

Please check the examination details below before entering your candidate information			
Candidate surname		Other names	
Centre Number		Candidate Number	
Pearson Edexcel International GCSE (9–1)			
Wednesday 15 January 2020			
Afternoon (Time: 1 hour 45 minutes)		Paper Reference 4HB1/02	
Human Biology Unit: 4HB1 Paper: 02			
You must have: Ruler Calculator			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 candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- 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 ☒.

Information

- The total mark for this paper is 90.
- 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.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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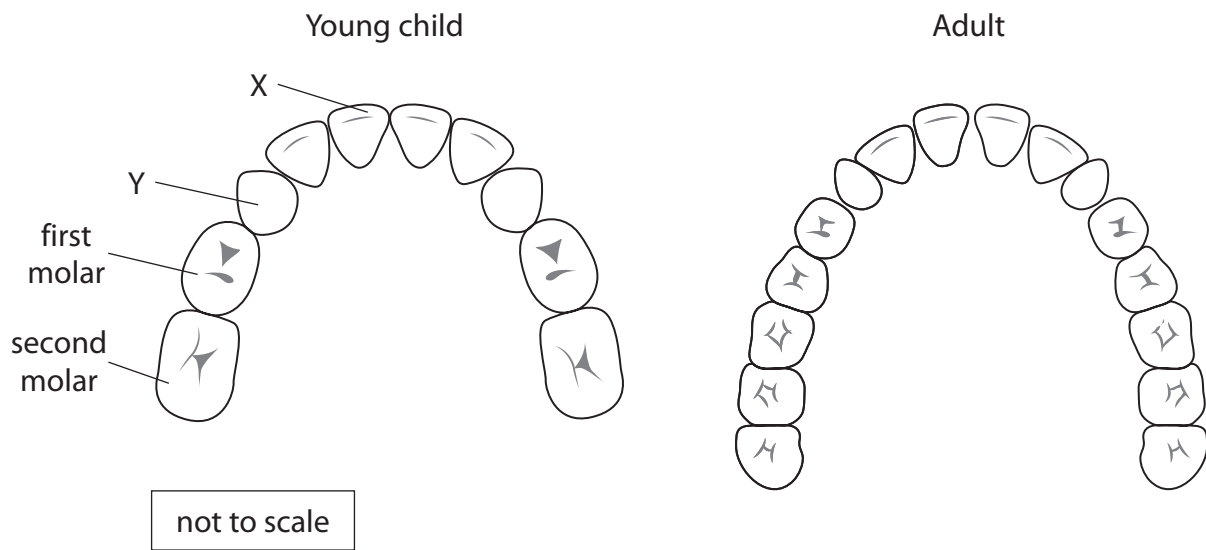
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Answer ALL questions.

- 1 The diagram shows the upper teeth of a young child and the upper teeth of an adult.



- (a) (i) Name tooth X and tooth Y.

(2)

tooth X

tooth Y

- (ii) State the function of the molar teeth.

(1)

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- (iii) State two differences between the teeth of a young child and the teeth of an adult.

(2)

