(The circulatory system (heart, blood vessels, blood))

Q1.(2018)

The circulatory system is composed of the blood, blood vessels and the heart.

Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

[2 marks]

1 _____

2 _____

Q2.(2018)

Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm^3 of blood.

Explain why having more red blood cells per cm^3 of blood is an advantage to an athlete.

[3 marks]

_____

_____

_____

_____

_____

_____

Q3.(2018)

Which **two** blood vessels carry deoxygenated blood?

[2 marks]

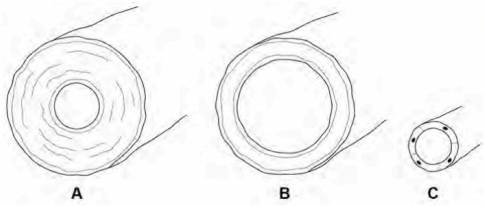
Tick **two** boxes.

- Aorta ☐
- Coronary artery ☐
- Pulmonary artery ☐
- Pulmonary vein ☐
- Vena cava ☐

Q4.a)(2018)

Figure 4 shows the three types of blood vessel.

Figure 4



Which type of blood vessel carries blood into the right atrium?

[1 mark]

Tick **one** box.

A		B		C	

Q4.b)(2018)

Compare the structure of an artery with the structure of a vein.

[3 marks]

Q5.(2018)

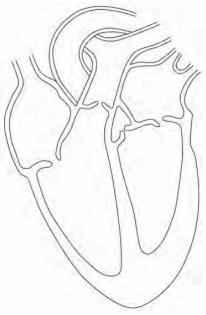
Heart rate is controlled by a group of cells. This group of cells act as a pacemaker.

Figure 5 shows a section through the heart.

Draw an **X** on **Figure 5** to show the position of the pacemaker.

[1 mark]

Figure 5



Q6.(2018)

A patient may be fitted with an artificial pacemaker.

What condition may be treated using an artificial pacemaker?

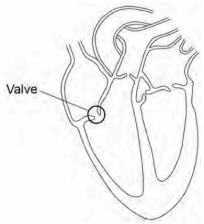
[1 mark]

Q7.(2019)

Figure 6 shows the internal structure of the human heart.

One of the heart valves is labelled.

Figure 6



Sometimes a valve in the heart can start to leak.

Explain why a person with a leaking heart valve has difficulty exercising.

[4 marks]

Q8.a)(2019)

A patient with a leaking heart valve may have the valve replaced.

A study compared two different types of replacement heart valve:

- mechanical valves
- biological valves from pigs.

The data used in the study was collected from female patients aged 50–69.

Table 4 shows the data.

Table 4

	Type of replacement heart valve	
	Mechanical	**Biological**
Number of patients given the valve	2852	1754
Number of patients who died from heart-related problems after valve replacement	180	178
Percentage of patients alive after 5 years	91	89
Percentage of patients needing a second valve replacement within 6 years	2.2	5.2
Percentage of patients who had a blood clot on the brain after surgery	5.8	0.1

Give **one** conclusion about the death of patients from heart-related problems after a valve replacement.

Include calculations to support your answer.

[3 marks]

Q8.b)(2019)

One risk of mechanical valves is that blood clots can form on the surface of the valve.

Name the component of the blood that starts the process of blood clotting.

[1 mark]

_____

Q8.c)(2019)

Evaluate the use of mechanical replacement heart valves and biological replacement heart valves.

Use information from **Table 4** and your own knowledge.

[6 marks]

_____

_____

_____

_____

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_____

_____

_____

Q9.a)(2019)

People with diabetes have difficulty controlling their blood glucose concentration.

Which part of the blood transports glucose?

[1 mark]

Tick (✓) **one** box.

- Lymphocytes ☐
- Plasma ☐
- Platelets ☐
- Red blood cells ☐

Q9.b)(2019)

Glucose is often found in the urine of people with diabetes.

Name a chemical used to test for glucose.

