8. Transport in Mammals

8.1 The circulatory system

Paper 1

Question Paper

1 Which components of blood are present in tissue fluid?

	phagocytes	some proteins	sodium ions
A	✓	✓	✓
B	✓	✗	✗
C	✗	✓	✓
D	✗	✓	✗

key
✓ = present
✗ = not present

2 The pumping action of the heart creates hydrostatic pressure in the blood. The table shows the hydrostatic pressure in a blood capillary.

	arteriole end of capillary / KPa	venule end of capillary / KPa
hydrostatic pressure in blood	4.2	1.7

About 90% of the tissue fluid which surrounds a capillary is returned to the blood at the venule end.

How is this achieved?

A The capillary wall is more permeable at the arteriole end than the venule end.

B The hydrostatic pressure in tissue fluid is higher than in blood.

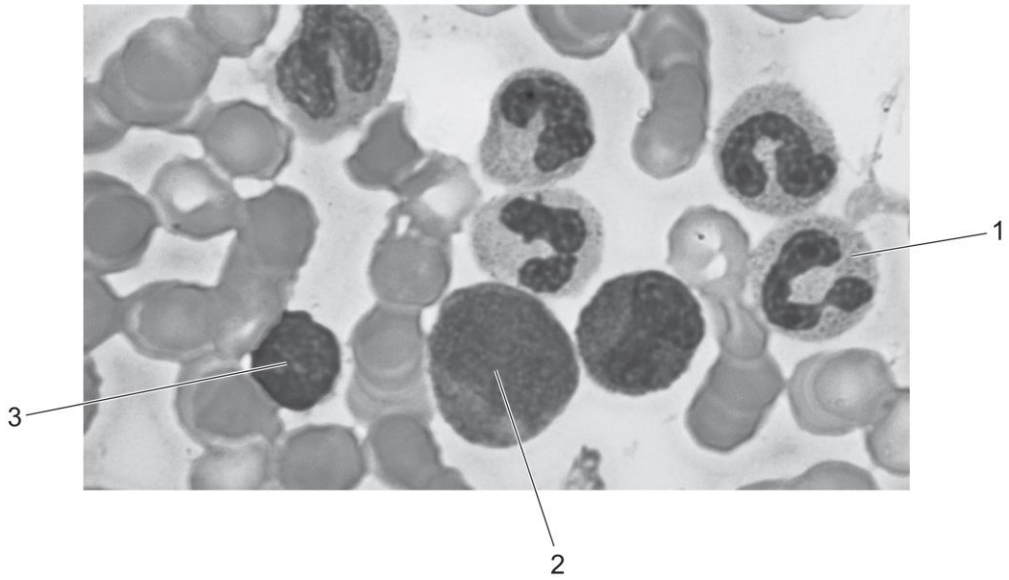
C There is a higher concentration of dissolved solutes in tissue fluid than in blood.

D There is osmotic movement of water from the tissue fluid into the blood.

3 Which row is correct for an artery?

	inner layer	middle layer	outer layer
A	smooth layer of endodermis cells	collagen, elastic fibres and smooth muscle	collagen only
B	smooth layer of endodermis cells	elastic fibres and smooth muscle only	collagen and elastic fibres
C	smooth layer of squamous cells	collagen, elastic fibres and smooth muscle	collagen and elastic fibres
D	smooth layer of squamous cells	elastic fibres and smooth muscle only	collagen only

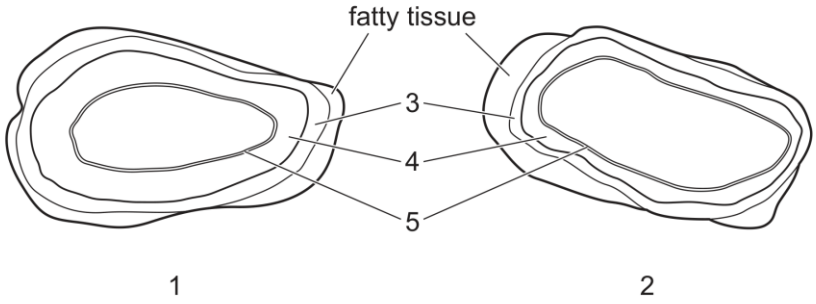
4 The photomicrograph shows blood cells as seen using a high-power light microscope.