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2

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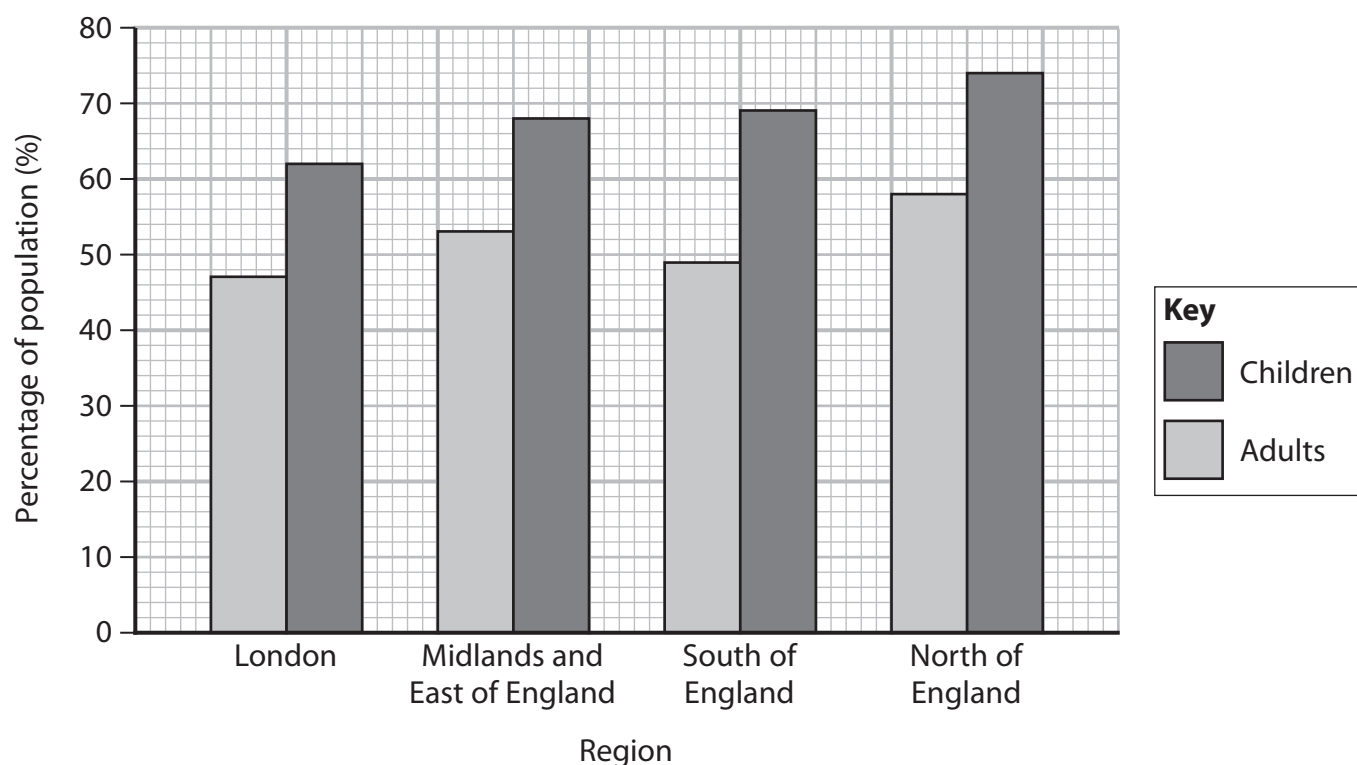
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- (b) The graph shows the percentage of adults and children in different regions of England who visited a dentist in a two-year period.



Data source/s: Health and Social Care Information Centre NHS Dental Activity Statistics:
December 2013 and GP Patient Survey Dental Results 2013/14

- (i) Explain which region is likely to have more adults and children with tooth decay.

(2)

- (ii) Give two reasons why molars are more likely to be damaged by tooth decay than other teeth.

(2)

1

2

(Total for Question 1 = 9 marks)



2 A student records her pulse rate in beats per minute (bpm) after different activities.

These are the student's results.

- at rest 78 bpm
- walking 95 bpm
- jogging 138 bpm
- running 146 bpm

(a) Draw a table to show the student's results.

(3)

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(b) Describe a method that the student could use to obtain these results.

(4)

(c) State one factor that the student should control during the investigation.

