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Centre Number

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Learner Registration Number

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Tuesday 14 January 2020

Morning (Time: 1 hour 30 minutes)

Paper Reference **21325L**

Applied Human Biology

Unit 1: Principles of Applied Human Biology

You will need:

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 (a) A motor neurone is adapted for transmission of a nerve impulse.

Figure 1 shows a motor neurone. A section has been magnified.

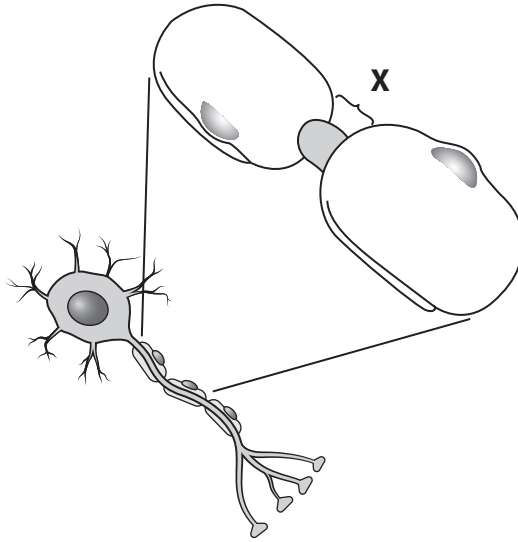


Figure 1

(i) Identify the feature labelled X.

(1)

<input type="checkbox"/>	A cell body
<input type="checkbox"/>	B myelin sheath
<input type="checkbox"/>	C node of Ranvier
<input type="checkbox"/>	D synaptic terminal

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(ii) Identify the function of the feature labelled **X**.

(1)

<input type="checkbox"/>	A allows for connection to other neurones
<input type="checkbox"/>	B is the binding site for neurotransmitters
<input type="checkbox"/>	C protects the nerve cell from damage
<input type="checkbox"/>	D speeds up impulse transmission

(iii) Two other adaptations of the motor neurone are

- many sodium-potassium pumps in the cell membrane
- many mitochondria.

Explain how these **two** adaptations of the motor neurone allow for transmission of the nerve impulse.

(4)

Sodium-potassium pumps

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Mitochondria

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(b) The nervous system is divided into the central nervous system and the peripheral nervous system.

Name **one** part of the central nervous system.

(1)

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(Total for Question 1 = 7 marks)

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- 2 (a) The body must have a good supply of oxygen.

Complete Paragraph 1 to show the changes that happen in the respiratory system during inspiration of air.

(3)

At the start of inspiration the flattens.

Then the external intercostal muscles,

causing the rib cage to

Paragraph 1

- (b) The normal respiratory rate for adults is between 12–20 breaths per minute.

The respiratory rates of two patients, taken at rest, are shown in Table 1.

	respiratory rate (breaths per minute)
patient A	12
patient B	46

Table 1

Patient A has normal lung function.

Patient B has been diagnosed with chronic obstructive pulmonary disease (COPD).

COPD causes decreased oxygen levels in the blood.

One symptom of COPD is a change in respiratory rate.

- (i) Explain the effect that COPD has on patient B's respiratory rate.

(2)

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- (ii) State **one** other symptom of COPD.

(1)

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(iii) People suffering with a type of COPD called emphysema may experience fibrosis.

Fibrosis is a thickening of the epithelial tissue in the lungs.

Which part of the lungs does fibrosis affect?

(1)

<input type="checkbox"/>	A alveoli
<input type="checkbox"/>	B bronchioles
<input type="checkbox"/>	C bronchus
<input type="checkbox"/>	D trachea

