Pearson Edexcel International GCSE (9–1)

Time 1 hour 45 minutes

Paper reference **4HB1/02**

Human Biology
UNIT: 4HB1
PAPER: 02

You must have:
Calculator, 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 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.

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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

Answer ALL questions.

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 The diagram shows a simple version of the human circulatory system.
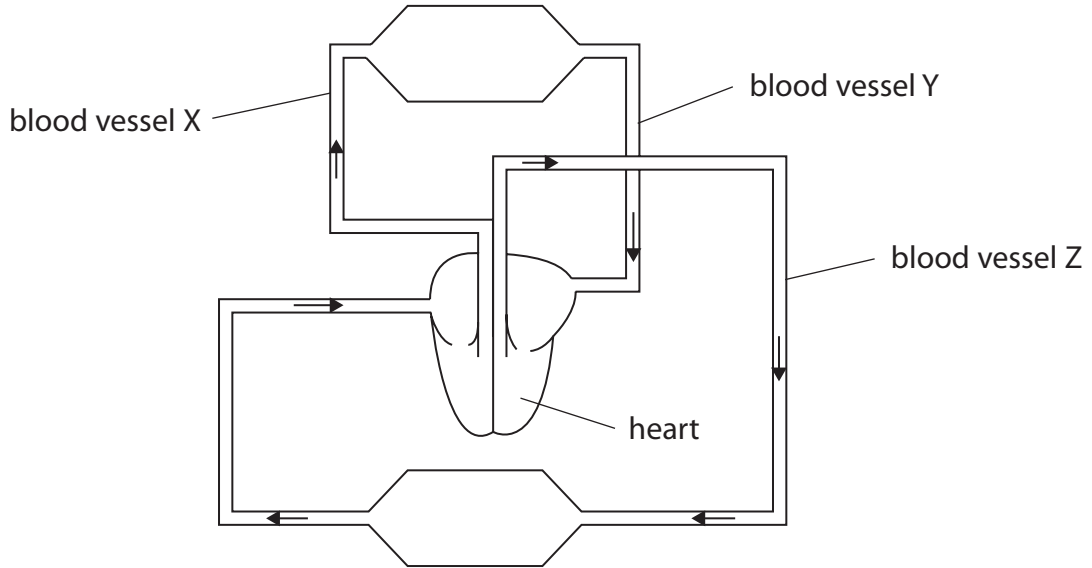
blood vessel X

blood vessel Y

blood vessel Z

heart

(a) Name blood vessel X.

(1)

....

(b) The box gives words about the circulatory system.

body	oxygenated	lungs	ventricle
deoxygenated	atrium		

Complete the sentences using words from the box.

(5)

Blood vessel Y transports .... blood from the

.... to the left .... of the heart.

Blood vessel Z transports blood from the left .... of the heart

to the ....

(c) The diagram shows the structure of blood vessel X and blood vessel Y.
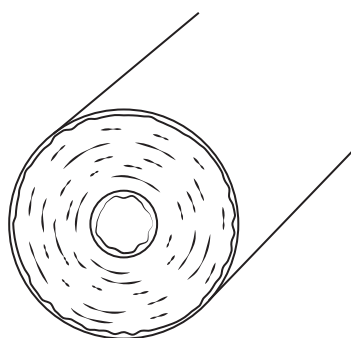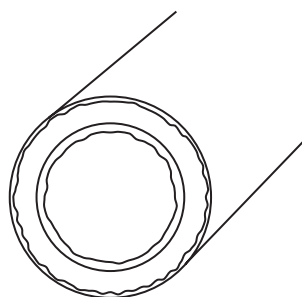
blood vessel X   blood vessel Y

Compare the structure of blood vessel X with the structure of blood vessel Y.