Which row correctly identifies the different types of white blood cell?

	1	2	3
A	lymphocyte	monocyte	neutrophil
B	monocyte	neutrophil	macrophage
C	neutrophil	monocyte	lymphocyte
D	phagocyte	lymphocyte	monocyte

5 Plan diagrams of two blood vessels are shown.



Which labels are correct?

	1	2	3	4	5
A	aorta	vena cava	elastic fibres	smooth muscle	epithelium
B	artery	vein	collagen fibres	smooth muscle and elastic tissue	endothelium
C	vein	artery	collagen fibres	elastic fibres	squamous cells
D	coronary artery	coronary vein	elastic fibres	smooth muscle and elastic tissue	epithelium

6 What are found in blood and tissue fluid?

1 carbon dioxide

2 fatty acids

3 white blood cells

4 proteins

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 3 and 4 only

7 Which properties of water are essential for its role in the transport of blood in mammals?

	high latent heat of vaporisation	solvent for polar substances
A	✓	✗
B	✗	✓
C	✓	✓
D	✗	✗

key
✓ = essential
✗ = not essential

8 Which factors affect blood pressure?

1 the diameter of the blood vessels

2 the systolic pressure of the heart ventricles

3 the volume of blood returning to the heart in each cardiac cycle

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

9 What does the inner layer of veins **and** capillaries contain?

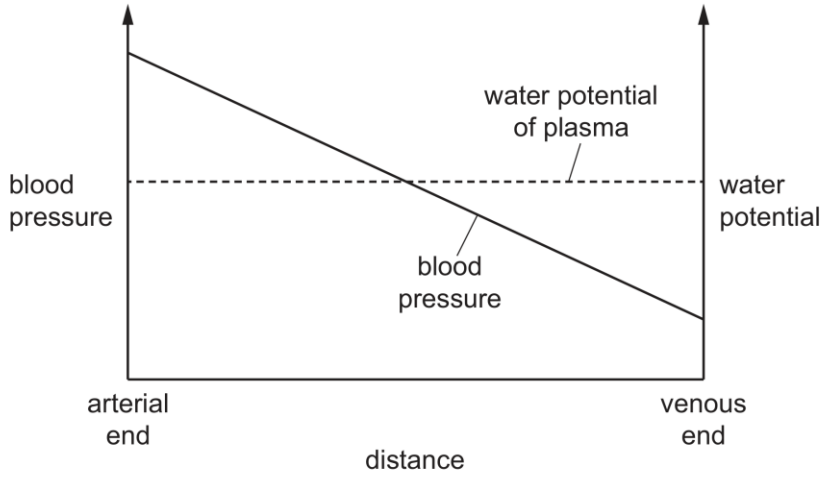
A collagen fibres

B elastic fibres

C endothelium

D smooth muscle

10 The graph shows the changes in blood pressure and water potential across a blood capillary from the arterial end of the capillary to the venous end of the capillary.



What could result in an accumulation of excess tissue fluid?

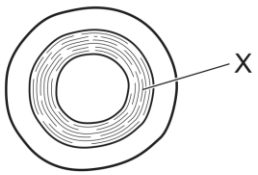
A an increase in concentration of large proteins in the blood plasma

B an increase in blood pressure

C a decrease in the concentration of small proteins in tissue fluid

D a decrease in blood pressure

11 The diagram shows a transverse section through an artery.



Which tissues are present in layer X?

