

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson BTEC  
Level 3  
Nationals  
Diploma**

Centre Number

Learner Registration Number

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**Tuesday 11 June 2019**

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 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 in a box . 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) Complete Table 1 to show the functions of the ureters and bladder.

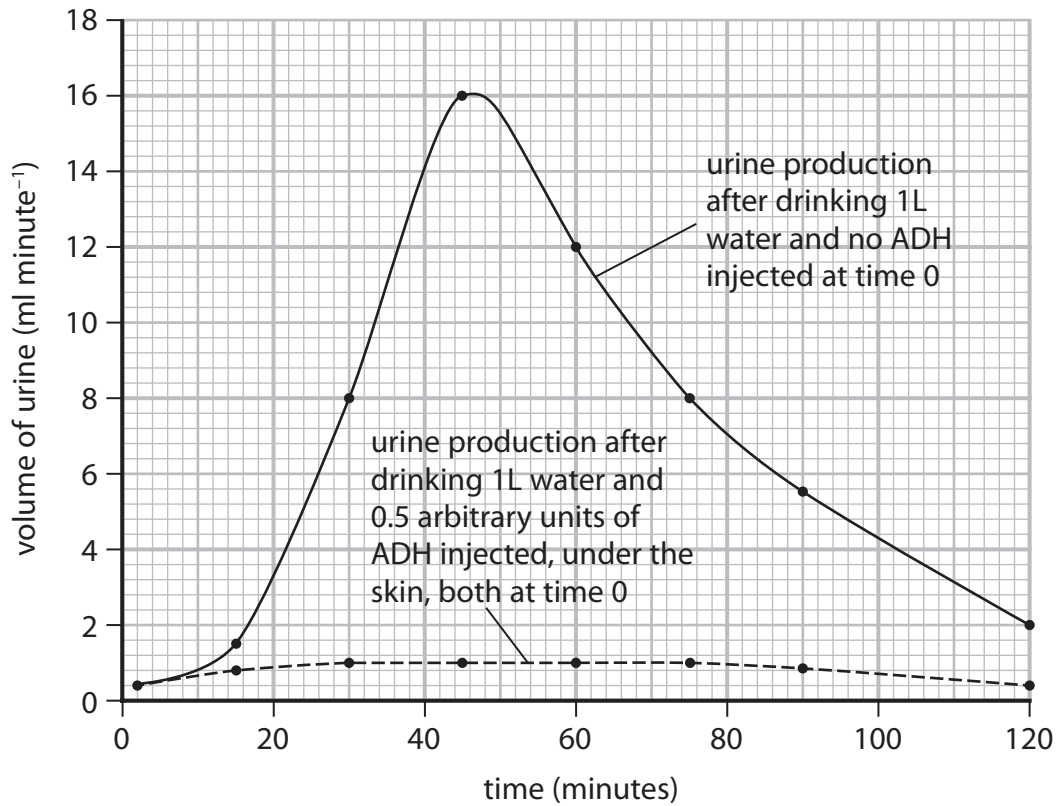
(2)

organ	function
Renal arteries	Carries blood to the kidneys
Renal veins	Carries blood away from the kidneys
Ureters	
Bladder	

Table 1



(b) Figure 1 shows the effect of anti-diuretic hormone (ADH) on the rate of urine production.



Source: P. 137 J H Green: Human Physiology 4th. ed. Oxford

**Figure 1**

(i) Describe the changes in the rate of urine production, when no ADH is injected, from 0 to 120 minutes.

(3)

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(ii) Explain the effect of ADH on the rate of urine production.

(2)

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(c) The blood in the renal vein contains less oxygen than the blood in the renal artery.

State **two other** ways that the blood in the renal vein is different from the blood in the renal artery.

(2)

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2 .....

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**(Total for Question 1 = 9 marks)**

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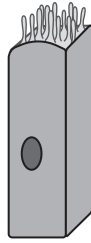
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2 Figure 2 shows two types of epithelial cell.



© Designua / Shutterstock

**Figure 2a:** Columnar epithelial cell from the lining of the bronchi

**Figure 2b:** Squamous epithelial cell from the wall of the glomerulus in the kidney

Table 2 contains information about the two types of epithelial cell.

	columnar cell from the lining of the bronchi	squamous cell from the wall of the glomerulus
surface area (SA) ( $\mu\text{m}^2$ )	1032	816
volume (V) ( $\mu\text{m}^3$ )	1440	80
SA/V		10.2

**Table 2**

- (a) Calculate, using information from Table 2, the surface area to volume ratio (SA/V) for the columnar cell from the lining of the bronchi.

(2)

Show your working.

SA/V = .....

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(b) The walls of a glomerulus in a kidney nephron consist of squamous epithelial cells.

Explain how the **SA/V ratio** of these cells helps them to filter blood efficiently.

(2)

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(c) Complete Table 3 to show the differences and similarities between active transport and endocytosis. Active transport has been completed for you.

