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Level 3 Nationals  
Certificate

Centre Number

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Learner Registration Number

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**Friday 24 May 2019**

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

### 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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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 Blood glucose levels must be maintained at a constant level.

(a) (i) Name the organ that secretes the hormones that maintain a constant blood glucose level.

(1)

(ii) Which hormone converts glucose into glycogen?

(1)

<input type="checkbox"/>	A catalase
<input type="checkbox"/>	B glucagon
<input type="checkbox"/>	C insulin
<input type="checkbox"/>	D trypsin

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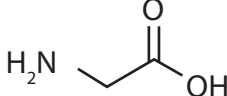
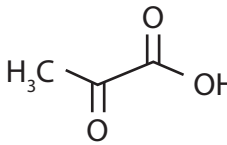
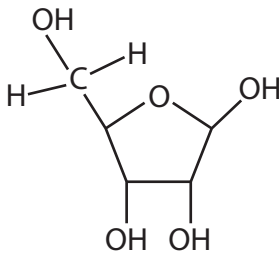
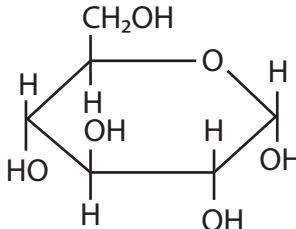
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(b) Which molecule is glucose?

(1)

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<input type="checkbox"/>	<b>B</b>	
<input type="checkbox"/>	<b>C</b>	
<input type="checkbox"/>	<b>D</b>	

(c) A 40-year-old man has a very high BMI.

Explain which type of diabetes he is at risk of developing.

(2)

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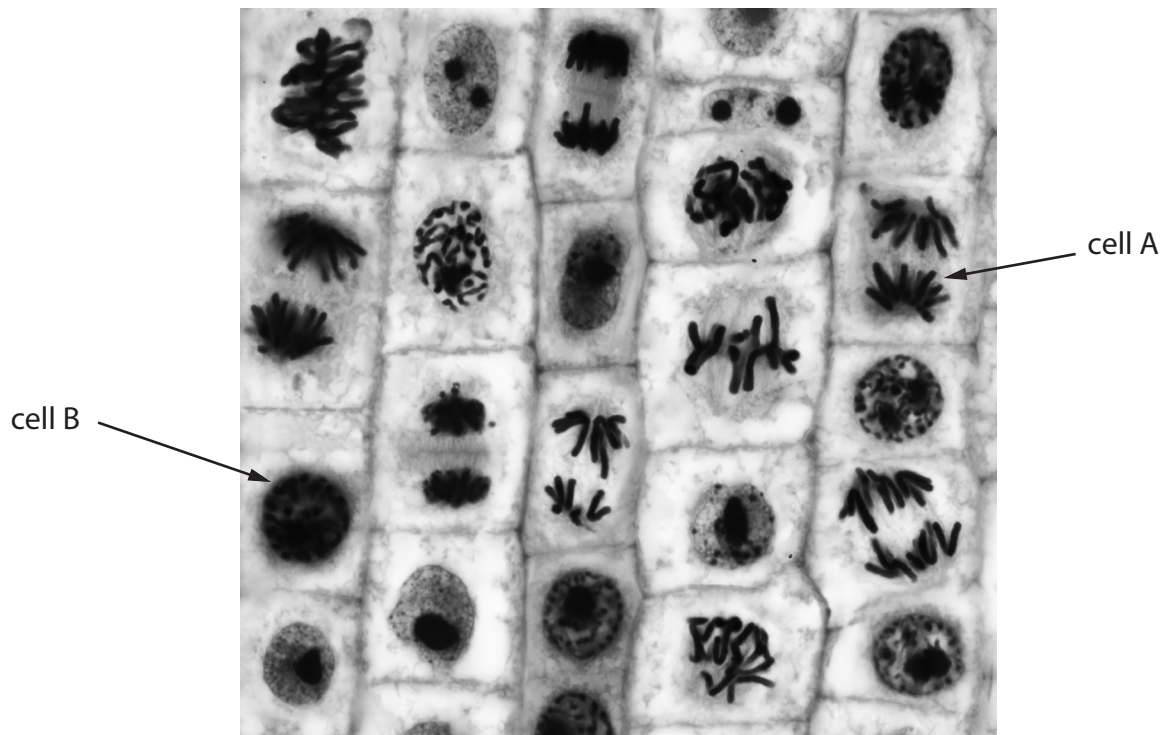
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(Total for Question 1 = 5 marks)



2 Figure 1 shows cells going through mitosis.  
The image is magnified 500 times.



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**Figure 1**

(a) Describe what is happening at the stage of mitosis shown in cell A.