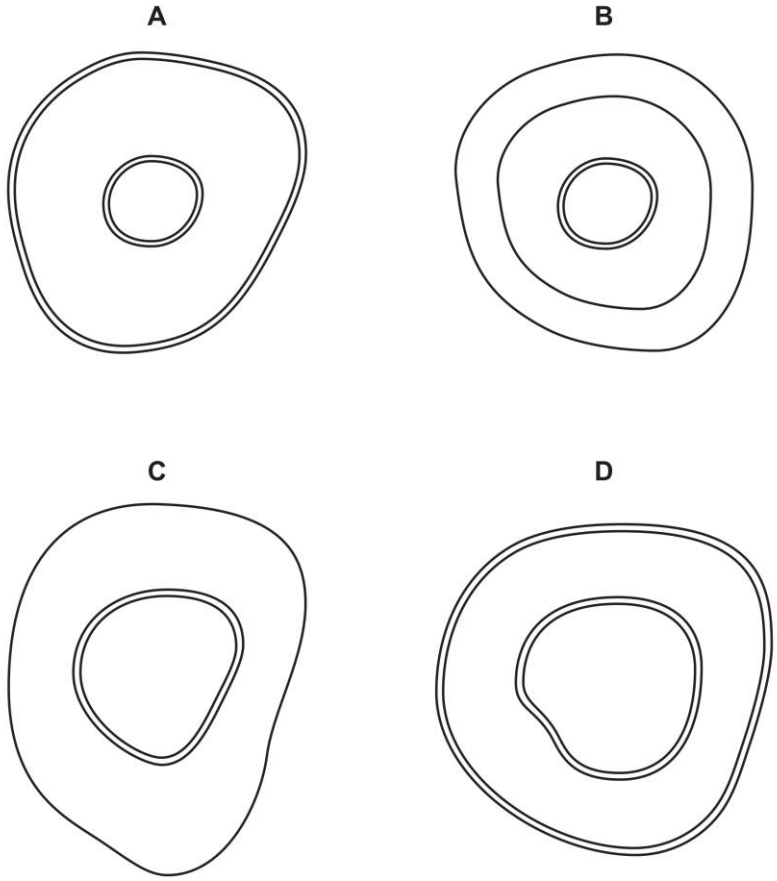
A collagen and smooth muscle only

B elastic fibres and collagen only

C elastic fibres and smooth muscle only

D elastic fibres, collagen and smooth muscle

12 Which plan diagram represents the tissues in a major vein?



13 Which description of movement of substances during tissue fluid formation is correct?

A Low hydrostatic pressure forces substances out of the capillary at the arterial end allowing small substances to enter the fluid that bathes the cells.

B Tissue fluid moves back into the venule due to a net hydrostatic pressure change in the capillary.

C Movement of water in tissue fluid into the capillary by osmosis is due to the low water potential and low hydrostatic pressure inside the capillary.

D A high water potential of the surrounding tissue fluid causes substances to leave the capillaries at the arterial end.

14 Which statements about arteries are correct?

1 Artery walls can resist high pressure.

2 Arteries pump blood out of the heart.

3 Blood in arteries has the same flow rate as in veins.

4 The pulse in arteries is the result of a surge in blood that causes expansion of the artery wall.

5 There are semilunar valves at the junction of arteries with the heart.

A 1, 2 and 4 **B** 1, 3 and 5 **C** 1, 4 and 5 **D** 2, 3 and 4

15 A shortage of protein in the diet of children can lead to a disease that causes excess tissue fluid to build up in the abdomen.

What explains why a build-up of excess tissue fluid can occur in this disease?

A A shortage of plasma proteins decreases blood water potential; less tissue fluid returns to the blood.

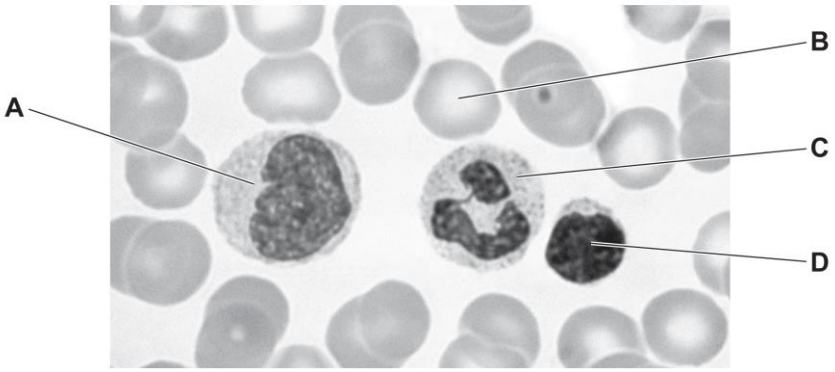
B A shortage of plasma proteins increases blood water potential; less tissue fluid returns to the blood.

