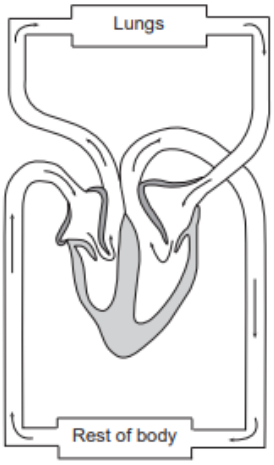
Q1. (2018)

A)

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]**

B)

(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 ↓

C)

(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]**

D)

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

1 .....

.....

2 .....

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

E)

(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]**

F)

(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]**

G)

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

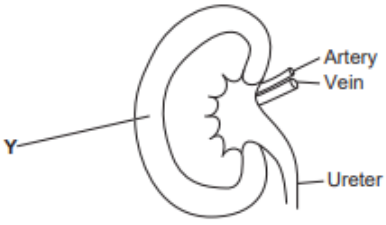
..... **[1]**

Q2 (2018)

A)

19 Look at the diagram.

It shows a vertical section through a kidney.



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

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

B)

(ii) Which liquid flows through the ureter?

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

C)

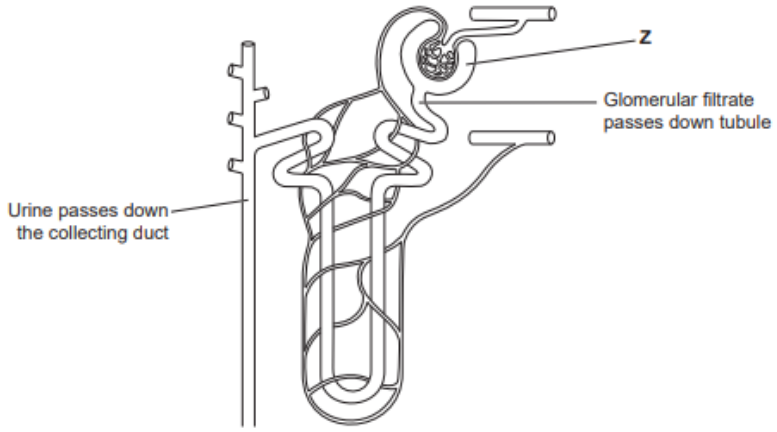
(iii) Draw an arrow in the ureter showing the direction that this liquid flows.

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

Q3 (2018) – 19c

A)

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

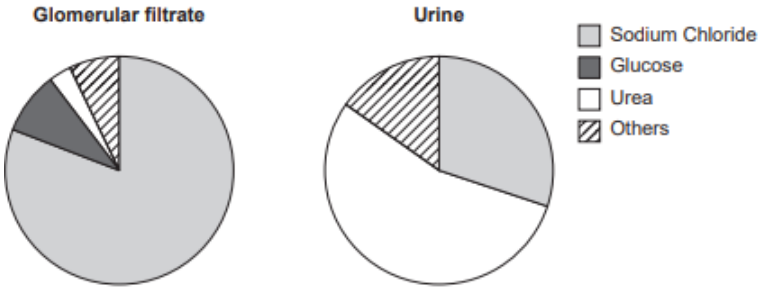


(i) What is the name of part **Z**?

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

B)

(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.

.....

.....

.....

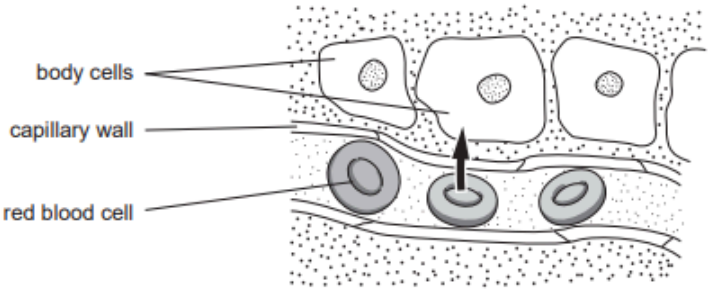
.....

