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Candidate surname

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Pearson BTEC
Level 3 Nationals
Certificate, Extended
Certificate

Centre Number

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Learner Registration Number

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Tuesday 12 January 2021

Morning (Time: 1 hour 30 minutes)

Paper Reference **21325L**

Applied Human Biology

Unit 1: Principles of Applied Human Biology

You must have:

A calculator and a ruler

Total Marks

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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 total mark for this paper is 80.
- 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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Pearson

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 The skin is a barrier against infection by pathogens.

When the skin is cut, a blood clot forms.

(a) Name **two** components of a blood clot.

(2)

1

2

(b) The immune system includes specific and non-specific defences.

Complete Table 1 by adding Yes and No to show whether each defence is specific or non-specific.

The first row has been completed for you.

(3)

defence	specific	non-specific
skin forming a physical barrier	No	Yes
antibody production by lymphocytes		
hydrochloric acid in the stomach		
phagocytosis by phagocytes		

Table 1

(c) Viruses are pathogens that replicate inside the body's cells.

Name **one** type of white blood cell that destroys cells containing viruses.

(1)

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(Total for Question 1 = 6 marks)

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2 Marfan syndrome is a genetic disorder that affects the body's connective tissues.

Marfan syndrome is caused by a mutation in the *FBN1* gene.

(a) (i) Analysis of a part of the *FBN1* gene showed that 16% of the DNA sequence was cytosine.

Identify the percentage of guanine in this part of the *FBN1* gene.

(1)

<input type="checkbox"/>	A 16%
<input type="checkbox"/>	B 18%
<input type="checkbox"/>	C 32%
<input type="checkbox"/>	D 34%

(ii) Name the nucleotide base that is found only in RNA.

(1)



P 6 7 4 9 5 A 0 3 2 4

(b) Marfan syndrome is inherited.

Figure 1 shows the allele combination for the *FBN1* gene for two people who are expecting a child.

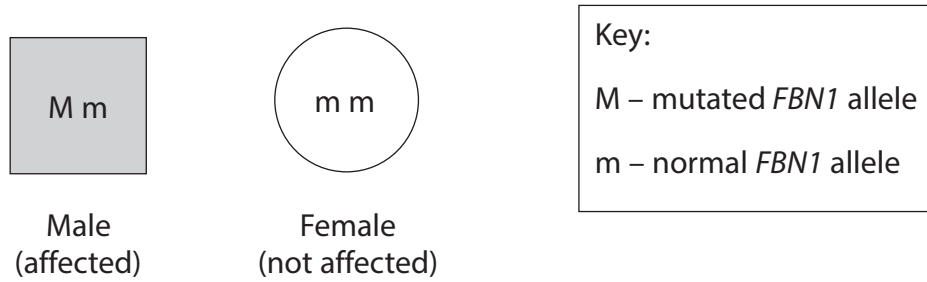


Figure 1

Explain why there is a 50% chance that their child will inherit Marfan syndrome.

You may include a diagram to support your answer.

(3)

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(c) Some mutations that cause Marfan syndrome happen in the non-coding regions within the *FBN1* gene.

Which word describes a non-coding region of DNA within a gene?

(1)

<input type="checkbox"/>	A anticodon
<input type="checkbox"/>	B codon
<input type="checkbox"/>	C exon
<input type="checkbox"/>	D intron

(Total for Question 2 = 6 marks)

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3 Most cancers cause tumours to form.

Tumours can be malignant or benign.

(a) State **two** differences between malignant tumours and benign tumours.

(2)

1

2

(b) Explain how mutations in different regions of a DNA molecule can cause cancer.

(6)

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4 Cells in the body respond to injury.

- (a) (i) Hyperplasia and atrophy are two examples of cell adaptation in response to injury.

Explain the effects that hyperplasia and atrophy have on cells.

(4)

hyperplasia

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atrophy

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- (ii) Severe damage to the cell may result in cell death.

Identify the word describing cell death.

(1)

<input type="checkbox"/>	A cytokinesis
<input type="checkbox"/>	B meiosis
<input type="checkbox"/>	C metastasis
<input type="checkbox"/>	D necrosis

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(b) (i) An ischemic stroke can result in damage to brain cells.

Explain how.

(3)

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(ii) Atherosclerosis is one factor that increases the risk of an ischemic stroke.

Give **one other** factor that increases the risk of an ischemic stroke.

(1)

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(Total for Question 4 = 9 marks)

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P 6 7 4 9 5 A 0 9 2 4

5 (a) Autoimmune diseases are caused when the body's immune system attacks its own cells.