C A shortage of protein in the diet causes weak cardiac muscle, reducing hydrostatic pressure.

D A shortage of protein in the tissue fluid decreases its water potential; more water leaves the blood.

16 The photomicrograph shows a blood smear.

Which cell is a monocyte?



17 The table shows some information about three blood vessels, P, Q and R, from a mammal.

	diameter / mm	wall thickness / mm	percentage composition of wall		
			muscle	collagen	elastic tissue
P	25	2	22	33	40
Q	20	1	25	40	25
R	4	1	35	25	30

Which row identifies blood vessels P, Q and R?

	P	Q	R
A	artery	vein	artery
B	artery	vein	capillary
C	vein	artery	capillary
D	vein	artery	vein

18 Which row correctly identifies components of **both** lymph and tissue fluid?

	antibodies	red blood cells	sodium ions	white blood cells
A	✓	✓	✓	✓
B	✓	✗	✓	✓
C	✗	✓	✗	✗
D	✗	✗	✓	✓

key

✓ = component present

✗ = component not present

19 Which row is correct for the mean blood pressure in different parts of the human circulatory system?

	mean blood pressure			
	right atrium	artery in arm	vein in arm	capillary in arm
A	+	++++	++	+++
B	++	++++	+++	+
C	+++	++	++++	+
D	++++	+++	+	++

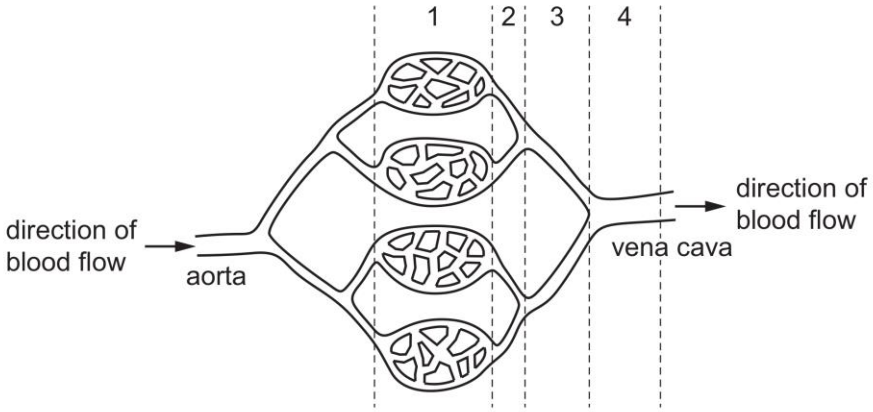
key

++++ highest mean blood pressure

↓

+ lowest mean blood pressure

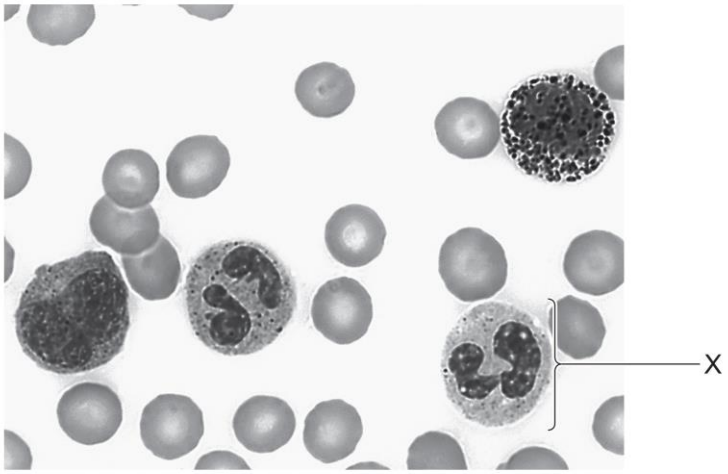
20 The diagram shows part of the circulatory system in a mammal.



Where is the blood pressure and the speed of flow the lowest?

	lowest blood pressure	lowest speed of flow
A	1	4
B	2	3
C	3	2
D	4	1

21 The photomicrograph shows human blood cells.



What type of blood cell is X?

