

Write your name here

Surname	Other names
---------	-------------

Pearson BTEC
Level 3
Diploma

Centre Number	Learner Registration Number
<input type="text"/>	<input type="text"/>

Applied Science

Unit 5: Principles and Applications of Science II
Biology
ORGANS AND SYSTEMS

<p>Wednesday 6 June 2018 – Afternoon</p> <p>Time: 50 minutes</p>	<p>Paper Reference</p> <p>31627H/1B</p>
---	--

<p>You must have: A calculator and ruler</p>	<p>Total Marks</p>
---	--------------------

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 is comprised of 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 ►

P61074A

©2018 Pearson Education Ltd.

1/1/1/1




Pearson

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

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

1 Figure 1a shows epithelial cells that line the respiratory airways.

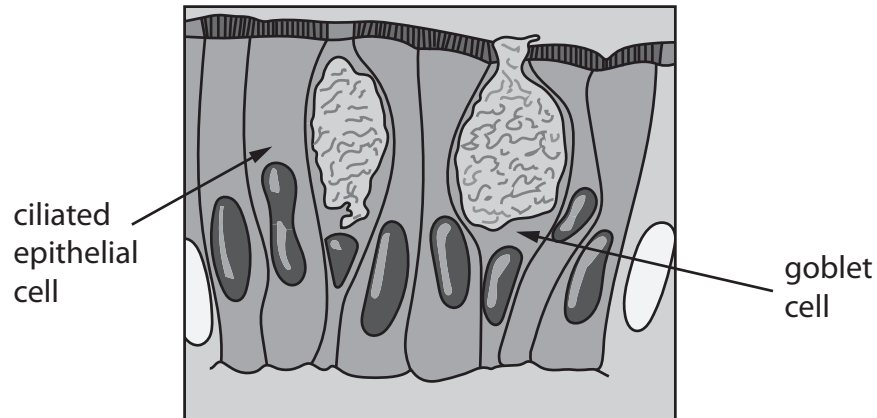


Figure 1a

Figure 1b shows the detailed structure of one goblet cell. Goblet cells produce mucus. Mucus contains large molecules of a protein called mucin.

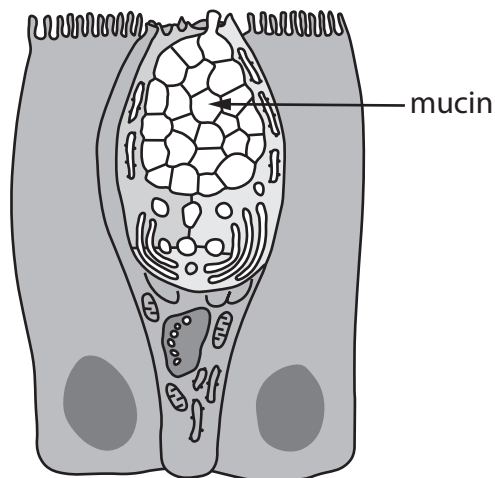


Figure 1b

(a) Identify the name of the cellular structure that transports mucin through the cell.

(1)

- A mitochondria
- B nucleus
- C ribosomes
- D vesicles



(b) Name the process by which mucin leaves the goblet cell.

(1)

(c) Describe the function of the cilia on the ciliated epithelial cells.

(2)

(d) The fluid mosaic model describes the structure of cell surface membranes.

State **two** features of the **fluid mosaic model**.

(2)

1

2

(e) State **two** roles of cholesterol in cell surface membranes.

(2)

1

2

(Total for Question 1 = 8 marks)