(3)

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(b) Identify the stage of the cell cycle when DNA is replicated.

(1)

<input type="checkbox"/>	<b>A</b> G <sub>1</sub> phase
<input type="checkbox"/>	<b>B</b> G <sub>2</sub> phase
<input type="checkbox"/>	<b>C</b> mitosis
<input type="checkbox"/>	<b>D</b> S phase

(c) In Figure 1, the observed diameter of the nucleus in cell B is 11 mm.

Calculate the actual diameter of the nucleus in cell B.

Give your answer in micrometres ( $\mu\text{m}$ ).

(3)

.....  $\mu\text{m}$

**(Total for Question 2 = 7 marks)**



3 The human body has physical, chemical and biological defences to prevent infection.

(a) Which part of the non-specific immune system involves general physical and chemical defences?

(1)

<input type="checkbox"/>	<b>A</b> cell mediated immunity
<input type="checkbox"/>	<b>B</b> humoral immunity
<input type="checkbox"/>	<b>C</b> innate immunity
<input type="checkbox"/>	<b>D</b> passive immunity

(b) Complete Table 1 to show where the chemical defence mechanisms that destroy microorganisms are found.

(3)

Chemical defence mechanism	Location
Sebum	
Hydrochloric acid	
Lysozyme	

Table 1

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(c) The human immunodeficiency virus (HIV) is transmitted through the exchange of body fluids.

The virus enters T-helper cells.

Explain how infection with HIV leads to immunodeficiency.

(6)

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**(Total for Question 3 = 10 marks)**

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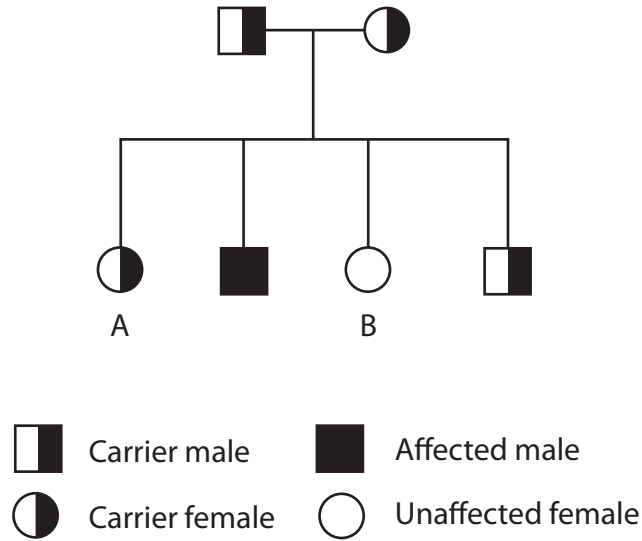


P 6 3 1 8 6 A 0 7 2 4

4 Figure 2 shows the inheritance of cystic fibrosis in a family.

Cystic fibrosis is an autosomal recessive genetic disorder.

The letter **D** is used for the dominant allele and the letter **d** for the recessive allele.



**Figure 2**

(a) Which row shows the correct genotypes for individual A and individual B?

(1)

		Individual A	Individual B
<input type="checkbox"/>	<b>A</b>	Dd	DD
<input type="checkbox"/>	<b>B</b>	Dd	dd
<input type="checkbox"/>	<b>C</b>	DD	DD
<input type="checkbox"/>	<b>D</b>	dd	dd

(b) State the phenotype of individual A.

(1)





(c) Individual A has a child.

Explain why this child would be advised to have a genetic test for the cystic fibrosis allele before starting a family.

(3)

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(d) People with cystic fibrosis have increased mucus secretion in the lungs and pancreas.

(4)

Explain **one** effect of increased mucus secretion for the respiratory system.

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Explain **one** effect of increased mucus secretion for the digestive system.

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**(Total for Question 4 = 9 marks)**

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5 (a) Air enters the lungs through the trachea.

(i) Explain the function of **two** structural features of the trachea.

(4)

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2 .....

