

1. Mistletoe is a green plant that is often seen growing high in a tree in winter.



Mistletoe can photosynthesise, but not at a very fast rate.

It therefore needs to act as a parasite on the tree.

Explain why the mistletoe grows into the phloem of the tree.

[2]

2(a). Some people have a condition called varicose veins.

This condition is caused when the valves in veins do not shut properly.

The data in the table shows the results from a study by scientists on varicose veins.

Age group	Number of people with varicose veins	Percentage of people with varicose veins who are male (%)
< 30	3 659	37.1
30–39	9 691	27.2
40–49	11 343	32.1
50–59	9 922	39.6
60–69	5 671	43.9
70+	3 438	33.3

Give **two** conclusions that can be made from the data in the table.

Conclusion 1

Conclusion 2

[2]

(b). The study was investigating a potential link between varicose veins and other circulatory conditions.

The study recorded how many of **43 724 people with varicose veins** had three other circulatory conditions. The results are shown in **Table 22.1**.

Table 22.1

Circulatory condition	Number of people with varicose veins
Deep vein thrombosis	458
Heart attack	1434
Stroke	1116

The study also recorded how many of **18 491 people without varicose veins** had the three other circulatory conditions. The results are shown in **Table 22.2**.

Table 22.2

Circulatory condition	Number of people without varicose veins
Deep vein thrombosis	79
Heart attack	638
Stroke	472

- i. The scientists stated this conclusion from the study:

Individuals with varicose veins were at a greater risk of deep vein thrombosis.
However, they were not at a greater risk of the other circulatory conditions.

Explain how they came to this conclusion.
You will need to use calculations to compare the data in **Table 22.1** and **Table 22.2**.

- ii. The results of this study were published in a peer reviewed journal.

What are **two** benefits of reading information that has been peer reviewed?

1

2

[2]

3. Describe how hormones are transported around the body to their targeted organs.

[2]

- 4(a). Some people have a condition called varicose veins.

This condition is caused when the valves in veins do not shut properly.

Describe the effect that this condition will have on blood flow.

[1]

- (b). Suggest **one** symptom someone with varicose veins can have.

[1]

5(a). Organisms use systems to transport substances around their bodies.

The words in the list are processes and parts of transport systems in animals and plants.

Aorta	Photosynthesis	Pulmonary artery	Pulmonary vein
Respiration	Translocation	Transpiration	Vena cava

Answer parts (i), (ii) and (iii) using words from the list.

- i. Name the blood vessel that transports blood from the left ventricle to the rest of the body.

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

- ii. Name the process that plants use to transport sugars to the roots.

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

- iii. Name the blood vessel that transports blood to the right atrium.

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

(b). The substances transported around the organism enter cells either by active transport, diffusion or osmosis.

For each substance indicate which method of transport is used.

Tick (✓) **one** box in each row.

Substance	Active transport	Diffusion	Osmosis
Water moving into guard cells			
Mineral ions moving into root hair cells against a concentration gradient			
Oxygen entering red blood cells			

[3]

6. In an experiment to investigate the effect of temperature on transpiration, a student measures the air temperature with a thermometer.



They use a thermometer that has a scale with 1 °C divisions.
The student measures the temperature as 16 °C.

What is the degree of uncertainty of the measurement?

- A + / – 0.5 °C
- B + / – 1 °C
- C + / – 2 °C
- D + / – 5 °C

Your answer

[1]

7. Beta thalassaemia is a genetic disorder caused by a mutation in DNA.

The haemoglobin in the red blood cells of a person with beta thalassaemia does **not** function correctly.

Suggest **one** symptom that a person with beta thalassaemia may have.

.....[1]

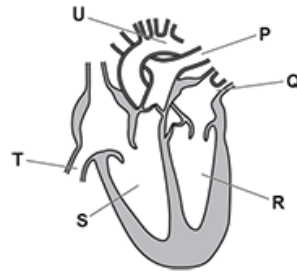
8. Which blood vessels have a valve at the junction between the blood vessel and the heart?

- A Aorta and pulmonary artery
- B Aorta and vena cava
- C Aorta, pulmonary artery and pulmonary vein
- D Aorta, pulmonary artery, pulmonary vein and vena cava

Your answer

[1]

9. The diagram shows the main structures in the heart.



Blood flows from the lungs back to the heart and is then pumped to the body.

Which order of structures does blood go through?

- A Q → R → P
- B T → S → P
- C Q → R → U
- D Q → R → U

Your answer

[1]

10. Water passes through a plant and is lost in transpiration.

What is the correct route for water to move in this process?

- A From the phloem to the stomata
- B From the stomata to the phloem
- C From the stomata to the xylem
- D From the xylem to the stomata

Your answer

[1]

11. How are mineral ions absorbed by plant roots?

- A By active transport
- B By diffusion
- C By osmosis
- D By translocation

Your answer

[1]

12. Mole rats are rodents that live in Africa. Mole rats spend most of their life burrowing underground in tunnels. Some tunnels have only 5% oxygen in the air compared with 21% above ground.

Scientists have found that the mole rats have several unusual features compared to other rodents.

The mole rats have:

- a very low respiration rate
- haemoglobin that binds to oxygen more easily
- very few pain receptors that respond to acid build up in their body.