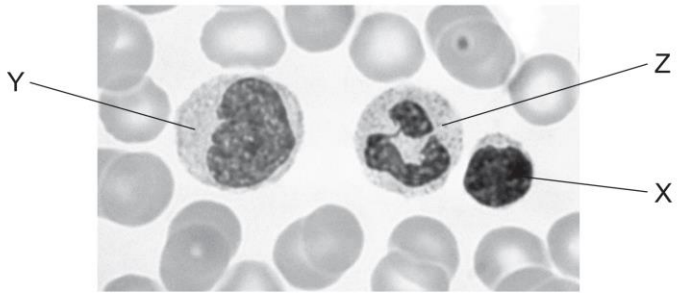
A B-lymphocyte

B monocyte

C phagocyte

D T-lymphocyte

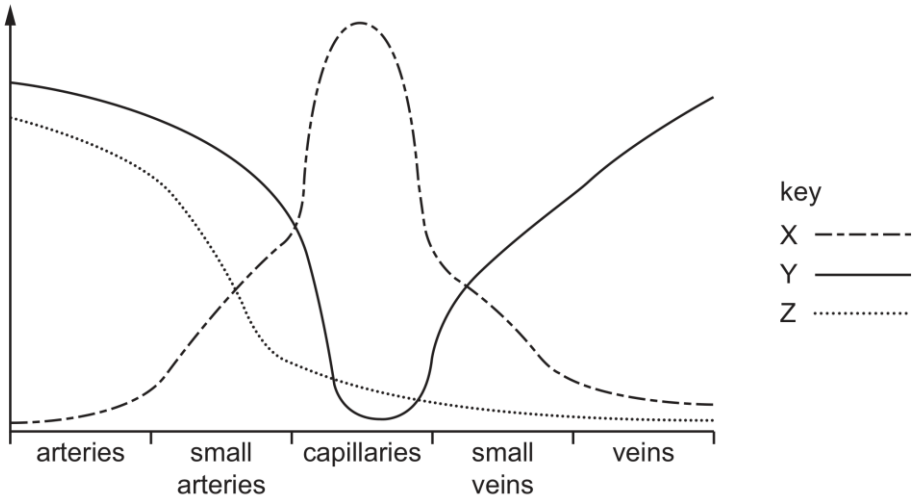
22 The photomicrograph shows three white blood cells labelled X, Y and Z.



Which row correctly identifies these cells?

	cell X	cell Y	cell Z
A	lymphocyte	monocyte	neutrophil
B	lymphocyte	neutrophil	monocyte
C	monocyte	neutrophil	lymphocyte
D	neutrophil	monocyte	lymphocyte

23 The graph represents data on blood vessels and blood flow.



Which row correctly identifies the curves?

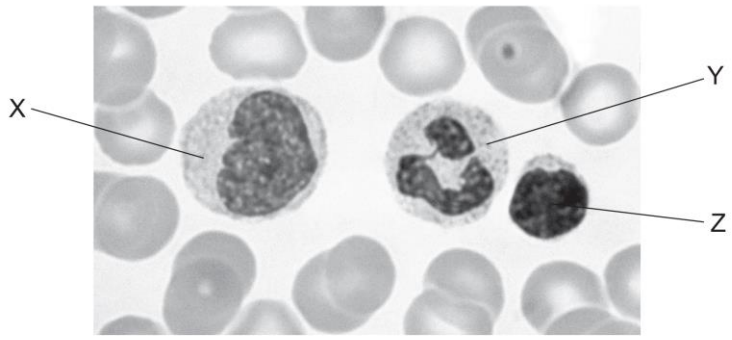
	speed of blood flow	pressure of blood	total cross-sectional area
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

24 Which are present in the walls of capillaries?

	endothelium	smooth muscle	elastic tissue	collagen fibres
A	✓	✗	✗	✗
B	✓	✗	✗	✓
C	✗	✓	✗	✓
D	✗	✓	✓	✗

key
✓ = present
✗ = not present

25 The photomicrograph shows three white blood cells labelled X, Y and Z.



Which row correctly identifies these cells?

	cell X	cell Y	cell Z
A	lymphocyte	monocyte	neutrophil
B	lymphocyte	neutrophil	monocyte
C	monocyte	neutrophil	lymphocyte
D	neutrophil	monocyte	lymphocyte

26 Why is the mammalian circulatory system described as a double circulation?

A Blood flows twice through the heart in one complete cardiac cycle.