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(ii) Name the type of tissue that causes recoil of the alveoli.

(1)

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(iii) Recoil of alveoli helps with gas exchange.

Give **one** other feature of alveoli that helps gas exchange.

(1)

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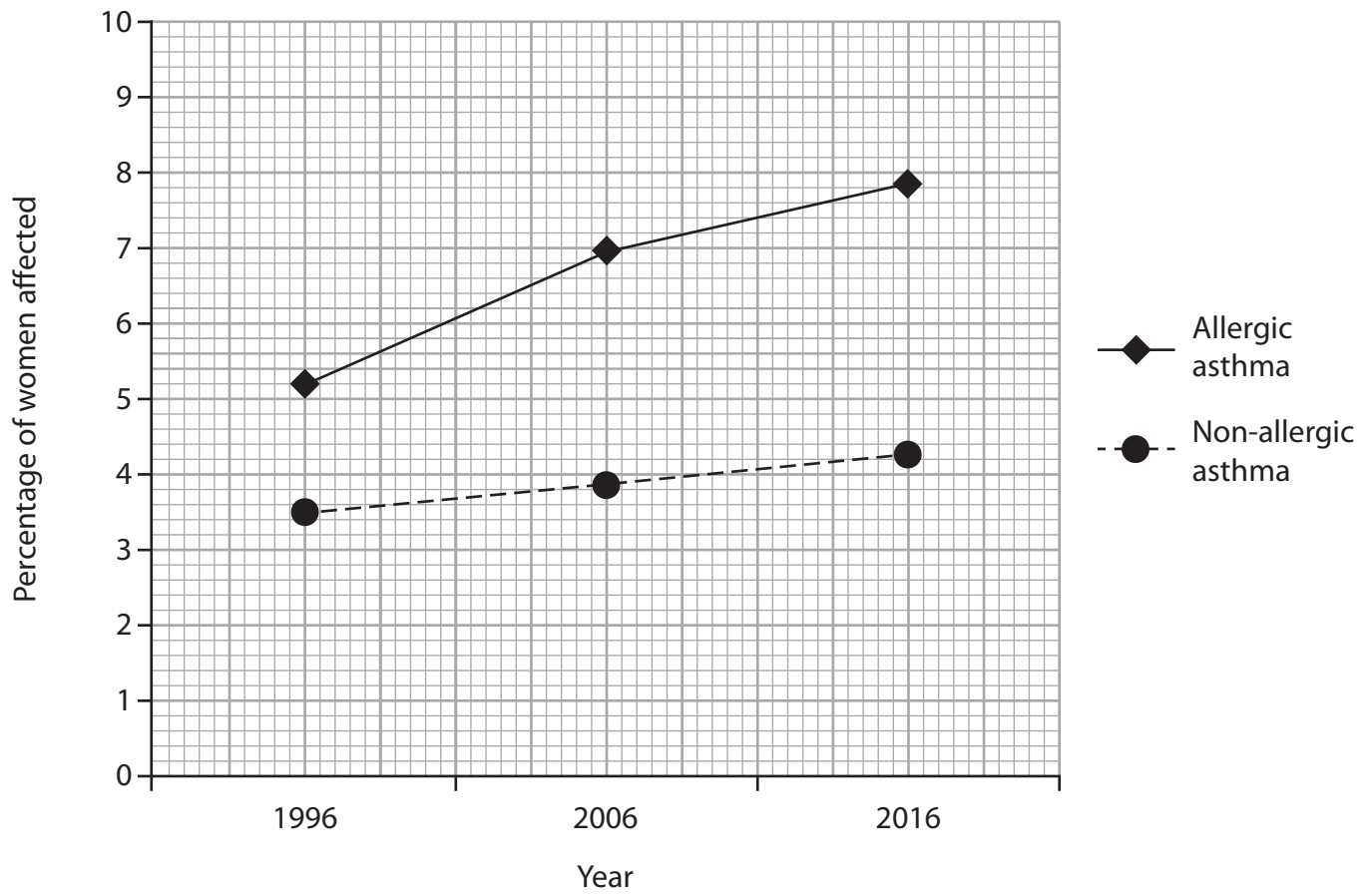
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(b) Figure 3 shows the percentage of women affected by asthma.



**Figure 3**

Describe the trends shown in Figure 3.