Which is an example of an autoimmune disease?

(1)

<input type="checkbox"/>	A arrhythmia
<input type="checkbox"/>	B COPD
<input type="checkbox"/>	C Down's syndrome
<input type="checkbox"/>	D rheumatoid arthritis

(b) (i) Hayfever is an example of an allergic reaction.

When a person is exposed to pollen, mast cells can release histamine.

Explain the effect of histamine on blood vessels.

(3)

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(ii) A severe allergic reaction may result in anaphylaxis.

Anaphylaxis can cause a person to lose consciousness.

Explain why anaphylaxis can cause a loss of consciousness and how anaphylaxis can be treated.

(4)

cause of loss of consciousness

treatment of anaphylaxis

(c) (i) Give **one** example of a medical treatment that reduces the function of the immune system.

(1)

(ii) Explain how infection with HIV can reduce the function of the immune system.

(2)

(Total for Question 5 = 11 marks)





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6 Blood is transported around the body in blood vessels.

(a) (i) Which blood vessel carries oxygenated blood from the lungs to the heart?

(1)

<input type="checkbox"/>	A aorta
<input type="checkbox"/>	B pulmonary artery
<input type="checkbox"/>	C pulmonary vein
<input type="checkbox"/>	D vena cava

(ii) Figure 2 shows a cross section of the heart.

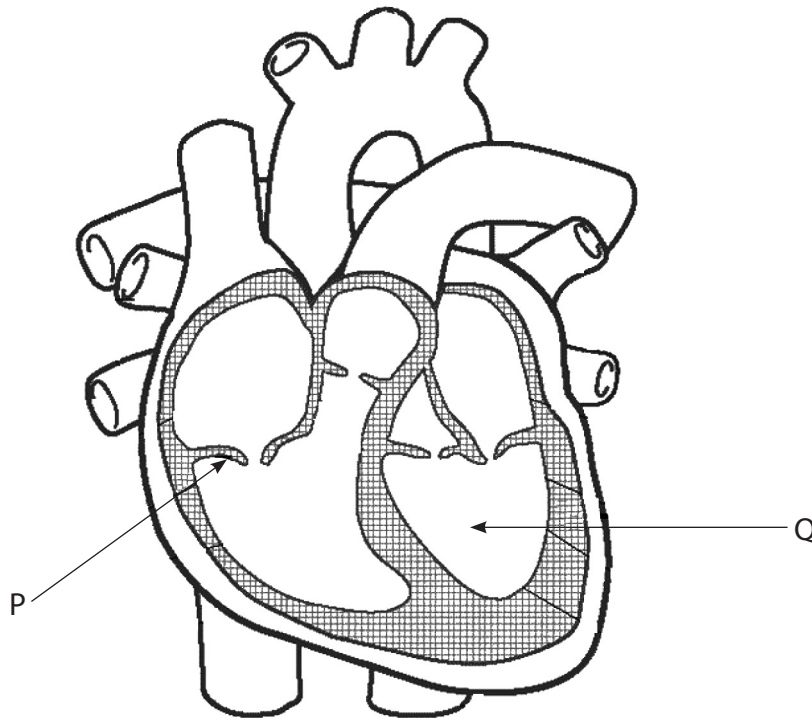


Figure 2

Name the parts of the heart labelled P and Q in Figure 2.

(2)

P

Q



(b) Figure 3 shows two types of blood vessel.



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

Figure 3

Evaluate how the structure of each type of blood vessel, R and S, is adapted for its function.

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(Total for Question 6 = 12 marks)



7 Every tissue within the body contains proteins.

(a) Proteins can be classified as either globular or fibrous depending on their structure.

Describe **two** structural similarities of and **two** structural differences between globular proteins and fibrous proteins.

(4)

similarities

1

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2

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differences

1

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2

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(b) Muscles contain protein.

Respiration uses glucose to release energy needed for muscle contraction.

Glycogen can be broken down to form molecules of glucose.

(i) Identify the type of bond that needs to be broken to release glucose molecules from glycogen.

(1)

<input type="checkbox"/>	A disulfide
<input type="checkbox"/>	B ester
<input type="checkbox"/>	C glycosidic
<input type="checkbox"/>	D ionic

(ii) Aerobic respiration uses oxygen.

Name the protein in red blood cells that transports oxygen around the body.

(1)

(iii) State **one** waste product formed during aerobic respiration.

(1)



P 6 7 4 9 5 A 0 1 7 2 4

(iv) Anaerobic respiration can also release energy within the muscle cells.