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

Q4. (2019)

3 The diagram shows the direction of **oxygen** transfer from red blood cells to body cells.

What process does the arrow show?



A Active transport

B Diffusion

C Osmosis

D Transpiration

Your answer ☐ **[1]**

Q5. (2019)

13 A cube of potato is used to investigate the effect of surface area on osmosis.

The cube is 3 × 3 × 3 cm.

What is the surface area to volume ratio of the cube?

A 1 : 2

B 2 : 1

C 6 : 1

D 1 : 6

Your answer ☐ **[1]**

Q6. (2019)

14 An experiment is carried out to find the concentration of potato tissue.

Four chips are cut from a potato.

At the start, each chip is 50 mm long, 10 mm wide and 10 mm high.

Each chip is put in a different sucrose solution **A**, **B**, **C** and **D**.

The volumes of the chips are calculated after 1 hour.

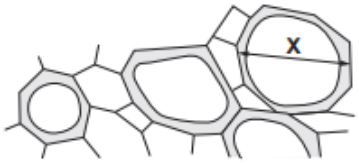
Sucrose solution	Volume of chip (mm^3)
A	50
B	500
C	5000
D	50 000

Which sucrose solution has the same concentration as the potato tissue?

Your answer ☐ **[1]**

Q7. (2019)

16 The diagram shows cells that are important in the process of **transpiration** in plants.



A)

(a) The diameter of cell **X** has been magnified 500×.

Calculate the actual diameter of cell **X**.

Use the equation: actual diameter = measured size ÷ magnification

Diameter = ... mm **[2]**

B)

(b) What is the name of plant cell **X**?

Tick (✓) **one** box.

Phloem cell ☐

Root hair cell ☐

Xylem cell ☐

[1]

C)

(c) State **two** ways that cell **X** is adapted to its function in a plant.

1 .....

2 .....

[2]

D)

(d) Light microscopes let us see objects as small as 0.2 micrometres.

The diameter of cells similar to cell **X**, can vary between 0.008 mm and 0.5 mm.
(1 mm = 1000 micrometres)

Is it possible to see all these types of cells using a light microscope?

Explain your answer.

.....

.....

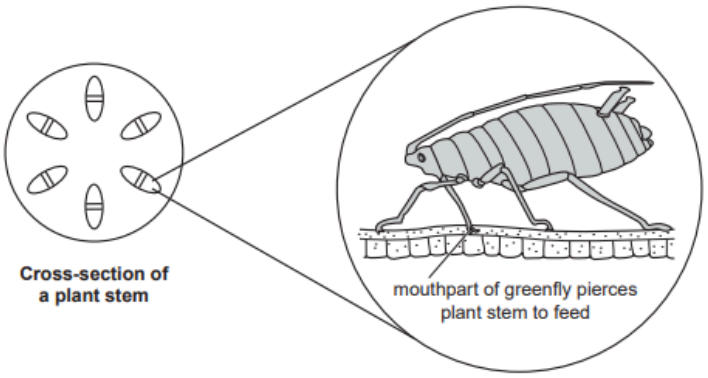
..... **[2]**

Q8. (2019)

A)

17 **(a)** The diagram shows a cross-section of a plant stem.

A greenfly feeds on the plant by piercing through to the tissue shown in the cross-section of a plant stem.



Greenfly

(i) What is the name of the tissue in the stem that the greenfly is trying to reach with its mouthpart?

Tick (✓) **one** box.

Phloem ☐

Root hair ☐

Xylem ☐

[1]

B)

(ii) Explain why plants infested with greenfly have very poor growth.

.....

.....

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

C)

(b) A gardener carries out an experiment using two similar tomato plants. The tomato plants are grown in pots.

She puts one inside a glasshouse and one outside beside the glasshouse.

To decide which plant loses the most water, the gardener looks to see which plant wilts first.

The diagrams show a plant before and after it has wilted.

(i) On a windy day, the plant **outside** the glasshouse wilts first.

