron).



(i) What is the name of part **Z**?

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

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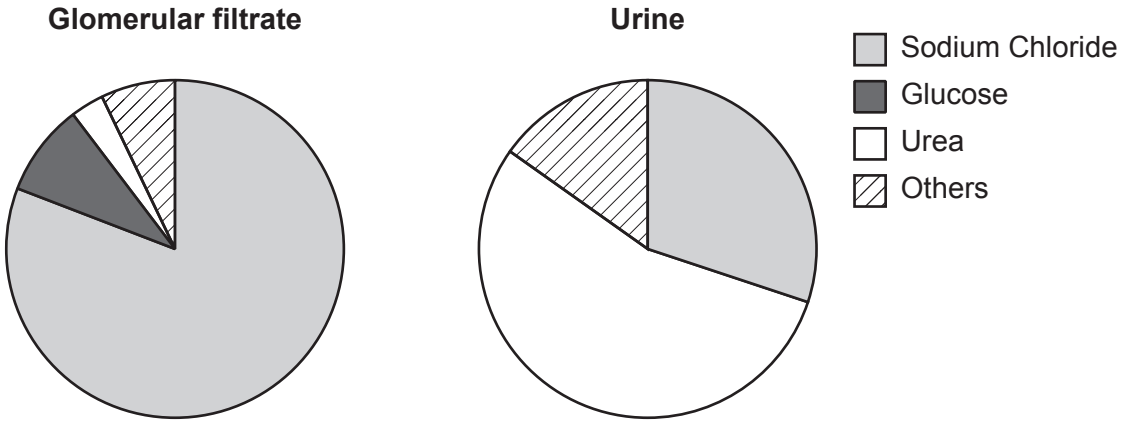
(ii) The diagram shows the composition of glomerular filtrate and urine.



What conclusions can be made about what happens between part **Z** and the collecting duct in the kidney tubule?

Use evidence from the diagram to support your answer.

.....

.....

.....

.....

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

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20 **(a)** How are hormones transported around the body?

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

(b) Finish these sentences to explain what is happening in the body of a female during the menstrual cycle.

The pituitary gland in the ..... releases the hormone FSH.

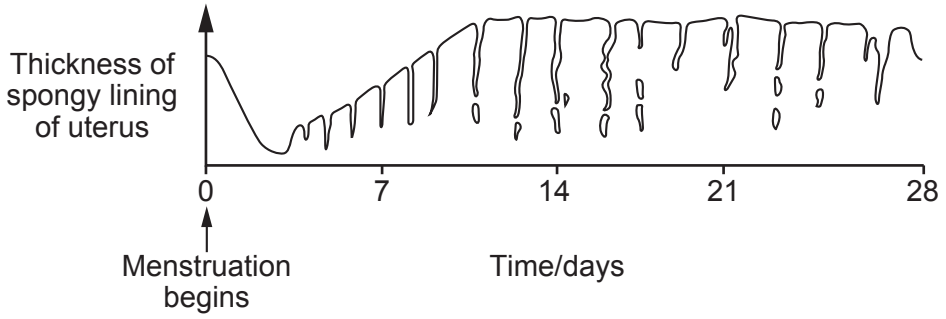
FSH causes an ..... to mature in a follicle.

FSH also causes the follicle to release the hormone ..... .

After ovulation, the empty follicle releases another hormone called ..... .

[4]

(c) The diagram shows how the lining of the uterus changes during the menstrual cycle.



(i) Mark on the diagram with the letter **E** the most likely point when ovulation occurs. **[1]**

(ii) If a fertilised egg is **not** present, a change happens to the uterus lining after 28 days.

How does the uterus lining change?

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

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(d)* The table shows the effectiveness of some different forms of contraception.

Form of contraception	**Percentage pregnancies per year (%)**
Hormonal	
Injection	<1
Patch	<1
Pill	2
Non-hormonal	
Diaphragm	6
Male condom	2
Male sterilisation	<1

Suggest explanations for the differences in the effectiveness of the methods of contraception and explain why the pill is a popular method.

.....

.....

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.....

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

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21 Students investigate how to extract DNA from peas.

Stage 1:

- Chill 10 cm^3 of ethanol. Keep it on ice throughout the method for use in stage 2.
- Make a thick 'soup' by blending 100 cm^3 of peas with salt and cold water. Blend for 15 seconds in an electric blender.
- Strain the 'soup' through a mesh strainer and collect the liquid part in a beaker.
- Add 30 cm^3 of washing-up liquid and swirl to mix.
- Let the mixture settle for 5–10 minutes in a water bath at 60 °C.