2 Figure 2 shows a student breathing in and out whilst connected to a closed circuit spirometer.

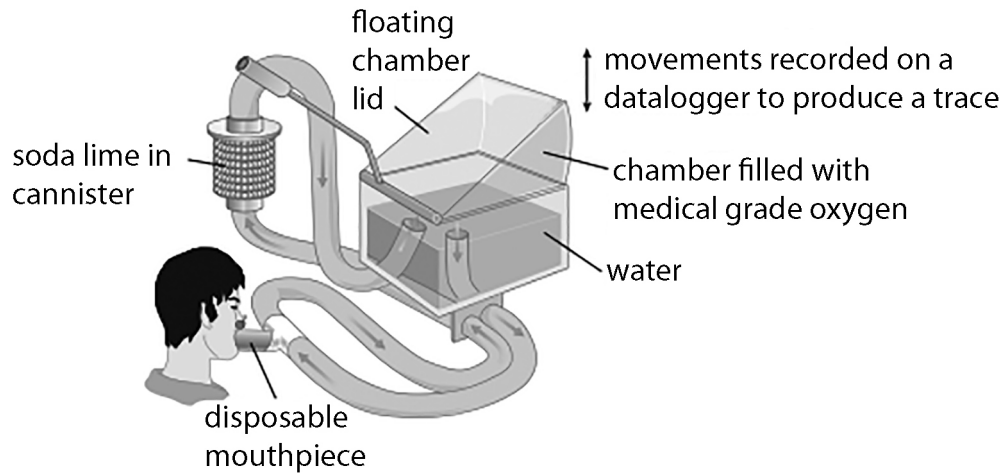


Figure 2

(a) Explain why soda lime is used in the spirometer.

(2)

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE



(b) Figure 3 shows the spirometer trace of the student whilst at rest for two minutes.

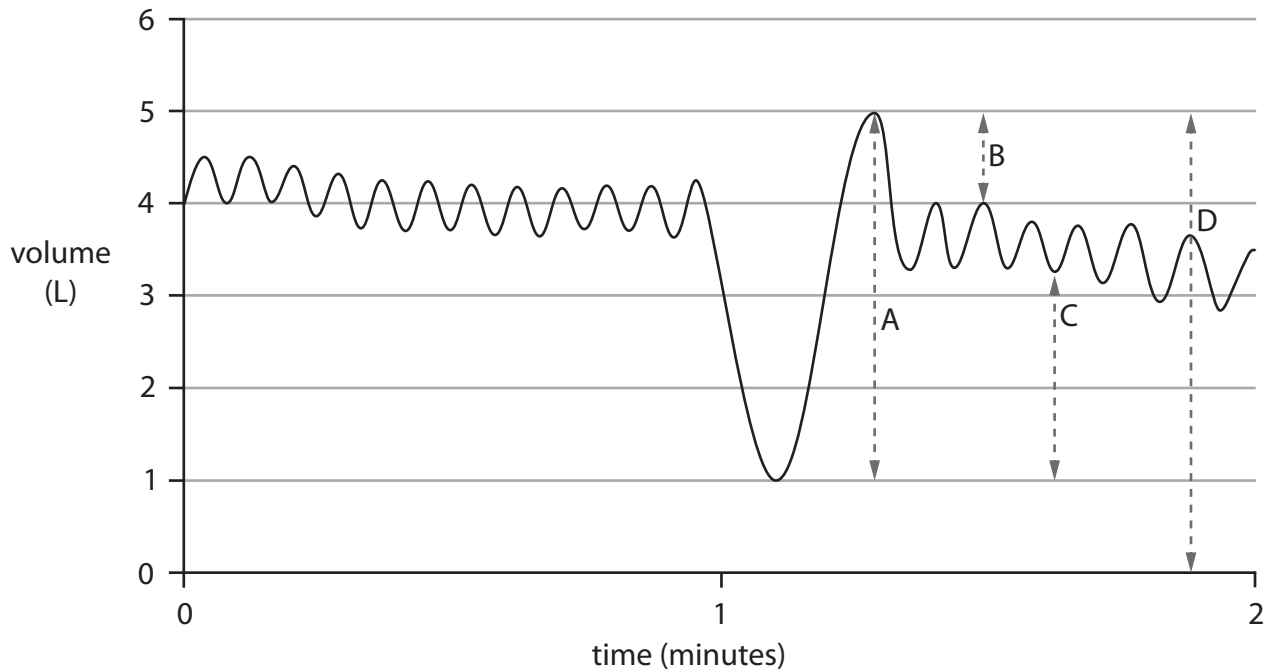


Figure 3

The student breathed in and out normally for the first minute, then took a deep breath in and immediately breathed out as much as possible.

They then continued to breathe normally.

(i) Identify the letter, on Figure 3, which shows the vital capacity of the student.

(1)

- A
- B
- C
- D

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



The respiratory minute ventilation rate (RMV) is the volume of air passing into and out of the lungs in one minute.

- (ii) Calculate, using the information in Figure 3, the RMV for the student during the **first** minute.