Explain why.

.....

.....

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

D)

(ii) The gardener's results do not provide very accurate information about the effect of wind on water loss.

How could the gardener improve the design of her experiment?

.....

.....

.....

.....

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

E)

(c) Fifty years ago scientists experimenting on plants had to inject dyes to measure water flow.

Now they can use modern methods such as MRI and X-ray imaging.

Scientists are now developing new ideas on how water flows through a plant that are different from theories developed fifty years ago.

Explain why.

.....

.....

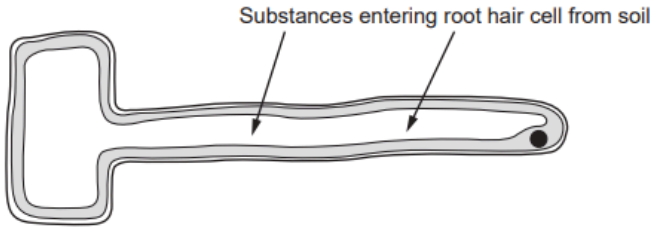
.....

.....

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

Q9. (2020)

3 Which substances are absorbed from the soil by the root hair cell?



A Carbohydrates and proteins

B Carbon dioxide and nitrogen

C Proteins and vitamins

D Water and mineral ions

Your answer ☐ **[1]**

Q10. (2020)

6 Which process moves food around in plants?

A Osmosis

B Respiration

C Translocation

D Transpiration

Your answer ☐ **[1]**

Q11. (2020)

7 Some plants can wilt if they lose more water than they take up.

Which conditions make a plant **most** likely to wilt?

A Higher wind speed and lower temperature

B Lower wind speed and lower temperature

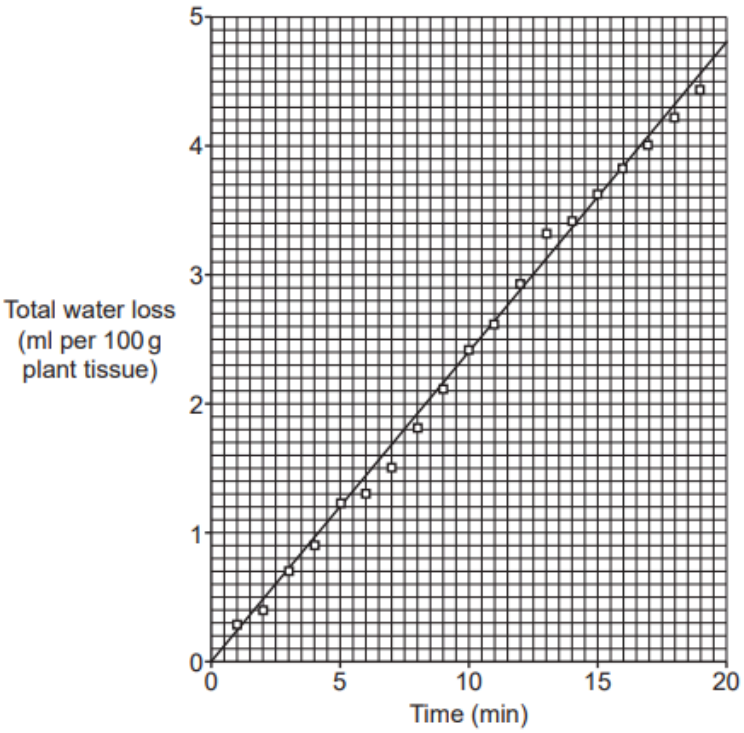
C Lower wind speed and higher temperature

D Higher wind speed and higher temperature

Your answer ☐ **[1]**

Q12. (2020)

8 The graph shows total water loss from a plant.



Calculate the water lost between 5 and 15 minutes using the line of best fit.

A 2.2 ml per 100 g

B 2.4 ml per 100 g

C 2.6 ml per 100 g

D 2.8 ml per 100 g

Your answer ☐ **[1]**

Q13. (2020)

13 Marram grass grows on sand dunes with very little water available. It has a leaf that is curled in on itself so that the stomata are hidden on the inside, as shown in the diagram.