(1)

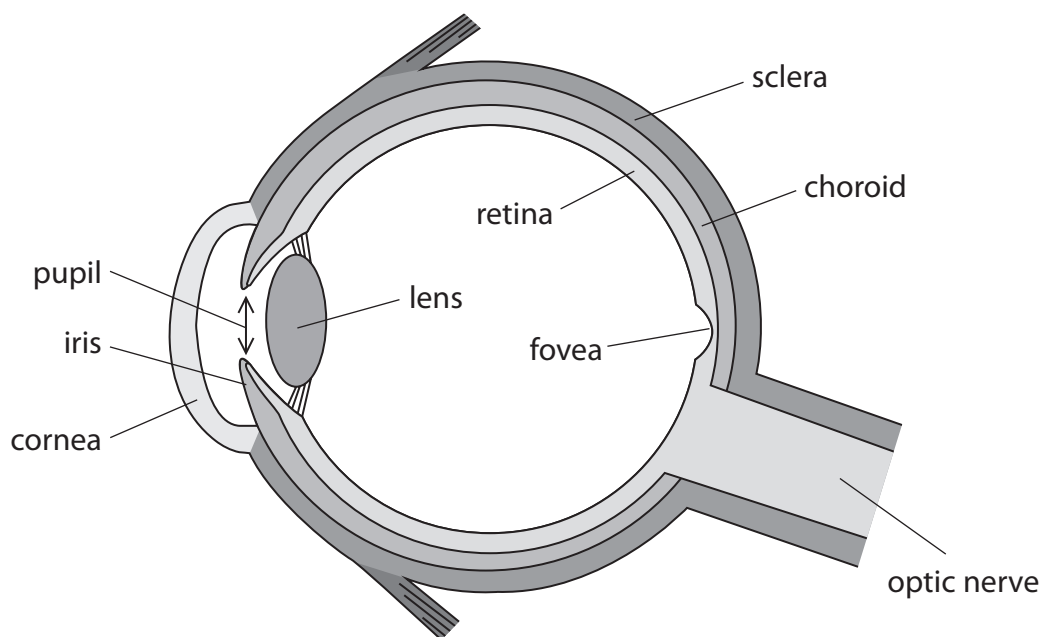
(d) Name a body process, other than pulse rate, that increases during exercise.

(1)

(Total for Question 2 = 9 marks)



- 3 (a) The diagram shows the human eye, with some structures labelled.



- (i) Which structure helps to focus light at the back of the eye?

(1)

- ☐ A fovea
☐ B iris
☐ C lens
☐ D pupil

- (ii) The box lists structures of the eye.

(3)

sclera	retina	choroid	iris	pupil
--------	--------	---------	------	-------

Use words from the box to complete the passage about the eye.

The contains receptor cells that are sensitive to light.

In bright light the gets smaller to control the amount of light entering the eye.

The contains blood vessels that deliver oxygen to receptor cells.

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(b) The photomicrograph gives the thickness of the two outer layers of the eye.



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Estimate the thickness of the retina.

(1)

thickness of the retina = μm

(c) The optic nerve contains sensory neurones.

(i) Describe the function of the sensory neurones in the optic nerve.

(2)

.....

.....

.....

.....

(ii) Glaucoma is a disease that damages the optic nerve.

Explain why damage to the optic nerve will affect vision.

(2)

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.....

(Total for Question 3 = 9 marks)



- 4 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

- 1 Pinworms are small parasites that live in the small intestine and colon of humans. They emerge at night and lay their eggs in the anal region. In addition to laying over 10 000 eggs at one time, pinworms also secrete a substance that causes a very strong itching sensation around the anus. Although this is particularly uncomfortable for the host, itching plays an important role in the spread of infection.

Pinworm infections are highly contagious and occur most commonly in children under the age of five years. Infections occur when eggs are ingested or inhaled. These eggs have been deposited onto a surface or object by an infected person. The eggs, which are very tiny, can survive on these surfaces for several weeks.

- 10 One method of detecting a pinworm infection is to carry out a tape test. This test consists of sticking a piece of transparent tape to the anus in the morning. If an infection is detected then medication can be taken to treat it. In addition to taking medication, it is important that the infected person and other people in the house follow strict procedures to eliminate pinworm eggs and to prevent the spread of the infection.
- 15 In rare cases where infections are not treated, large populations of pinworms can grow in the intestines. This can lead to nutritional deficiencies in the infected person, which cause further symptoms that have a more serious effect on health.