Use the equation: $RMV = \text{tidal volume} \times \text{breaths per minute}$

Show your working.

(2)

RMV = L minute⁻¹

- (c) The student then cycled on an exercise bike for two minutes whilst still connected to the spirometer.

Sketch on Figure 4, the spirometer trace for this student as they cycled. Start your trace from the ● on the y axis.

(3)

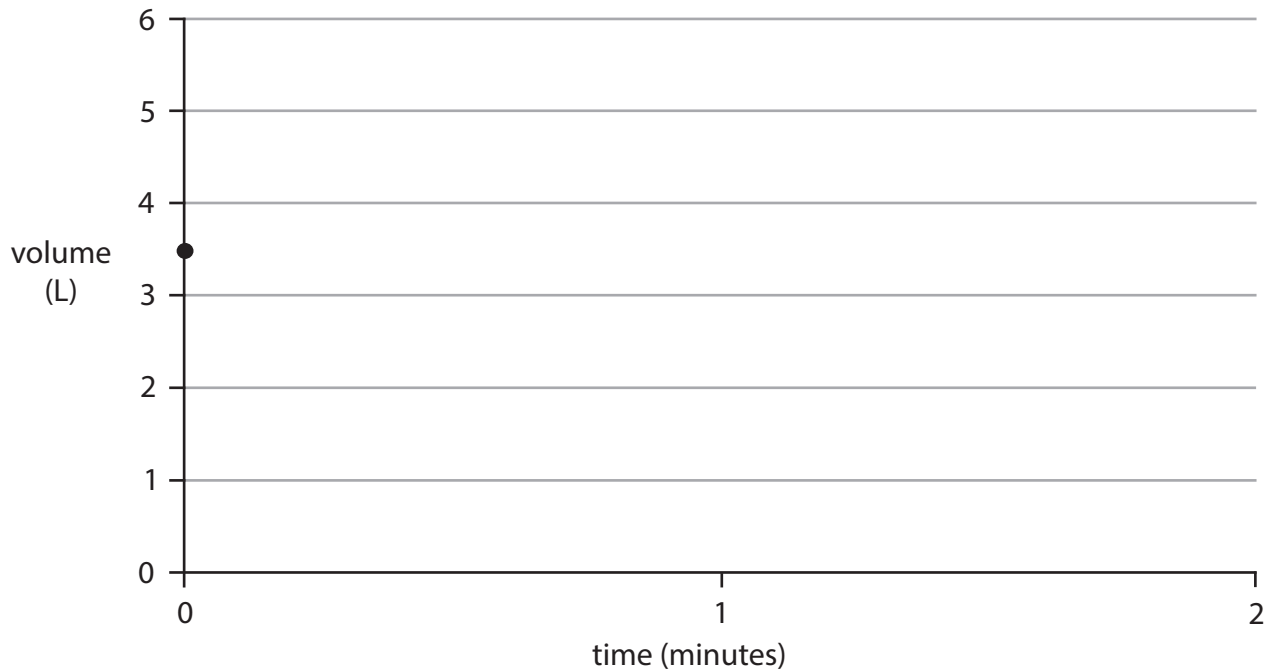


Figure 4

(Total for Question 2 = 8 marks)



- 3 Figure 5a shows the external structure of a human heart.
Figure 5b shows a blocked coronary artery.

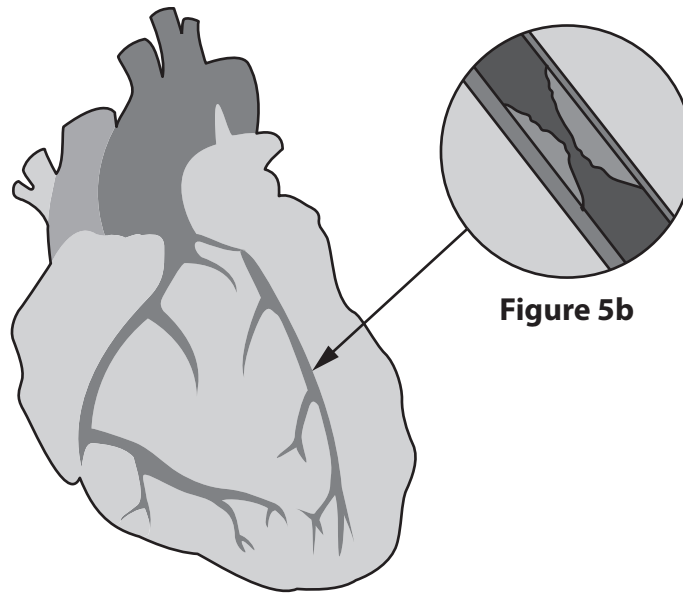


Figure 5a

- (a) (i) State what is meant by the term **myogenic**.