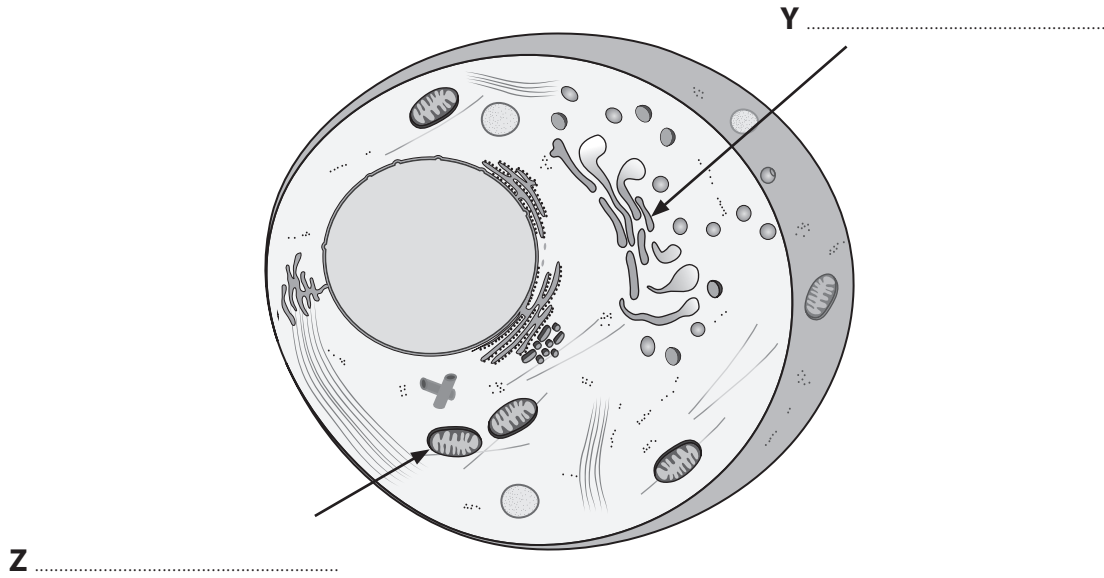
(Total for Question 2 = 7 marks)



3 (a) Figure 2 shows a cell from the human body.

Name structures **Y** and **Z** in Figure 2.

(2)



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Figure 2

(b) (i) Figure 3 shows the surface of the cell membrane containing a glycoprotein.

Glycoproteins are proteins with polysaccharide chains attached.

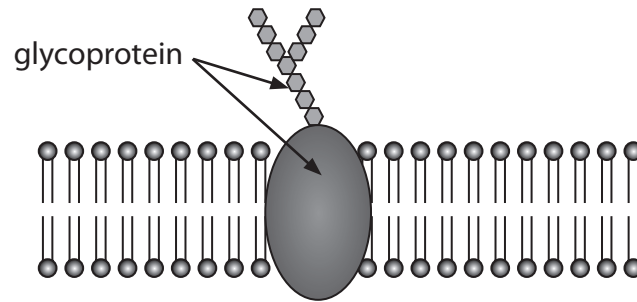


Figure 3

Explain the function of glycoproteins on the surface of the cell membrane.

(2)

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4 Stem cells are un specialised cells in the human body.

This means they have the potential to become more than one type of cell when they divide.

Some stem cells, for example blood stem cells, form only a few types of specialised cells.

- (a) (i) Identify where stem cells, which produce the cells found in blood, can be found in the body. (1)

<input type="checkbox"/>	A bone marrow
<input type="checkbox"/>	B heart
<input type="checkbox"/>	C kidneys
<input type="checkbox"/>	D lymph nodes

- (ii) Name the **two** types of specialised cell produced by blood stem cells. (2)

1

2

(b) Other stem cells can divide to form every type of cell.

- (i) Name the type of stem cell that can differentiate into every other cell type. (1)

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- (ii) Name the process used by stem cells to divide. (1)

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(c) Stem cell therapy can be used to treat disorders such as cerebral palsy (CP).

CP is a condition caused by damage to the brain during its development.

Figure 4 shows the result of a study investigating if stem cell therapy can help improve the symptoms of CP in 20 patients.