(a) A pinworm infection causes itching.

- (i) Give one other symptom of a pinworm infection.

(1)

- (ii) Explain why itching plays an important role in the spread of a pinworm infection (lines 4 to 5).

(2)

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- (b) Suggest how the small intestine provides perfect conditions for the growth of pinworm populations.

(2)

- (c) Pinworms can cause nutritional deficiencies (line 16).

- (i) State what is meant by the term **nutritional deficiency**.

(1)

- (ii) State one nutritional deficiency that could be caused by a pinworm infection.

(1)

- (iii) Suggest why a large population of pinworms in a person's intestines can lead to nutritional deficiency.

(2)

- (d) Suggest how the transparent tape test can be used to detect a pinworm infection (lines 10 to 11).

(1)



- (e) Suggest how an infected person and other people in the house can help prevent the spread of a pinworm infection (lines 13 to 14).

(2)

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(Total for Question 4 = 12 marks)



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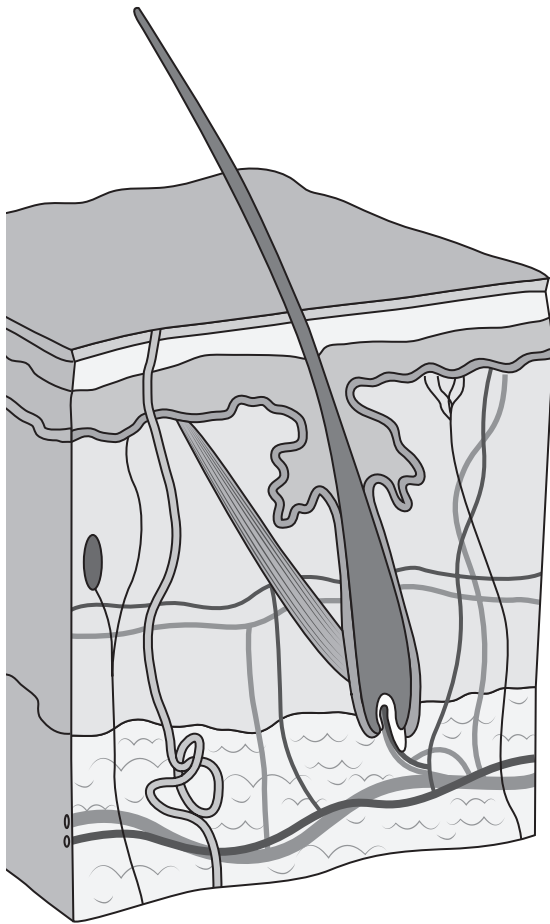
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- 5 Burns can be first degree, second degree or third degree depending on how many layers of the skin are damaged.

The diagram shows the structure of the skin and the layers damaged by each type of burn.



layer 1	first degree burn
layers 1 and 2	second degree burn
layers 1, 2 and 3	third degree burn

- (a) Name the three layers of skin that are damaged by a third degree burn.

(3)

layer 1.....

layer 2.....

layer 3.....

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(b) Which two skin structures are damaged by a second degree burn?

(1)

- ☐ **A** blood vessels and sebaceous glands
- ☐ **B** fat tissue and blood vessels
- ☐ **C** hair follicles and sweat glands
- ☐ **D** sebaceous glands and fat tissue

(c) Explain why a person with a second or third degree burn has a high risk of infection.

(2)

(d) Blood clotting helps to prevent infection.

Describe the process of blood clotting.

(4)

(Total for Question 5 = 10 marks)



- 6 *Staphylococcus aureus* (*S. aureus*) and MRSA are microorganisms that cause a wide range of infections in humans.

The table shows the number of deaths from *S. aureus* and from MRSA in England in one year.

The data is for males and females of different age groups.