(3)

feature	active transport	endocytosis
direction of movement	out of or into the cell	
involves protein carriers in the membrane	yes	
uses ATP	yes	

Table 3

(Total for Question 2 = 7 marks)





3 Figure 3 shows some of the structures in the thoracic cavity.

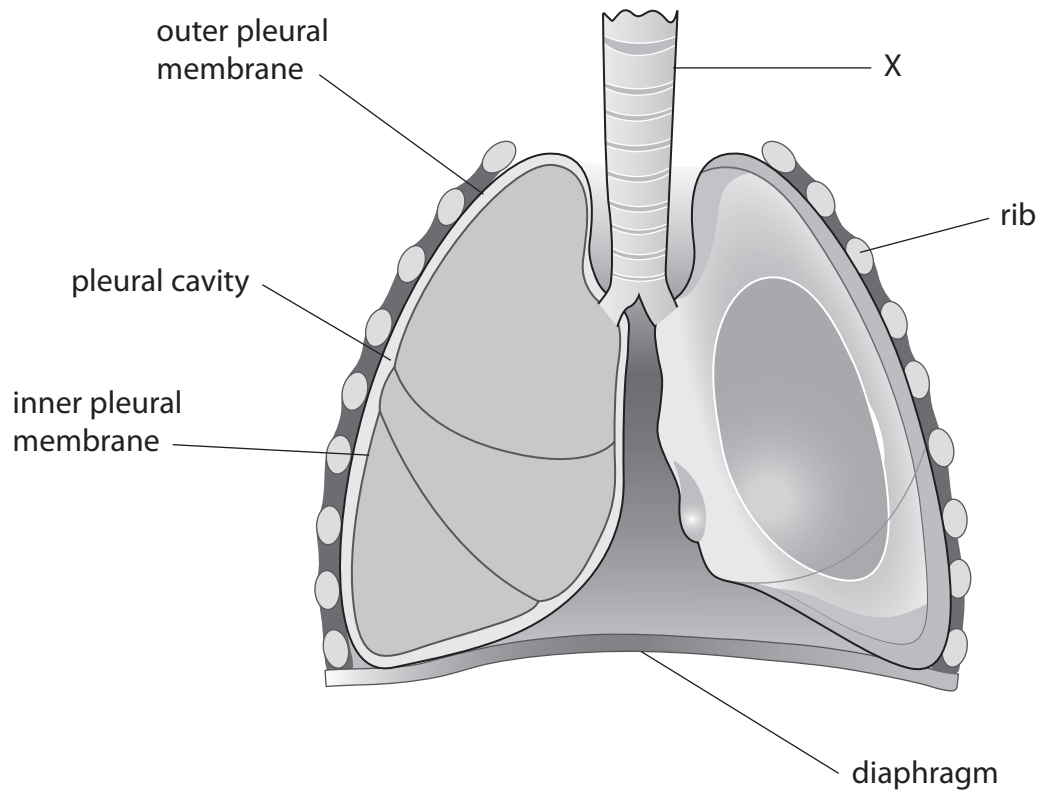


Figure 3

(a) (i) Name structure X in Figure 3.

(1)

(ii) The pleural membranes secrete pleural fluid.

Identify the function of the pleural fluid.

(1)

- A to keep airways open
- B to prevent alveoli collapsing
- C to reduce friction
- D to remove pathogens





(b) Name the muscles that cause the rib cage to move during breathing.

(1)

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(c) Explain how the movements of the rib cage and diaphragm enable a person to inhale.

(4)

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**(Total for Question 3 = 7 marks)**

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4 Figure 4 shows the structure of a human heart.

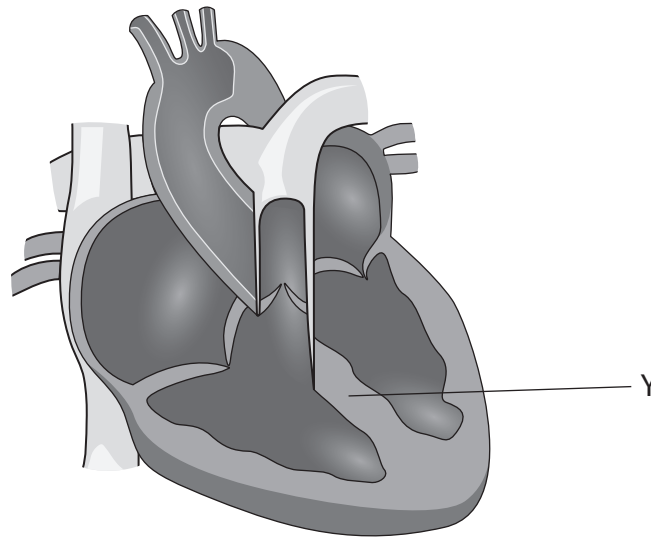


Figure 4

(a) Name the structure labelled Y on Figure 4.

(1)

(b) Identify which row of Table 4, A, B, C or D, correctly describes the type of blood present in each blood vessel.

(1)

	blood vessels			
	aorta	pulmonary arteries	pulmonary veins	venae cavae
A	deoxygenated	oxygenated	deoxygenated	oxygenated
B	oxygenated	oxygenated	deoxygenated	deoxygenated
C	oxygenated	deoxygenated	deoxygenated	oxygenated
D	oxygenated	deoxygenated	oxygenated	deoxygenated

Table 4

- A
- B
- C
- D



(c) Sentence 1 gives an incomplete definition.

The volume of blood pumped out of the heart in one minute is the .....

**Sentence 1**

Identify the missing words from Sentence 1 to complete the definition.

(1)

- A** cardiac output
- B** heart rate
- C** stroke volume
- D** ventricular systole

(d) A patient visits their doctor. The doctor determines they have a reduced stroke volume.

The doctor tells the patient they have congestive heart failure.

The doctor finds that the patient has a resting heart rate of 105 beats per minute.

(i) Which term describes this patient's resting heart rate?

(1)

- A** atrial fibrillation
- B** bradycardia
- C** tachycardia
- D** ventricular fibrillation



- (ii) After the patient received treatment for congestive heart failure, their resting stroke volume increased from 40 ml to 60 ml.

Calculate the percentage increase in this patient's stroke volume after treatment.

(3)

Show your working.

..... %

- (iii) Increasing the patient's stroke volume increases their cellular respiration, enabling them to be more active.

Explain why.

(4)

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**(Total for Question 4 = 11 marks)**

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