(3)

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(Total for Question 1 = 9 marks)

2 The graph shows the number of working-age people at risk of developing a mental illness.

Number of people at risk in millions
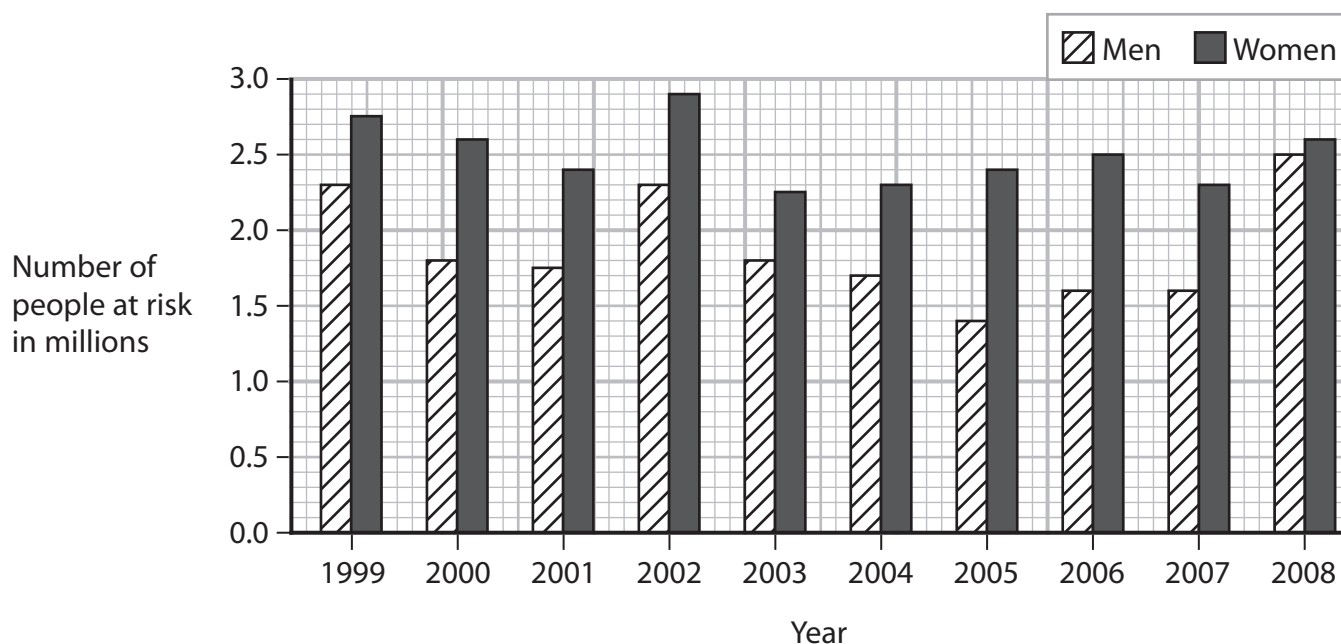
(a) (i) Determine the year when the greatest number of women were at risk of developing a mental illness.

(1)

....

(ii) Determine the year when there was the greatest difference between the number of males and the number of females at risk of developing a mental illness.

(1)

....

(iii) Determine the ratio of females at risk of developing a mental illness in 1999 compared with 2008.

Give your answer in the form n : 1

(2)

ratio = ...

(iv) Suggest one possible reason why the number of females at risk of developing a mental illness increased from 2007 to 2008.

(1)

....

....

(b) The boxes list two mental illnesses and some symptoms.

Draw one straight line from each mental illness to a symptom of the illness.

(2)

Mental illness   **Symptom**

hallucinations

depression   tremors (shakes)

schizophrenia   lack of energy

memory loss

(c) Which combination of drugs is most likely to affect mental health?

(1)

☒ **A** alcohol and heroin

☒ **B** antibiotics and alcohol

☒ **C** cannabis and paracetamol

☒ **D** paracetamol and antibiotics

(d) People who use the drug cocaine often have a raised body temperature.

Name two body structures that help to control body temperature.

(2)

1 ....

2 ....

(Total for Question 2 = 10 marks)

3 (a) The nervous system is adapted to transfer information rapidly from one part of the body to another.

Complete the passage about the nervous system by giving the correct words.

(4)

A change in the external environment is detected by .... in

sense organs. These structures convert stimuli into electrical impulses which then

travel along .... neurones to the central nervous system.

The central nervous system coordinates the incoming information using

.... neurones. These neurones then transfer the electrical

impulses to .... neurones.