(a) One group of students made a water bath using a beaker of water, thermometer and Bunsen burner. Another group used an electric water bath.

Write down **two** advantages of using an electric water bath.

1 .....

.....

2 .....

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

(b) Low temperatures protect DNA by slowing down the activity of enzymes that destroy DNA. High temperatures break down membranes in the cell.

To extract DNA, some methods use a water bath at 60 °C but other methods do not use an increased temperature.

Suggest **two** reasons for the different methods.

.....

.....

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

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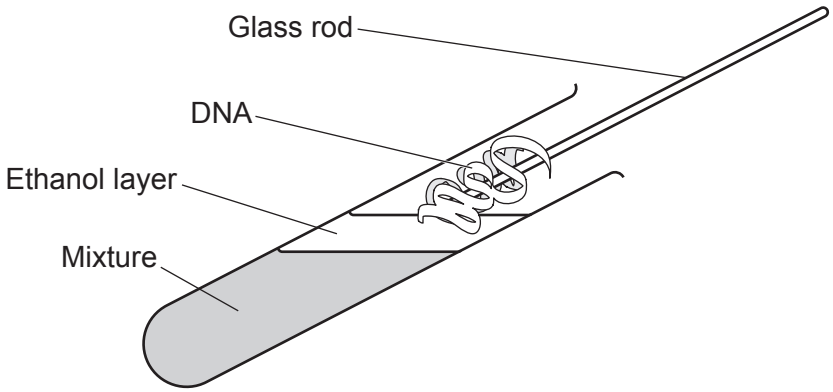
Stage 2 isolates the DNA.



- Pour the mixture collected from stage **1** into a test tube until a third full. Add protease enzymes to the test tube.
- Slowly pour cold ethanol at an angle of 45° into the tube. Ethanol will float on top.
- DNA is soluble in water, but salted DNA does not dissolve in ethanol and will form white clumps where the water and ethanol layers meet.
- Twirl a glass rod and the DNA will collect on the rod.
- Dry the sample on a pre-weighed filter paper and measure the mass of product.

(c) Suggest **two** safety precautions which should be taken at stage **2**.

Explain why each safety precaution is needed.

1 Safety precaution: .....

Explanation: .....

2 Safety precaution: .....

Explanation: ..... **[2]**

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(d) Look at the table. It shows the results from the two groups of students in the investigation.

Type of water bath used	Mass of DNA collected (mg)			
	Test 1	**Test 2**	**Test 3**	**Mean**
Beaker of water and Bunsen burner				22.9
Electric	33.6	32.3	33.3	.....

(i) Calculate the mean mass collected in the investigation using the electric water bath.

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

Answer = ... mg **[2]**

(ii) The range of the three test readings for the beaker of water and Bunsen burner was 3.4.

Does the evidence support using an electric water bath instead of a beaker of water and Bunsen burner?

Explain your answer.

.....

.....

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

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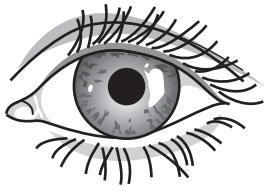
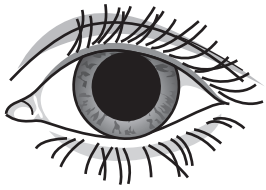
22 A girl walks from a sunny beach into a dark café.

Diagram **A** shows the girl's left eye on the beach.



A



B

(a) Diagram **B** shows the girl's left eye after she enters the café.

Explain how you can tell this and how this change happens.

.....

.....

.....

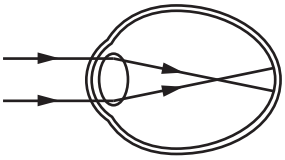
.....

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

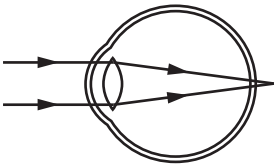
(b) Look at the diagrams.

They show how light is focused in people with different eye defects.

Person **X**



Person **Y**



(i) Name the eye defect in each person.

Person **X** .....

Person **Y** .....

[2]

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(ii) Identify the type of corrective lens needed by person **X** and **Y** and explain how the lenses work.

.....

.....

.....

.....

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

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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