

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Learner Registration Number

Pearson BTEC Level
3 Nationals Diploma,
Extended Diploma

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Tuesday 19 January 2021

Afternoon (Time: 50 minutes)

Paper Reference **31627H/1B**

Applied Science

Unit 5: Principles and Applications of Science II

Biology

SECTION A: ORGANS AND SYSTEMS

You must have:

A calculator and a ruler.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The exam comprises three papers worth 40 marks each:
 - Section A: Organs and systems (Biology)
 - Section B: Properties and uses of substances (Chemistry)
 - Section C: Thermal physics, materials and fluids (Physics).
- The total mark for this exam is 120.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

1 (a) Figure 1a shows the structures of three different types of blood vessel.



(Source from: <https://www.eiscolabs.com/products/anatomy-of-artery-vein-and-capillary>)

Figure 1a

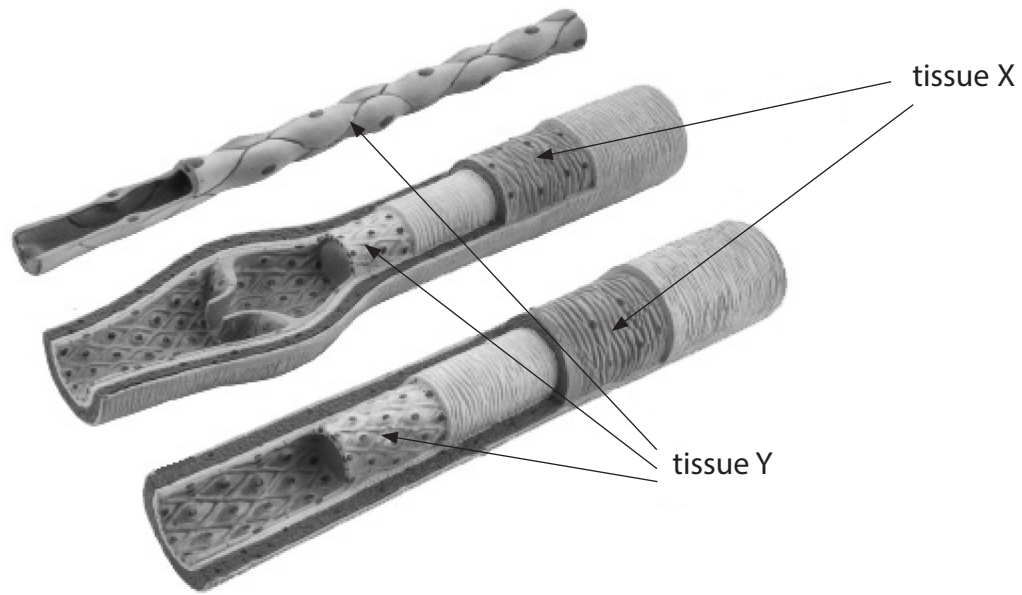
(i) Which row correctly identifies each type of blood vessel in Figure 1a?

(1)

		vessel 1	vessel 2	vessel 3
<input checked="" type="checkbox"/>	A	artery	vein	capillary
<input checked="" type="checkbox"/>	B	capillary	artery	vein
<input checked="" type="checkbox"/>	C	capillary	vein	artery
<input checked="" type="checkbox"/>	D	vein	capillary	artery



(ii) Figure 1b shows tissue X and tissue Y in the blood vessels.



(Source from: <https://www.eicolabs.com/products/anatomy-of-artery-vein-and-capillary>)

Figure 1b

Draw **one** line from each tissue to its correct name.

(2)

	collagen
tissue X	elastin
	endothelium
tissue Y	connective
	smooth muscle



P 6 7 5 0 6 A 0 3 1 6

(b) Figure 2 represents the human circulatory system.