B Blood flows twice through the heart in one complete circuit of the body.

C Blood remains within arteries, capillaries and veins.

D Blood transports both oxygen and carbon dioxide.

27 Which factors affect blood pressure?

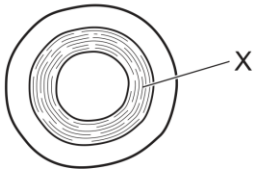
1 the diameter of the blood vessels

2 the systolic pressure of the heart ventricles

3 the volume of blood returning to the heart in each cardiac cycle

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

28 The diagram shows a transverse section through an artery.



Which statement describes the tissues present in layer X?

A collagen and smooth muscle only

B elastic fibres and collagen only

C elastic fibres and smooth muscle only

D elastic fibres, collagen and smooth muscle

29 The large arteries close to the heart have a thick elastic layer in their walls.

Which statements about this layer are correct?

1 helps to maintain the blood pressure in arteries

2 reduces friction within the arteries

3 prevents too much pressure bursting the artery wall

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

30 Which are present in the walls of arteries?

	endothelium	smooth muscle	elastic tissue	collagen fibres
A	✓	✓	✓	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✓
D	✗	✓	✗	✓

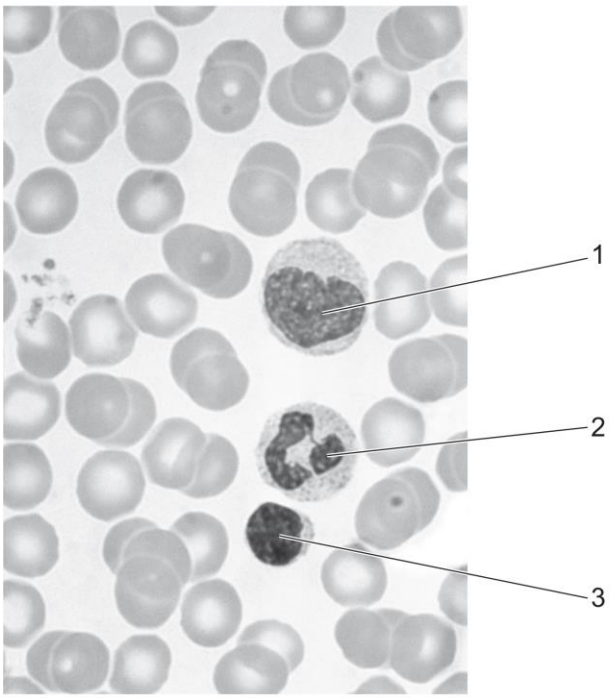
key
✓ = present
✗ = not present

31 Which row correctly identifies the molecules or cells that are present in the different locations?

	type of molecule or cell	blood	lymph	tissue fluid
A	antibodies	✗	✓	✓
B	large plasma proteins	✓	✗	✓
C	lymphocytes	✓	✓	✗
D	phagocytes	✓	✓	✓

key
✓ = present
✗ = not present

32 The photomicrograph shows a human blood smear.



Which row identifies the labelled cells?

	1	2	3
A	lymphocyte	monocyte	neutrophil
B	lymphocyte	neutrophil	monocyte
C	monocyte	lymphocyte	neutrophil
D	monocyte	neutrophil	lymphocyte

33 Which statement correctly compares blood plasma and tissue fluid in a healthy person?

A Blood plasma contains more protein than tissue fluid.

B Both blood plasma and tissue fluid contain red blood cells.

C Tissue fluid contains white blood cells whereas blood plasma does not.

D Tissue fluid is formed from blood plasma and is not returned to blood plasma.

34 Which process can be carried out by a mature red blood cell?

A active transport

B cell division

C phagocytosis

D protein synthesis