[1 mark]

_____

Q9.c)(2019)

Describe a test that could be used to show that a person's urine contains glucose.

[2 marks]

Test _____

_____

Positive result _____

_____

Q9.d)(2019)

The body cells of a person with untreated diabetes lose more water than the body cells of a person who does **not** have diabetes.

Explain how diabetes can cause the body cells to lose more water.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

Q9.e)(2019)

Glucose is absorbed into the blood in the small intestine by both diffusion and active transport.

Describe how the small intestine is adapted for efficient absorption.

[5 marks]

_____

_____

_____

_____

_____

Q10.a)(2019)

A small animal called an axolotl lives in water. The axolotl has a double circulatory system.

Define the term double circulatory system.

[1 mark]

_____

_____

_____

Q10.b)(2019)

Figure 7 shows the double circulatory system of the axolotl.

Figure 7

The following figure cannot be reproduced here due to third-party copyright restrictions.

The heart of the axolotl has only one ventricle.

Label the ventricle on **Figure 7**.

[1 mark]

Q10.c)(2019)

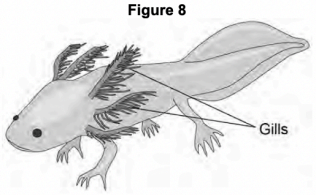
Explain why having only one ventricle makes the circulatory system less efficient than having two ventricles.

[2 marks]

Q10.d)(2019)

Figure 8 shows an axolotl.

Figure 8



Explain why an axolotl may die in water with a low concentration of oxygen.

[4 marks]

Q10.e)(2019)

If a gill of an axolotl is removed, a new gill will grow in its place.

Scientists hope to use information on how axolotls grow new gills to help with regenerating human tissue.

Name the type of cell that divides when a new gill grows.

[1 mark]

Q10.f)(2019)

Name **one** condition that could be treated using regenerated human tissue.

[1 mark]

Q10.g)(2019)

Suggest **one** reason why an axolotl is a suitable animal for research in the laboratory.

[1 mark]

Q10.h)(2019)

An axolotl may **not** be a suitable animal to study when researching regeneration in human tissue.

Suggest **one** reason why.

[1 mark]

Q11.a)(2021)

Some patients with a very low number of blood cells may be given a blood transfusion.

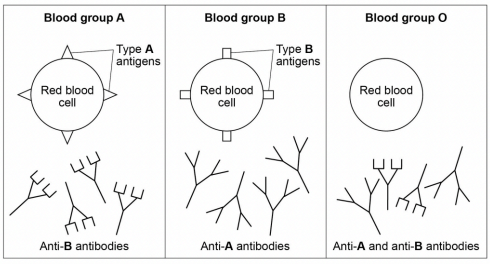
A blood transfusion is where a patient receives blood from a donor.

Different people have different blood groups.

Figure 12 shows:

- the red blood cells found in people with different blood groups
- the antibodies that can be made by people with different blood groups.

Figure 12



Antibodies can bind to antigens that have complementary shapes.

When antibodies bind to the antigens on red blood cells, many red blood cells begin to clump together.

Each red blood cell is about 8 μm in diameter.

Many capillaries have an internal diameter of about 10 μm.

In one type of blood transfusion, **only** red blood cells from a donor are transferred to the patient.

It is dangerous for a patient with blood group **A** to receive red blood cells from a donor with blood group **B**.

Explain why.

[3 marks]

Q11.b)(2021)

Explain why blood group **O** red blood cells can be given to patients with any blood group.

[2 marks]

Q11.c)(2021)

Table 4 shows some of the risks associated with blood transfusions.

Table 4

Risk	Probability of risk occurring
Allergic reaction	0.9 %
Hepatitis B infection	1 in (3×10^5)
Hepatitis C infection	6.7×10^{-7}
Kidney damage	1 in 70 000

Which risk has the **lowest** probability of occurring?

[1 mark]

Tick (✓) **one** box.