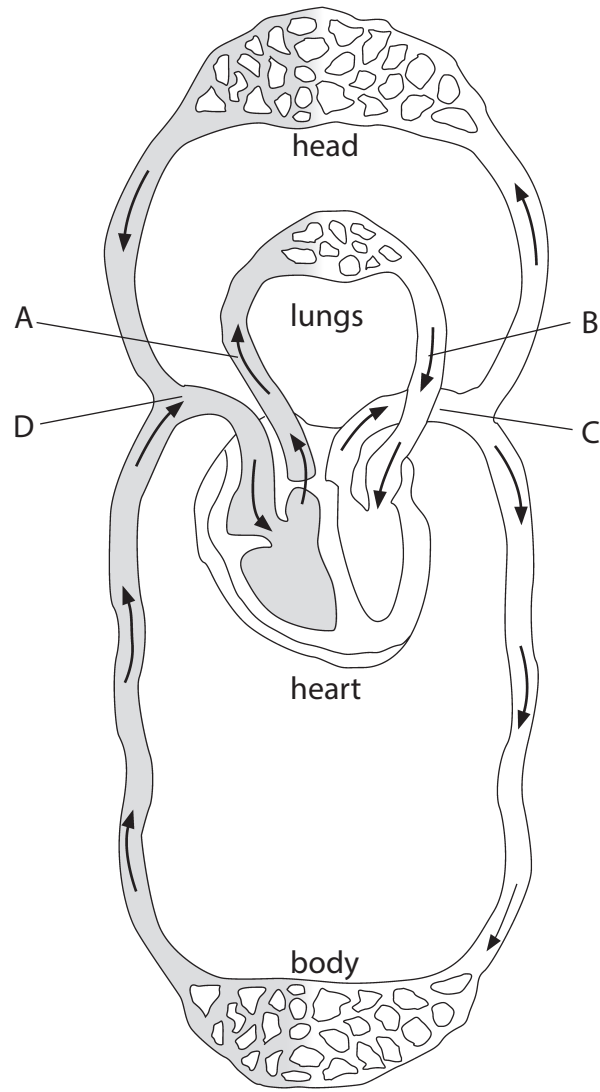


Figure 2

Which letter, A, B, C or D, labels the pulmonary artery?

(1)

- A
- B
- C
- D

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(c) Describe the function of the vena cava.

(2)

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(d) Figure 3a shows the total cross-sectional area of the three main types of blood vessel.

Figure 3b shows the speed of blood flow in the three main types of blood vessel.

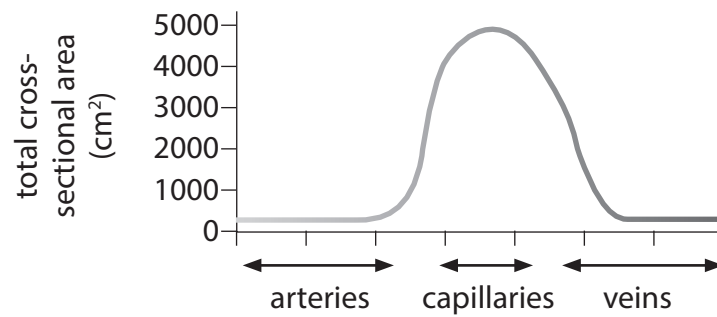


Figure 3a

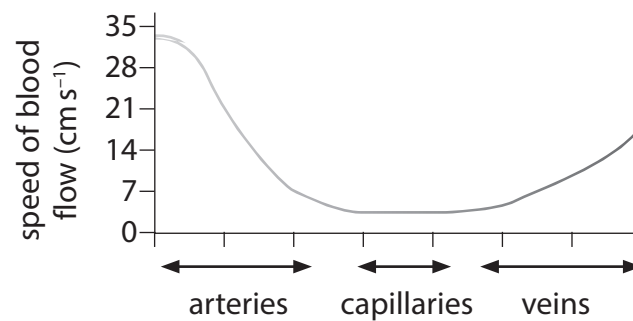


Figure 3b

(i) State the relationship between the total cross-sectional area of the capillaries and the speed of blood flow in the capillaries, shown in Figures 3a and 3b.

(1)

.....

.....



(ii) The total cross-sectional area of the arteries is 300 cm^2 .

The total cross-sectional area of the capillaries is $5\,000 \text{ cm}^2$.

Calculate the percentage increase in cross-sectional area when comparing arteries with capillaries.

(3)

Show your working.

percentage increase =%

(iii) Give **three** functions of capillaries.

(3)

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2

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3

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(Total for Question 1 = 13 marks)

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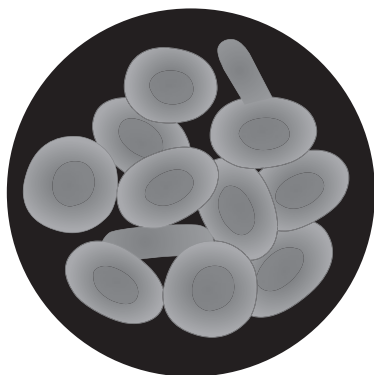
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2 Figure 4a shows red blood cells in blood plasma.

Figure 4b shows red blood cells after being placed in a 5% salt solution for 10 minutes.



(By LadyofHats – <https://commons.wikimedia.org/w/index.php?curid=1685492>)

Figure 4a

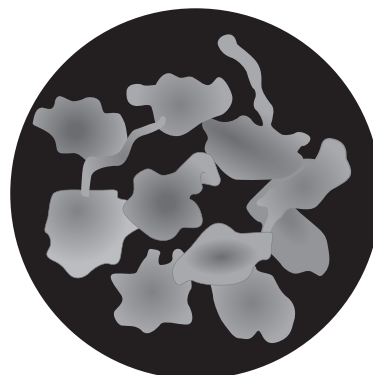


Figure 4b

(a) Sentence 1 explains the changes that happened in the red blood cells in Figure 4b.