Why does this adaptation help the plant to survive on sand dunes?

A Increases gas exchange from the stomata.

B Reduces air movement around the stomata.

C Increases photosynthesis by the leaf.

D Increases water uptake by the leaf.

Your answer ☐ **[1]**

Q14. (2020)

A)

21 Some students investigate the effect of the surface area : volume ratio on the rate of diffusion in animal cells.

They use hydrochloric acid and gelatine cubes that have been stained blue using a pH indicator solution. The indicator will turn red in acidic conditions.

They put different sized cubes into 3 different test tubes of hydrochloric acid and time how long it takes for the cubes to completely change to red.

Fig. 21.1 shows the apparatus they use.

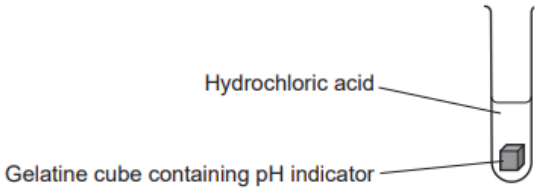


Fig. 21.1

The table shows the students' results.

Length of each side of the cube (mm)	surface area : volume ratio	Time to completely change colour (seconds)
2	.....	32
4	3 : 2	61
6	1 : 1	170

(a) (i) Calculate the surface area : volume ratio for the cube with sides of 2 mm.

surface area : volume ratio = ... **[2]**

B)

(ii) What conclusion can be made about the effect of surface area : volume ratio on the rate of diffusion?

.....

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

C)

(iii) Emphysema causes some of the walls of alveoli in the lungs to break down. This produces a smaller number of larger air sacs.

Use the results to explain the effect of emphysema on oxygen diffusing into the blood.

.....

.....

.....

.....

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

D)

(b) In a condition called sickle cell anaemia, the red blood cells can change shape. This reduces the amount of oxygen getting to cells in the body.

Fig. 21.2 shows a red blood cell and a sickled red blood cell.

Red blood cell **Sickled red blood cell**

Fig. 21.2

Explain why sickle cell anaemia reduces the amount of oxygen getting to cells in the body.

.....

.....

.....

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

E)

(c) Red blood cells burst when they are placed in a solution with a much higher water potential than the red blood cells. This is called lysis.

Explain why lysis happens.

.....

.....

.....

.....

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

Q15. (2021)

3 After blood leaves the human heart it passes through different blood vessels.

Which is the correct order of these blood vessels?

A Heart → arteries → capillaries → veins

B Heart → arteries → veins → capillaries

C Heart → capillaries → arteries → veins

D Heart → veins → capillaries → arteries

Your answer ☐ **[1]**

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Q16. (2021)

4 Plants contain stomata.

Where are stomata found in most plants?

A Mainly on the lower surface of the leaves.

B Mainly on the upper surface of the leaves.

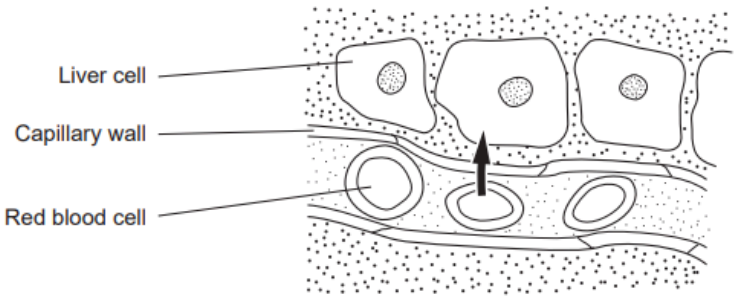
C Mainly on the surface of the stem.

D Mainly on the surface of root hairs.

Your answer ☐ **[1]**

Q17. (2021)

5 The diagram shows a capillary inside liver tissue.



What does the arrow represent?

A Carbon dioxide diffusing into a liver cell.