Age group in years	Number of deaths in one year per million people			
	Males		Females	
	<i>S. aureus</i>	MRSA	<i>S. aureus</i>	MRSA
under 45	1.8	0.5	1.4	0.4
45–54	6.0	2.5	4.3	2.4
55–64	15.7	8.2	8.1	4.2
65–74	41.2	26.1	21.9	12.5
75–84	128.6	86.8	81.1	51.6
85 and over	416.6	299.9	200.3	146.4

Source: Office for National Statistics

- (a) (i) The data shows that there are more deaths caused by *S. aureus* than by MRSA.

Give two other conclusions that can be made from the data.

(2)

1

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2

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- (ii) Calculate the ratio of males aged 85 and over who die from *S. aureus* infection to males under the age of 45 who die from *S. aureus* infection.

(2)

ratio =

- (iii) The total population in England is 53 million.

Calculate the number of people aged between 65 and 74 who died from *S. aureus*.

(2)

number =

- (iv) The number of deaths caused by MRSA is lower than the number of deaths caused by *S. aureus*.

Explain why an infection caused by MRSA is still a major concern.

(2)

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.....

.....

.....



- (b) (i) An infection caused by *S. aureus* is usually harmless and can be treated using antibiotics.
State one source of an antibiotic.

(1)

- (ii) Describe an aseptic method that a scientist could use to find out whether an infection is caused by *S. aureus* or by MRSA.

(6)

(Total for Question 6 = 15 marks)



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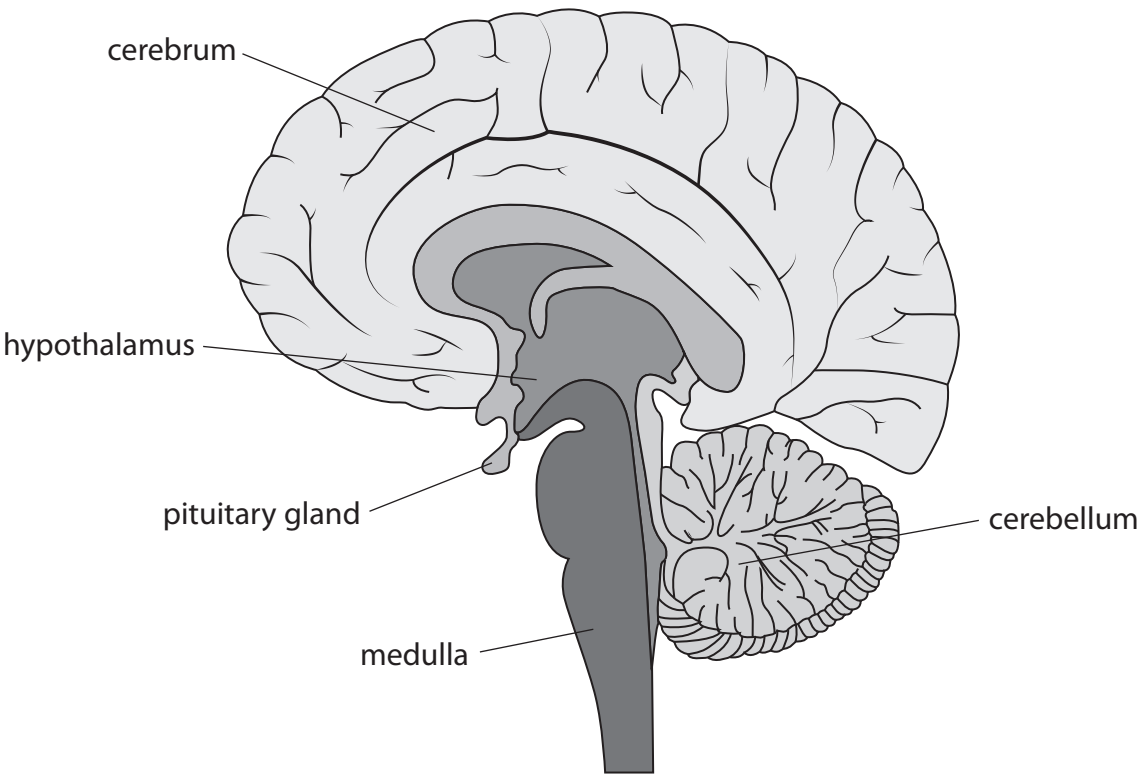
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7 The diagram shows parts of the human brain.