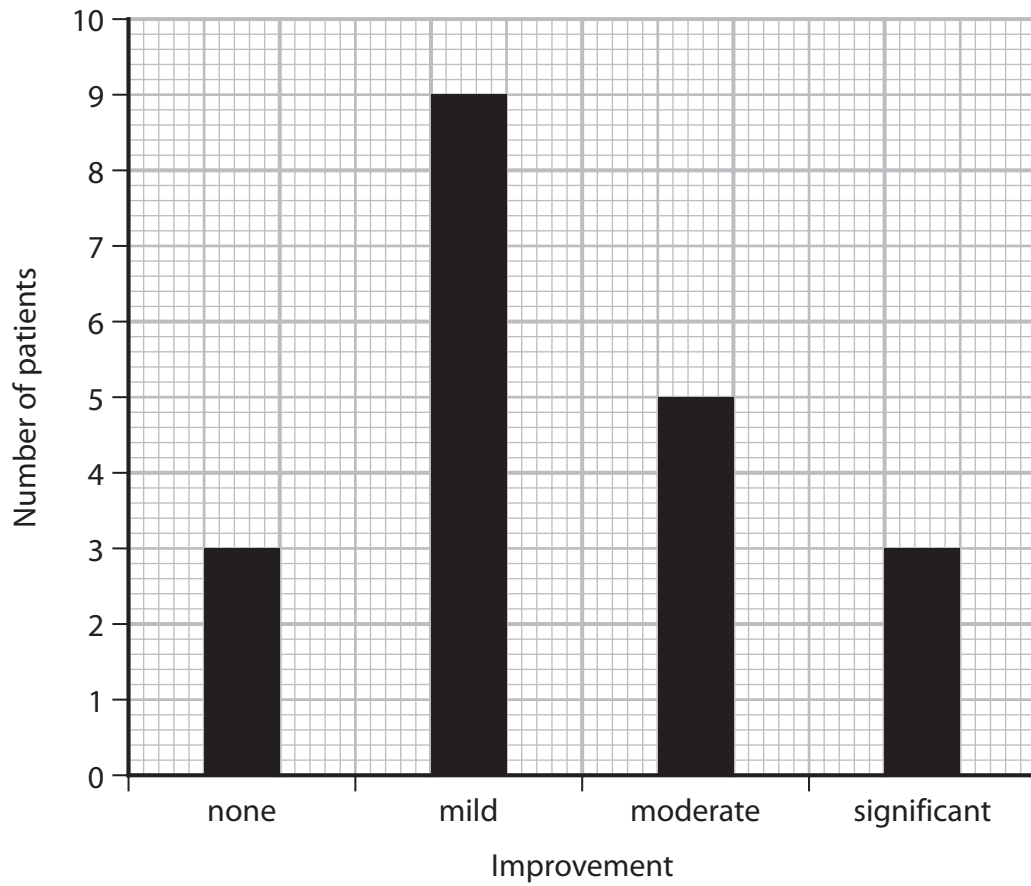


Figure 4

Describe the trends in improvement shown in Figure 4.

(3)

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(Total for Question 4 = 8 marks)



5 A person with organ failure can have an organ transplant.

- (a) (i) If the patient's immune system recognises the transplanted organ as "non-self" then the body may reject the organ.

Explain how the immune system can tell the difference between self and non-self cells.

(3)

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- (ii) Name a type of disorder that is caused by the body's immune system attacking the body's own cells.

(1)

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(iii) Figure 5 shows the percentage of patients rejecting a transplanted kidney.

The rejection rate can depend on whether the donor is related to the patient or not.