B Carbon dioxide diffusing out of a liver cell.

C Oxygen diffusing into a liver cell.

D Oxygen diffusing out of a liver cell.

Your answer ☐ **[1]**

Q18. (2021)

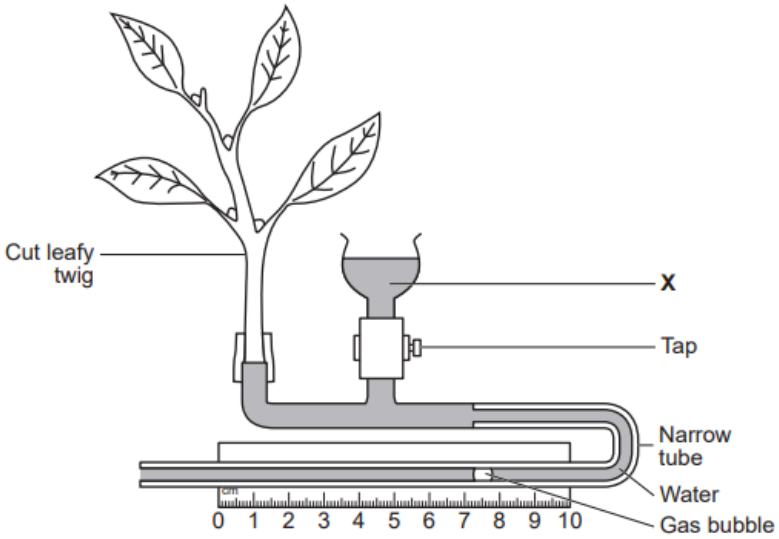
13 Which row in the table is the correct description for the process of **translocation**?

	Structure involved	Liquid transported	Direction of movement
A	phloem	sugar	downwards
B	phloem	sugar and water	upwards and downwards
C	xylem	sugar	upwards
D	xylem	sugar and water	upwards and downwards

Your answer ☐ **[1]**

Q19. (2021)

14 The diagram shows a potometer.



What is the purpose of the water in **X**?

A To provide water for the leafy twig.

B To reset the gas bubble to the start of the scale.

C To remove the gas bubble from the narrow tube.

D To measure the volume of water lost in transpiration.

Your answer ☐ **[1]**

Q20. (2021) – 18c

(c) A gardener digs up a bush and then plants it in a different position in their garden. They try to dig up the bush with as much soil as possible so that the root hairs are not damaged.

Explain why the gardener tries to prevent the root hairs being damaged.

.....

.....

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

Q21. (2022)

4 Which blood vessels have valves along their length?

A Arteries and capillaries

B Arteries, veins and capillaries

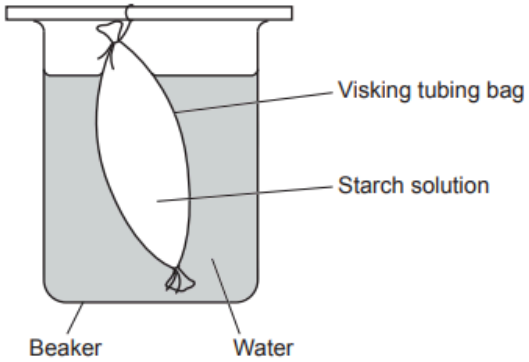
C Capillaries

D Veins

Your answer ☐ **[1]**

Q22. (2022)

10 Visking tubing is made of a selectively permeable membrane.
A visking tubing bag containing starch solution is placed in a beaker of water.



What will happen?

A Nothing will happen.

B Starch will leave the visking tubing bag.

C Water will enter the visking tubing bag.

D Water will leave the visking tubing bag.

Your answer ☐ **[1]**

Q23. (2022)

11 The diagram shows a red blood cell from a person who has sickle cell anaemia.
This condition results in red blood cells that are sickle shaped.

People with sickle cell anaemia can feel tired.
Which statement about sickle cells explains why?

A They contain a nucleus.

B They have a smaller surface area.