(a) (i) The table lists parts of the brain and some functions of the brain.

Complete the table by putting a tick (✓) to show if the function is correct for each part.

(3)

Part	Function	Tick
medulla	controls heart rate and breathing	
pituitary gland	involved in language	
hypothalamus	responsible for osmoregulation	
cerebellum	controls voluntary movements	

(ii) The cerebrum is divided into the left and right cerebral hemispheres.

Each hemisphere contains different areas. One of these is the motor area.

State the function of the motor area.

(1)

(b) Nerve cells deep inside the brain produce the neurotransmitter dopamine.

Parkinson's disease is a brain disorder that destroys these nerve cells.

Explain why the destruction of these nerve cells causes the symptoms associated with Parkinson's disease.

(3)

(Total for Question 7 = 7 marks)



8 Describe how monoclonal antibodies are produced.

(5)

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(Total for Question 8 = 5 marks)



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- 9 (a) Phenylketonuria (PKU) is a serious genetic disorder.

People with PKU are unable to break down the amino acid, phenylalanine.

Phenylalanine builds up in the blood and in the brain causing brain damage.

- (i) Describe how levels of phenylalanine are reduced in the body of a healthy person. (3)

- (ii) Explain why people with PKU are advised to follow a low-protein diet. (3)

- (iii) Explain the impact of a low-protein diet on protein synthesis in the cytoplasm of body cells. (3)

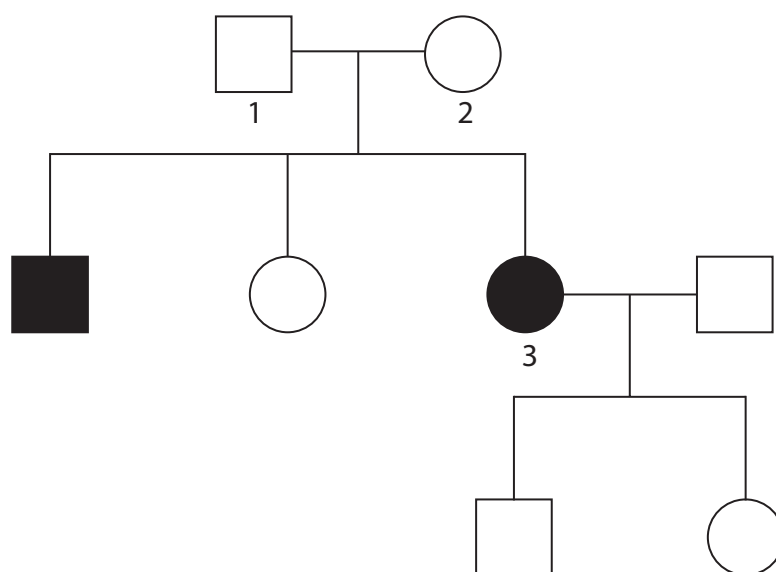


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(b) The diagram shows how PKU is inherited in a family.



Key



male with PKU



female with PKU



male without PKU



female without PKU

- (i) The allele for PKU can be represented by n . The normal allele can be represented by N .

Give the genotype of person 1.

(1)

- (ii) Determine the probability that person 2 has one allele for PKU.

(1)

(iii) Deduce the genotype of person 3.

You may draw a diagram to support your answer.

(3)

(Total for Question 9 = 14 marks)

TOTAL FOR PAPER = 90 MARKS



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