When red blood cells were placed in a 5% salt solution, ... M... left the cells by the process of ... N... .

Sentence 1

Identify the missing words, M and N, in Sentence 1.

(2)

M

N

(b) Molecules can move across a cell surface membrane by diffusion, facilitated diffusion or active transport.

Table 1 compares some facts about diffusion, facilitated diffusion and active transport.

Complete Table 1 by circling Yes or No in each box.

(3)

	diffusion	facilitated diffusion	active transport
Are protein carriers involved?	Yes / No	Yes / No	Yes / No
Is ATP needed?	Yes / No	Yes / No	Yes / No

Table 1

(Total for Question 2 = 5 marks)



P 6 7 5 0 6 A 0 7 1 6

- 3 Figure 5 shows the changes in pressure, inside the lungs of a person, during one breath.

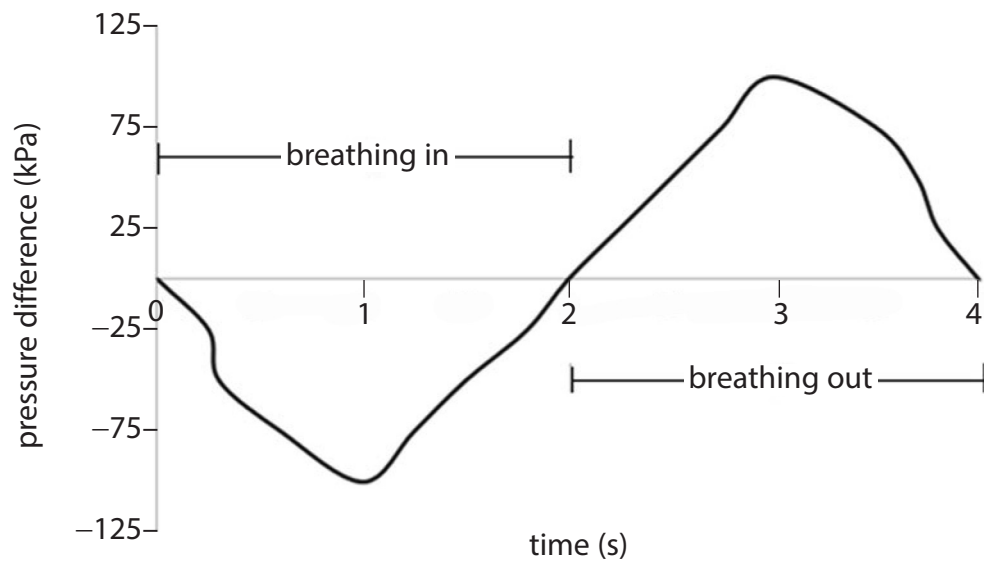


Figure 5

- (a) Identify the times, shown on Figure 5, when the pressure inside the lungs is equal to the pressure in the atmosphere.

(1)

- A** 0 s, 2 s and 3 s
- B** 0 s, 2 s and 4 s
- C** 1 s, 2 s and 3 s
- D** 1 s, 3 s and 4 s



(b) When a person breathes in, the intercostal muscles contract and the diaphragm flattens.

Explain how the pressure in the lungs changes during time 0 s to 2 s, as shown in Figure 5.

(4)

From 0 s to 1 s

.....

.....

.....

.....

From 1 s to 2 s

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(c) Calculate, using information from Figure 5, the breathing rate of the person in breaths per minute.

(2)

Show your working.

breathing rate = breaths per minute

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(d) Diffusion gradients enable the absorption of oxygen into the blood in the lungs.
Explain how.

(3)

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(Total for Question 3 = 10 marks)

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4 (a) Paragraph 1 explains how the kidneys regulate the acid-base balance of the body.

If the blood is too acidic, the kidneys excrete more V..... ions into the urine.

This causes the blood pH to increase.

If the blood is too alkaline, the kidneys excrete more W..... ions into the urine.

This causes the pH of the blood to decrease.

Paragraph 1

Identify the missing words, V and W, in Paragraph 1.

(2)

V

W

(b) Explain why it is important that the kidneys regulate the pH of the blood and tissue fluid.

(4)

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(Total for Question 4 = 6 marks)

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5 Cardiovascular disease (CVD) is a major cause of death in the UK and the rest of the world.

CVD includes heart disease and strokes.

Diet and biological sex are two factors that may affect the risk of CVD.

Explain how diet and biological sex affect the risk of CVD.

(6)

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Handwriting practice area with 15 horizontal dotted lines.

(Total for Question 5 = 6 marks)

TOTAL FOR SECTION A = 40 MARKS





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