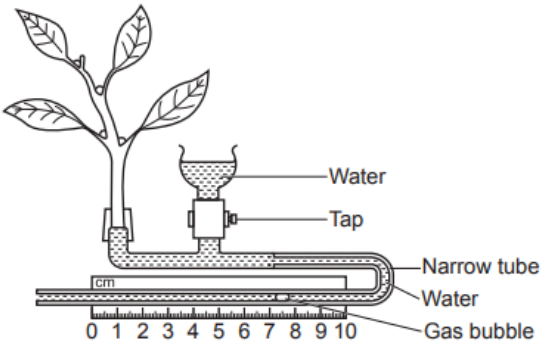
C They have more haemoglobin.

D They leave capillaries and enter tissues.

Your answer ☐ **[1]**

Q24. (2022)

15 The diagram shows a potometer.



A student wants to test the hypothesis that the number of stomata on a plant affects water loss.

They first record the distance the gas bubble moves in 10 minutes.

What should the student do next before taking a second reading to test this hypothesis?

A Cover the plant with a black plastic bag.

B Remove some of the leaves.

C Repeat the test in a warmer room.

D Use an electric fan to move the air.

Your answer ☐ **[1]**

Q25. (2022)

A)

17 (a) Fig. 17.1 shows a section through a human heart.

Fig. 17.1

(i) On **Fig. 17.1** draw an arrow to identify one valve. Label the arrow **V**. **[1]**

B)

(ii) On **Fig. 17.1** draw a second arrow to identify one atrium. Label this arrow **A**. **[1]**

C)

(iii) The left ventricle has more muscle than the right ventricle.

Explain why.

.....

.....

.....

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

D)

(b) The heart circulates blood around the body three times every minute.

Calculate how many times blood will circulate around the body in **one** hour.

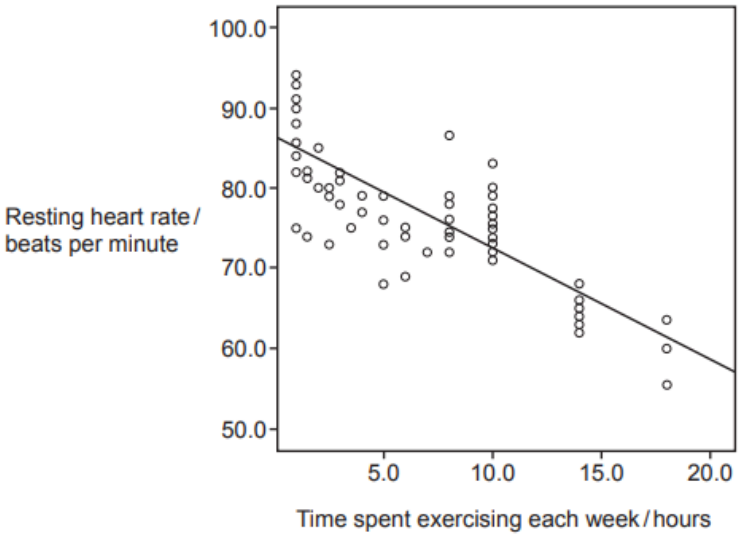
Number of times ..... **[2]**

E)

(c) A scientist compares the time spent exercising each week with the resting heart rates of a number of individuals.

Fig. 17.2 shows their results.

Fig. 17.2



Write down **one** conclusion the scientist can make from the data.

.....

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

F)

(d) A student writes some notes about veins:

Veins are large blood vessels that carry blood towards the heart.
They have a smooth lining and a narrow lumen.

The student has made **one** mistake in their notes.
Identify the mistake they have made.

.....

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

G)

(e) The human circulatory system is described as a double circulatory system.
Explain why.

.....

.....

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

Q26. (2022)

18 Photosynthesis, transpiration and translocation are three processes occurring in plants.

(a) Draw **three** lines to connect each **description** to its correct **process**.