(2)

.....

.....

.....

.....

- (ii) Describe the function of the coronary artery.

(2)

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) (i) Figure 6a shows an electrocardiogram (ECG) trace during the cardiac cycle.

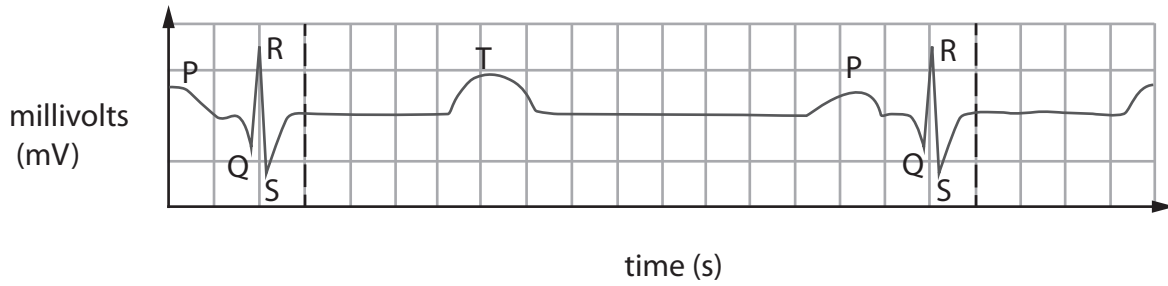


Figure 6a

Identify the letter on Figure 6a that represents when the atria contract.

(1)

- A P
- B R
- C S
- D T

(ii) Figure 6b shows the changes in the volume of blood in the left ventricle during the cardiac cycle.

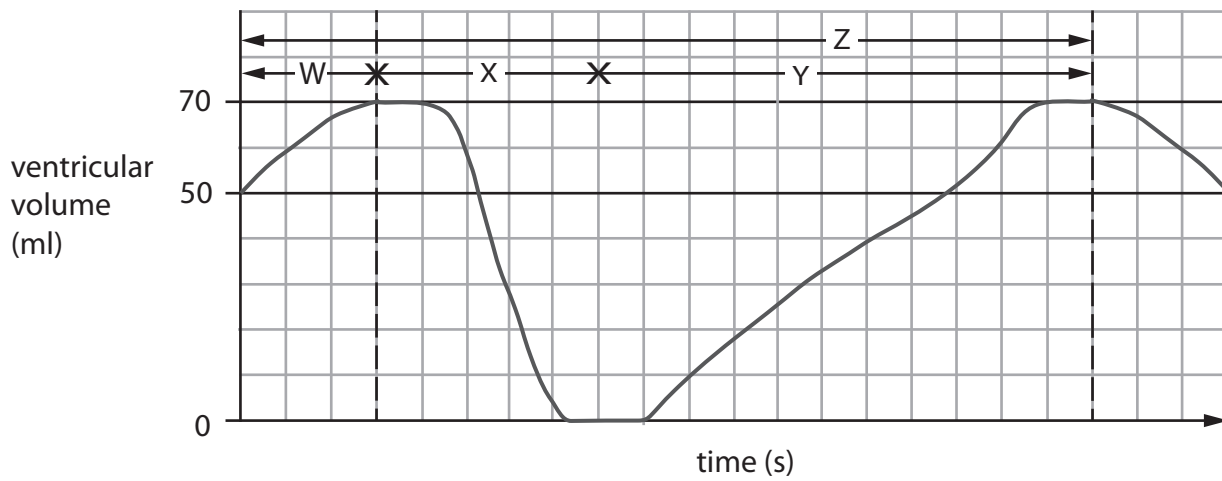


Figure 6b

Identify the letter on Figure 6b that represents ventricular systole.

(1)

- A W
- B X
- C Y
- D Z



(iii) The duration of a heartbeat in Figure 6b is 0.8 seconds.

Calculate, using information from Figure 6b, the cardiac output for this heart.