Figure 4 shows the process of anaerobic respiration.

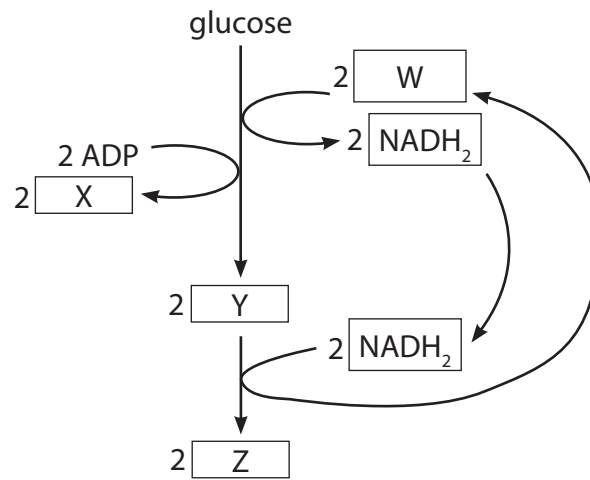


Figure 4

Identify molecules W, X, Y and Z in Figure 4.

(4)

- W
- X
- Y
- Z

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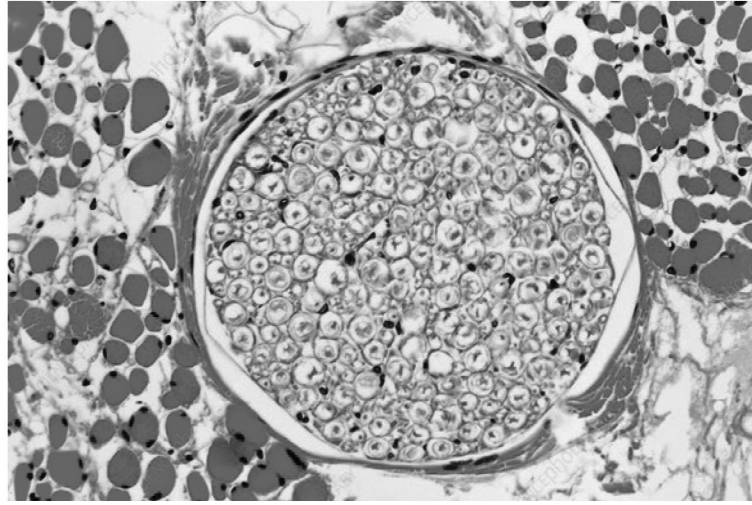
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(c) Figure 5 shows an electron micrograph of a bundle of nerve cells within a section of skeletal muscle.



(Source: © HERVE CONGE, ISM / SCIENCE PHOTO LIBRARY)

Figure 5

The magnification of the image in Figure 5 is $\times 825$.

The observed diameter of the bundle of nerve cells is 66 mm.

Calculate the actual diameter, in micrometres (μm), of the bundle of nerve cells.

(3)

actual diameter = μm

(Total for Question 7 = 14 marks)



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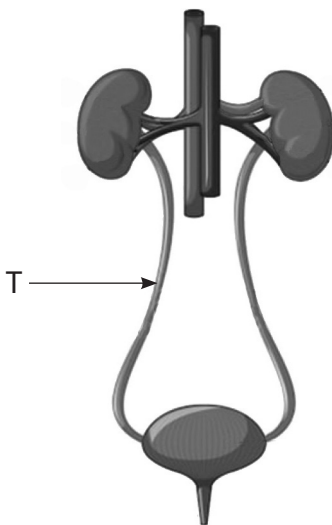
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8 The kidneys control the body's water balance.

(a) Figure 6 shows the structure of the urinary system.



(Source: © GraphicsRF.com/Shutterstock)

Figure 6

(i) Identify the feature labelled T in Figure 6.

(1)

<input type="checkbox"/>	A nephron
<input type="checkbox"/>	B renal vein
<input type="checkbox"/>	C ureter
<input type="checkbox"/>	D urethra

(ii) Glucose in urine is a sign of diabetes.

Explain why.

(3)

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(iii) Which substance is selectively reabsorbed back into the blood using active transport?

(1)

<input type="checkbox"/>	A plasma proteins
<input type="checkbox"/>	B sodium ions
<input type="checkbox"/>	C creatinine
<input type="checkbox"/>	D water

(b) Discuss how the negative feedback mechanism controls the body's water balance.

Your answer should include the role of:

- the brain
- the kidneys.

(9)

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(Total for Question 8 = 14 marks)

TOTAL FOR PAPER = 80 MARKS





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