- Allergic reaction ☐
- Hepatitis B infection ☐
- Hepatitis C infection ☐
- Kidney damage ☐

Q11.d)(2021)

A person has a tumour blocking the tube leading from the gall bladder to the small intestine.

Explain why this person would have difficulty digesting fat.

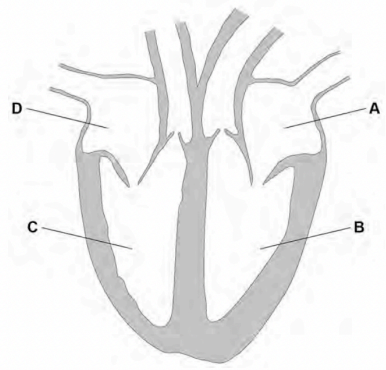
[5 marks]

Q12.a)(2023)

This question is about the circulatory system.

Figure 1 shows the human heart.

Figure 1



Which part of the heart receives oxygenated blood from the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Q12. b)(2023)

Which part of the heart pumps deoxygenated blood to the lungs?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Q12.c)(2023)

A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

[1 mark]

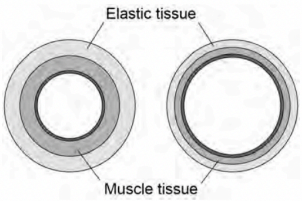
Tick (✓) **one** box.

- Left atrium ☐
- Left ventricle ☐
- Right atrium ☐
- Right ventricle ☐

Q13.(2023)

Figure 2 shows a cross section of an artery and of a vein.

Figure 2



Describe **two** ways that the structure of an artery is different from the structure of a vein.

[2 marks]

1 _____

2 _____

Q14.a)(2023)

In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

Table 2 shows how a blockage in a coronary artery affects blood flow.

Table 2

Percentage (%) of coronary artery that is blocked	Blood flow in cm^3/minute
0	100
10	64
20	42
50	8
80	2

Describe the trend shown in **Table 2**.

[1 mark]

_____

Q14.b)(2023)

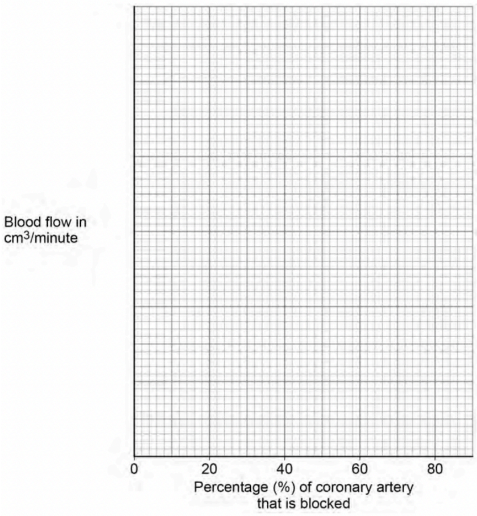
Complete **Figure 3**.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 2**
- draw a line of best fit.

[4 marks]

Figure 3



Q14.c)(2023)

Predict the blood flow in a coronary artery with a 35% blockage.

Use **Figure 3**.

[1 mark]

Blood flow = _____ cm^3/minute

Q15.(2023)

Explain the effect of a partly blocked coronary artery on the human body.

[6 marks]

Q16.(2023)

There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

[2 marks]

Q17.a)(2024)

A person's heart stops beating.

The person stops breathing.

A first-aider pushes down on the person's chest.

Pushing down on the person's chest puts pressure on the heart.

Explain why putting pressure on the heart helps the person.

[2 marks]

Q17.b)(2024)

The first-aider also forces air into the person's lungs by blowing into their mouth.

Describe how forcing air into the person's lungs helps the person.

[1 mark]

Q17.c)(2024)

The person's heart starts to beat again and the person starts breathing.

The person has a high level of cholesterol in their blood.

Name **one** type of drug that would decrease the level of cholesterol in the person's blood.

[1 mark]

Q17.d)(2024)

A doctor decides that the person needs to have a stent fitted.

Explain how a stent works to treat coronary heart disease.

[2 marks]