Cardiac output = stroke volume (ml) X heart rate (beats per minute)

Show your working.

(3)

cardiac output = ml minute⁻¹

(Total for Question 3 = 13 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



4 Figure 7 shows the structure of a nephron in a kidney.

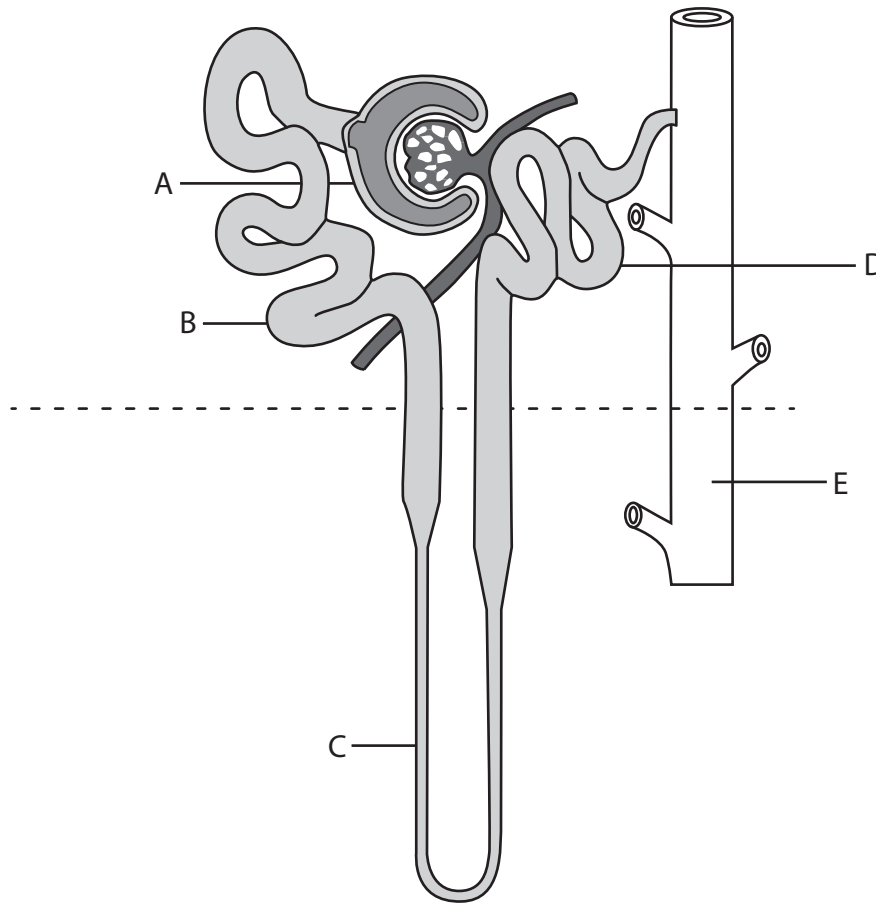


Figure 7

(a) Complete the table to show the names of C and D.

(2)

Region of nephron
A Glomerulus
B Proximal convoluted tubule (PCT)
C
D
E Collecting duct

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(b) Aldosterone is a hormone that is secreted by the adrenal glands when blood pressure drops.

Figure 8 shows kidneys and adrenal glands.

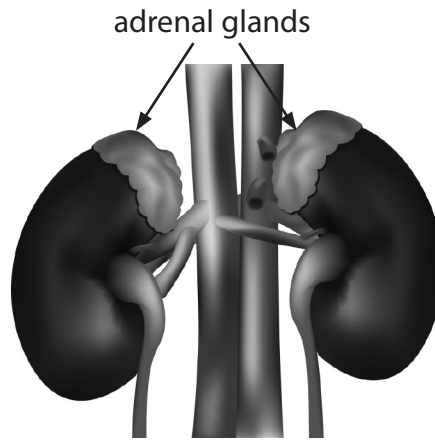


Figure 8

Describe how aldosterone increases blood pressure.

(3)

.....

.....

.....

.....

.....

.....

.....



(c) Kidney failure occurs when 50% or more of the nephrons are damaged. Patients with kidney failure may be treated with kidney transplantation.

Discuss the advantages and disadvantages of treating kidney failure with kidney transplantation.

(6)

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 4 = 11 marks)

TOTAL FOR PAPER = 40 MARKS



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Pearson Education Ltd. will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.