(2)

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(c) Explain the immune response that happens in a person with allergy-induced asthma when the person inhales an allergen.

(3)

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**(Total for Question 5 = 11 marks)**

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6 In human cells, splicing happens after transcription.

(a) Describe the process of **splicing**.

(2)

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(b) Which type of molecule is produced by transcription?

(1)

<input type="checkbox"/>	<b>A</b> DNA
<input type="checkbox"/>	<b>B</b> mRNA
<input type="checkbox"/>	<b>C</b> polypeptide
<input type="checkbox"/>	<b>D</b> polysaccharide



(c) Discuss the consequences of a mutation in the gene encoding the digestive enzyme pepsin.

You should refer to transcription, translation and enzyme action in your response.

(9)

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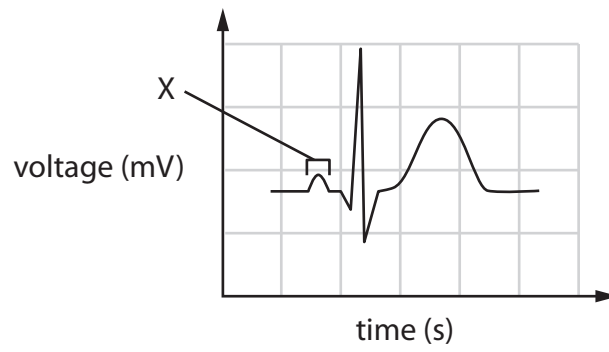
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Handwriting practice area with 18 horizontal dotted lines.

**(Total for Question 6 = 12 marks)**



7 (a) Figure 4 shows a normal ECG trace.



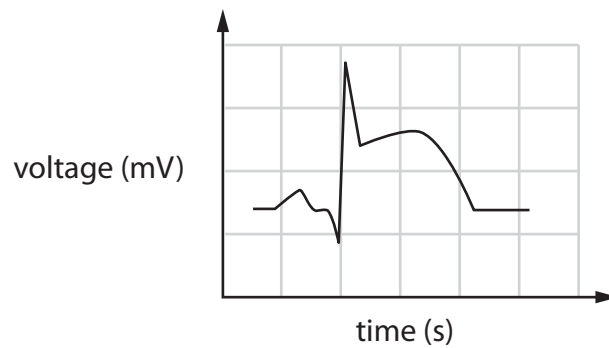
**Figure 4**

(i) Which part of the ECG trace is labelled X?

(1)

<input type="checkbox"/>	<b>A</b> p wave
<input type="checkbox"/>	<b>B</b> q wave
<input type="checkbox"/>	<b>C</b> qrs wave
<input type="checkbox"/>	<b>D</b> t wave

(ii) Figure 5 shows an ECG trace from a patient in hospital with a heart attack.



**Figure 5**

State what is abnormal about the trace shown in Figure 5.

(1)





(b) Table 2 shows the blood pressure and temperature of a different patient.

<b>blood pressure (mmHg)</b>	145/102
<b>temperature (°C)</b>	38.8

**Table 2**

(4)

Explain how the blood pressure of this patient affects their body.

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Explain how the temperature of this patient affects their body.

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(c) (i) The patient had a full blood count in hospital.

Which hospital department would test the patient's blood?

(1)

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(ii) Describe what a full blood count measures.

(3)

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(iii) The c-reactive protein (CRP) was detected in the blood of the patient.

Explain why there is CRP in the patient's blood.

(2)

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**(Total for Question 7 = 12 marks)**

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8 The kidneys are involved in osmoregulation and the production of urine.

(a) Which process happens between the glomerulus and the Bowman's capsule?

(1)

<input type="checkbox"/>	<b>A</b> active transport
<input type="checkbox"/>	<b>B</b> glycolysis
<input type="checkbox"/>	<b>C</b> phagocytosis
<input type="checkbox"/>	<b>D</b> ultrafiltration

(b) Explain why glucose is not found in the urine of a healthy person.

(4)

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(c) Water is reabsorbed into the blood in the kidneys.

If more water is reabsorbed than the body needs, a person can develop hypertension.

This increases the amount of tissue fluid formed at the arterial end of the capillary and decreases the amount reabsorbed at the venous end.

Discuss the impact of hypertension on tissue fluid formation.

(9)

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**TOTAL FOR PAPER = 80 MARKS**





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