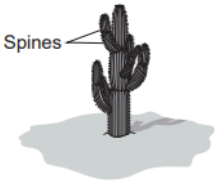
Then draw **three** lines to connect each **process** to the **structure** where that process takes place.

Description	Process	Structure
sunlight is used to make food for the plant	photosynthesis	xylem and stomata
the method of moving sugars around the plant	transpiration	phloem
the loss of water from the leaves of a plant	translocation	chloroplasts

[4]

Q27. (2023)

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]**

Q28. (2023)

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

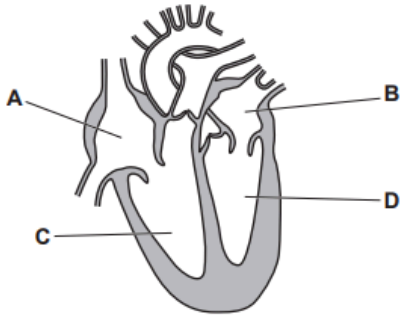
C Stomata

D Xylem

Your answer ☐ **[1]**

Q29. (2023)

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



Your answer ☐ **[1]**

Q30. (2023)

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]**

Q31. (2023)

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]**

Q32. (2023)

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]**

Q33. (2023)

A)

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)

(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)

(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)

(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?

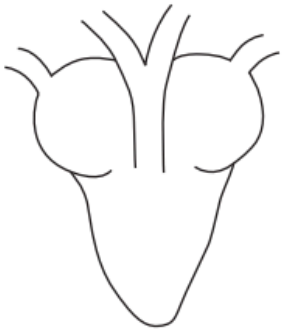
.....

.....

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

Q34. (2024)

3 The diagram shows the structure of a snake's heart.



Which sentence describes the structure of the snake's heart?

A It has one atrium and one ventricle.

B It has one atrium and two ventricles.

C It has two atria and one ventricle.

D It has two atria and two ventricles.

Your answer ☐ **[1]**

Q35. (2024)

5 Which word describes the loss of water vapour from the leaves of the plant?

A Circulation

B Respiration

C Translocation

D Transpiration

Your answer ☐ [1]

Q36. (2024)

8 What is transported by red blood cells?

A Antibodies

B Glucose

C Hormones

D Oxygen

Your answer ☐ [1]

Q37. (2024)

9 Which blood vessel transports blood from the lungs to the heart?

A Aorta

B Pulmonary artery

C Pulmonary vein

D Vena cava

Your answer ☐ [1]

Q38. (2024)

10 Which diagram shows a red blood cell?

A B C D

Your answer ☐ [1]

Q39. (2024)

A)

21 Some people have a condition called varicose veins in their legs.

The veins swell up because the valves are not working properly.

(a) What is the role of the valves in veins?

.....

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

B)

(b) Varicose veins are more common in pregnant females.

During pregnancy, the baby can push on the main veins bringing blood back from the mother's legs.

Give **one** reason why this could lead to varicose veins in the legs.

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

C)

(c) The data in **Table 21.1** shows the results from a study on varicose veins.

Table 21.1

Age group	Number of people with varicose veins	Percentage of people with varicose veins who are male (%)
< 25	1256	46.0
25–29	2403	32.5
30–34	4304	26.5
35–39	5387	27.7
40–44	5630	29.6
45–49	5713	34.5
50–54	5297	37.9
55–59	4625	41.6
60–64	3400	46.1
65–69	2271	40.6
70+	3438	33.3

(i) Calculate the number of **males** in the study with varicose veins who were younger than 25 years old.

Number of males = ... **[2]**

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D)

(ii) Which conclusions based on the data in **Table 21.1** are **true** and which are **false**?

Tick (✓) **one** box in each row.

Conclusion	True	False
More females than males develop varicose veins.		
Varicose veins are more common in people under the age of 25.		
The age range 50–54 has the greatest number of cases of varicose veins.		
There are more than double the number of people with varicose veins in the age range 55–59 compared to 65–69.		

[2]

E)

(d) The results of the study were published in a peer review journal.

Give **one** reason why peer review is important.

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