Explain how these features would help the mole rats survive in the tunnels.

13. The table shows some different treatments for cardiovascular disease.

Which treatments for cardiovascular disease work by directly reducing blood pressure?

Treatment	Main method of action
antiplatelets	reduce the action of platelets
beta blockers	block the effects of adrenaline
nitrates	widen blood vessels
statins	reduce cholesterol levels in the blood

- A** Antiplatelets and beta blockers
- B** Beta blockers and nitrates
- C** Nitrates and antiplatelets
- D** Statins and nitrates

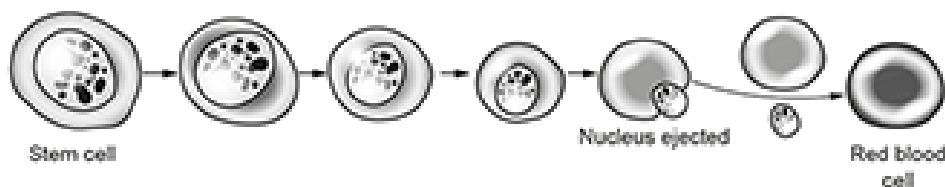
Your answer

[1]

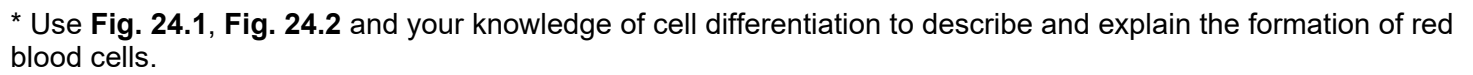
14(a). Fig. 24.1 shows how stem cells in bone marrow differentiate into red blood cells.

Fig. 24.2 shows how the concentration of RNA and haemoglobin changes as the stem cell differentiates and the area of the nucleus changes.

Fig. 24.1



Red blood cell development

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b). A male has:

- 4.7 million red blood cells per microlitre of blood.
- 4.5 litres of blood.

(1 litre = 1 000 000 microlitres)

Calculate how many red blood cells are in his blood.

Give your answer in standard form.

Number of red blood cells =[3]

15. Hypothyroidism occurs when the body has an underactive thyroid gland.

Hypothyroidism can also change the way the body processes fat.

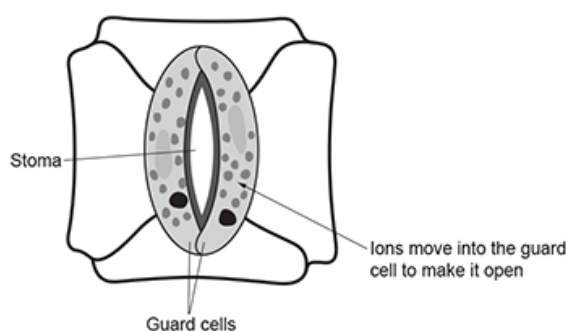
- This can cause high cholesterol levels that lead to deposits of cholesterol in the coronary artery.
- The coronary artery supplies blood to the cardiac muscle.

Suggest why cholesterol deposits could affect the correct functioning of the heart.

[2]

16. For gases to enter a leaf, the stomata must be open.

The diagram shows a stoma and two guard cells. When the stomata are open, the guard cells are described as being turgid (full of water).



The diagram has a magnification of $\times 400$.

The width of the stoma is 5 mm.

Calculate the actual size of the stoma. Give your answer in micrometres.

(1 mm = 1000 micrometres)

Width of stoma = micrometres[2]

17. In 2018, a newspaper headline suggested that a cure for blindness had been found.

The newspaper was reporting on a study looking at operations in patients with age-related macular degeneration (AMD). In AMD, part of the retina is damaged.

There are two types of AMD, wet and dry.

In wet AMD, tiny blood vessels 5 – 10 μm in size grow as the body tries to repair the retina.

Name the type of blood vessels that grow.

.....[1]

18. A student cuts a cube of potato to use in an experiment. Each face of the cube is 2 cm by 2 cm.

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

- A** 3 : 1
- B** 4 : 8
- C** 8 : 24
- D** 16 : 8

Your answer ☐

[1]

19. The table shows some features of blood vessels.

	Valves along the length	Thickness of walls	Diameter of lumen
A	yes	thick	wide
B	no	thin	narrow
C	yes	thin	wide
D	no	thick	narrow

Which row in the table correctly describes the structure of arteries?

Your answer

☐

[1]

20. Transpiration will occur fastest in which conditions?

- A** A cold and windy environment
- B** A dark and cold environment
- C** A dark and warm environment
- D** A warm and windy environment

Your answer

☐

[1]

21. Which adaptation of xylem helps prevent water leaving the xylem vessels?

- A** Lignin in the walls of the xylem
- B** Pits (holes) in the walls of the xylem
- C** The breakdown of cross walls between cells that make up the xylem
- D** The lack of cell contents in the cells that make up the xylem

Your answer

☐

[1]

22. Water moves into root hair cells due to differences in water potentials.

Which term describes this process?

- A** Active transport
- B** Diffusion
- C** Osmosis
- D** Translocation

Your answer

☐

[1]

END OF QUESTION PAPER