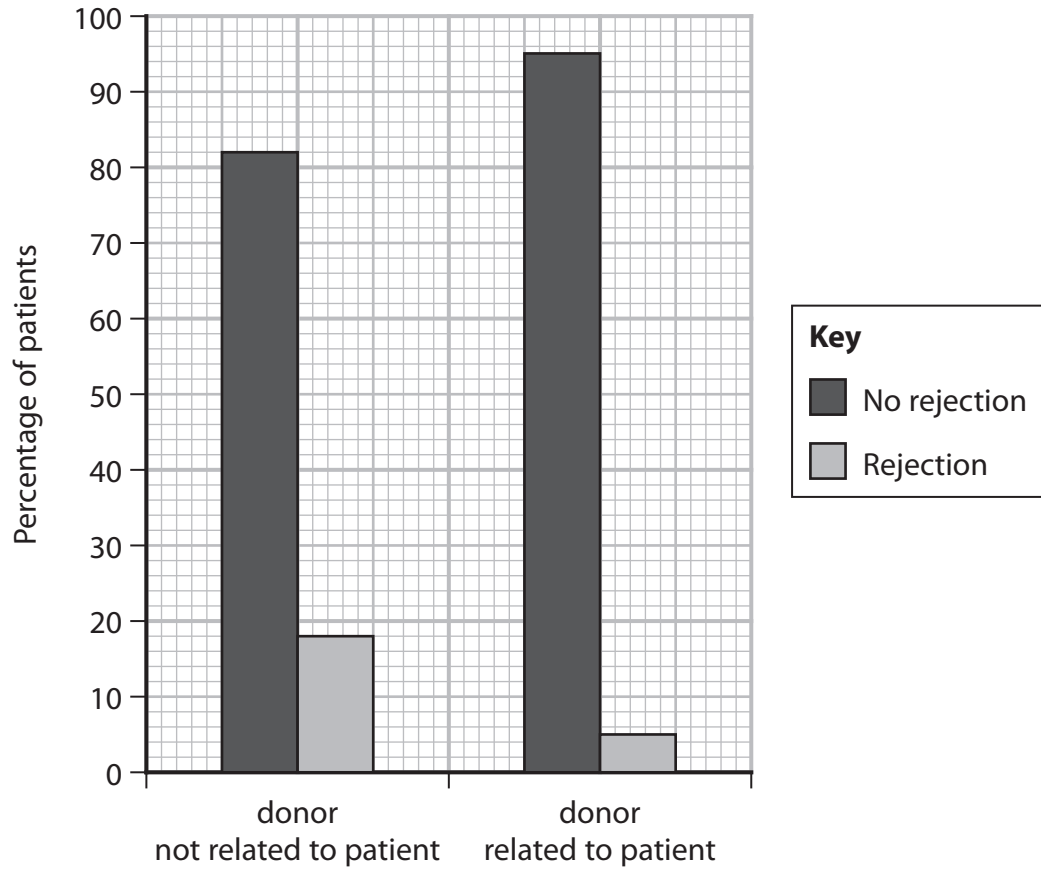


Figure 5

Explain the trend in rejection rate shown in Figure 5.

(3)

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(b) A patient with a transplanted organ will need to take immunosuppressant medication.

Explain why the patient has to take immunosuppressants and what other effects the medication could have on their health.

(4)

Reason to take immunosuppressants

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Effects on patient's health

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(Total for Question 5 = 11 marks)

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6 Inheritance patterns can give doctors important information about genetic disorders.

(a) (i) Some conditions only affect a person if the person inherits two identical alleles.

Which word describes this type of allele?

(1)

<input checked="" type="checkbox"/>	A diploid
<input checked="" type="checkbox"/>	B dominant
<input checked="" type="checkbox"/>	C haploid
<input checked="" type="checkbox"/>	D recessive

(ii) State the word used to describe a genotype with two different alleles of the same gene.

(1)

(b) Genetic pedigree diagrams can be used to record the inheritance of genetic disorders.

Genetic pedigree diagrams record the phenotypes of the individuals in a family.

Figure 6 shows a genetic diagram for the inheritance of sickle cell anaemia in a family.

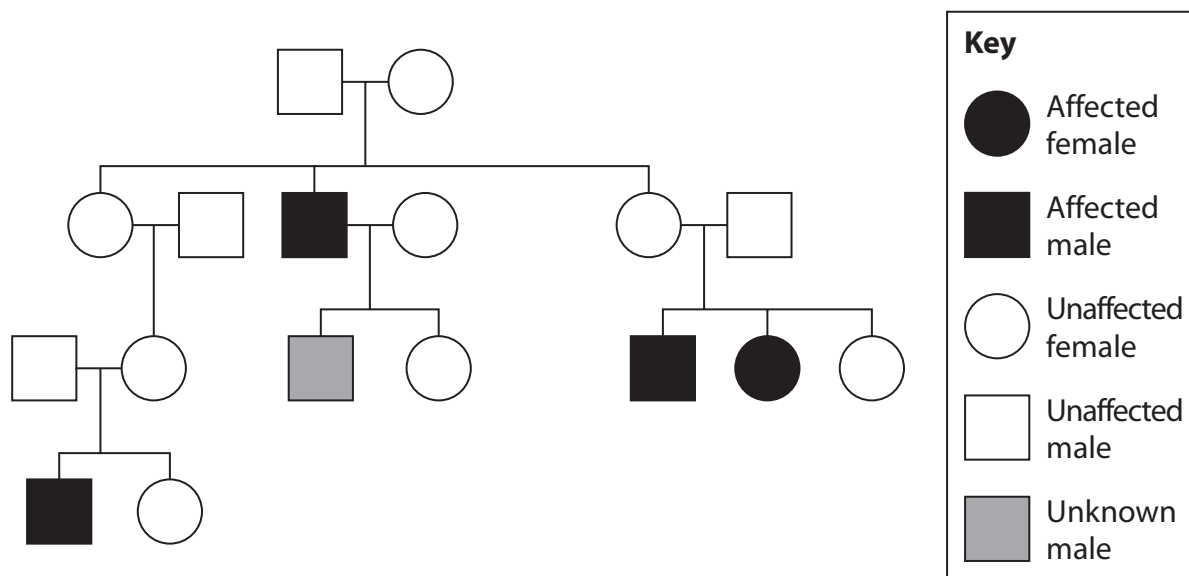


Figure 6



Evaluate the usefulness of Figure 6 when predicting whether sickle cell anaemia will affect the unknown male.

(9)

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(Total for Question 6 = 11 marks)



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7 (a) Cell injury can be reversible or irreversible.

One of the main causes of cell injury is a lack of oxygen, which is called hypoxia.

(i) Which of the following conditions would give a patient an increased risk of hypoxia?

(1)

<input type="checkbox"/>	A cystic fibrosis
<input type="checkbox"/>	B Down's syndrome
<input type="checkbox"/>	C Huntington's disease
<input type="checkbox"/>	D rheumatoid arthritis

(ii) Explain **two** causes of cell injury that affect the cell membrane.

(4)

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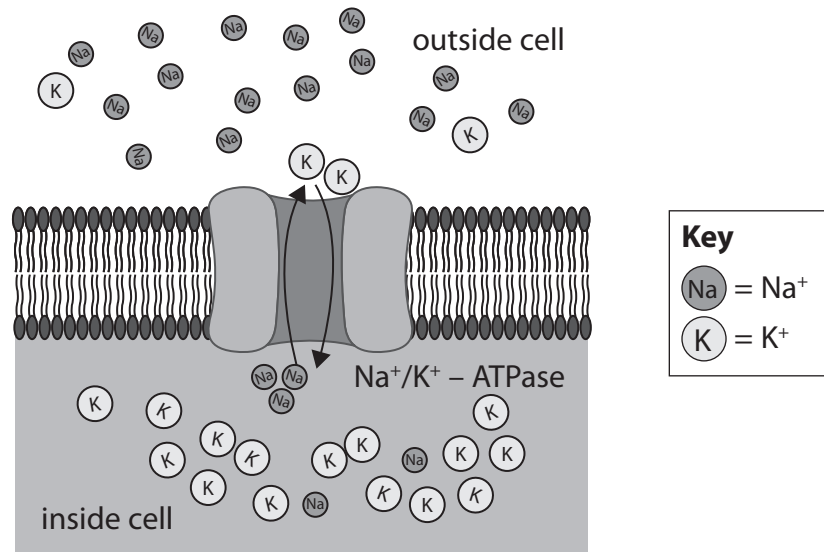
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(iii) Sodium-potassium pumps in the cell membrane help to maintain the osmotic potential of the cell.

Figure 7 shows a sodium-potassium pump functioning normally.



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Figure 7

Cellular swelling happens when the sodium-potassium pumps stop functioning normally.

Explain how the sodium-potassium pump is involved in cellular swelling.

(4)

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(b) One possible response to cellular injury is for a cell to go through a process called metaplasia.

Metaplasia can cause a tumour to form.

(i) State the meaning of the word **metaplasia**.

(1)

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(ii) Explain how damage to DNA in a cell can cause a tumour to form.

(3)

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8 Coronary heart disease (CHD) is one of the leading causes of death in the UK.

It is estimated that 1 in 5 male deaths are caused by CHD.

(a) Which blood vessel carries oxygenated blood to the heart muscle?

(1)

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

(b) (i) Describe how genetic screening can be used to identify if a person has an increased risk of developing CHD.

(3)

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(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS





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