(b) The diagram shows the junction between two neurones.

direction of impulse
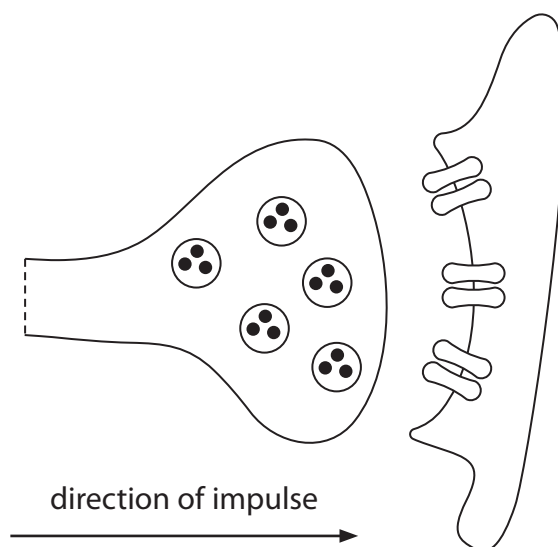
(i) State the name of the junction between two neurones.

(1)

....

(ii) Describe how an impulse reaching the end of one neurone produces an impulse in the next neurone.

(2)

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....

....

(c) A nerve impulse travels at a speed of 120 metres per second.

Calculate the distance that this nerve impulse will travel in 5.0 minutes.

(2)

distance = ... m

(Total for Question 3 = 9 marks)

4 A student tests foods W, X and Y for the presence of different nutrients.

The student tests each of the foods using three different solutions, A, B and C.

The table shows the student's results.

Food	Solution used in test		
	A	**B**	**C**
W	no change	no change	blue-black
X	lilac	no change	no change
Y	no change	brick-red	no change

(a) Name solution C.

(1)

....

(b) Name the nutrient present in food X.

(1)

....

(c) Describe a safe method the student could use to test a food using solution B.

(4)

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(Total for Question 4 = 6 marks)

5 The diagram shows a section through the human ear.
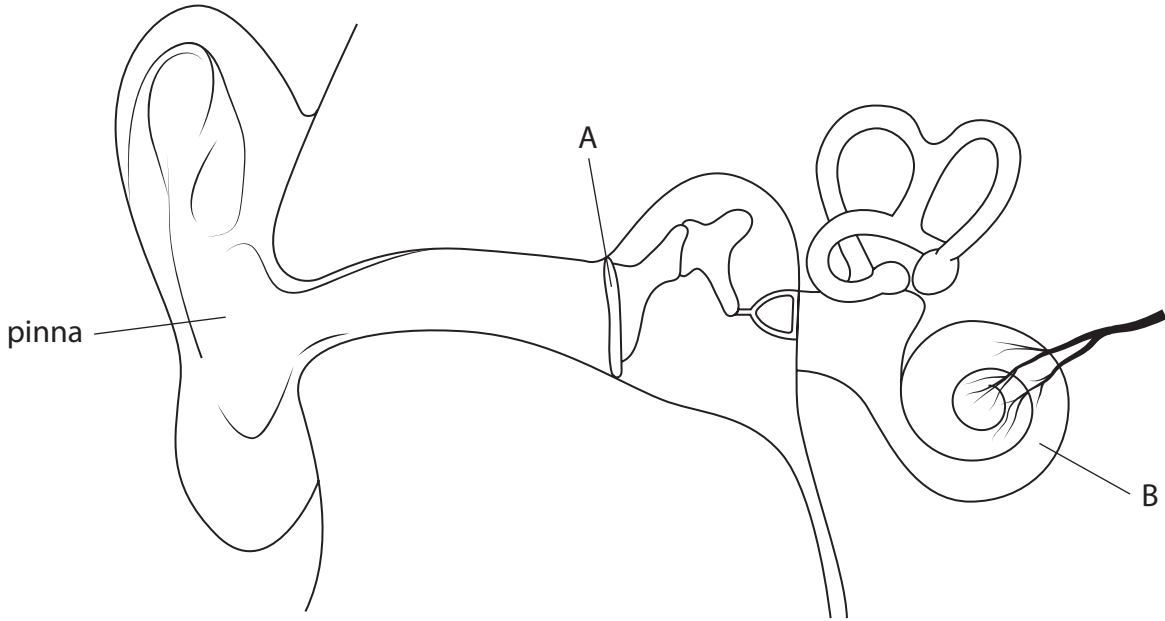
(a) (i) Name parts A and B.

(2)

A ....

B ....

(ii) Describe the function of the pinna.

(2)

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(b) The range of frequencies audible to the human ear can vary with age.

The table shows the maximum frequency detected by people of different ages.

Age in years	Maximum frequency detected in kHz
20	20
30	18
40	16
50	14

(i) Draw a bar chart to show how the maximum frequency detected varies with age.

(4)
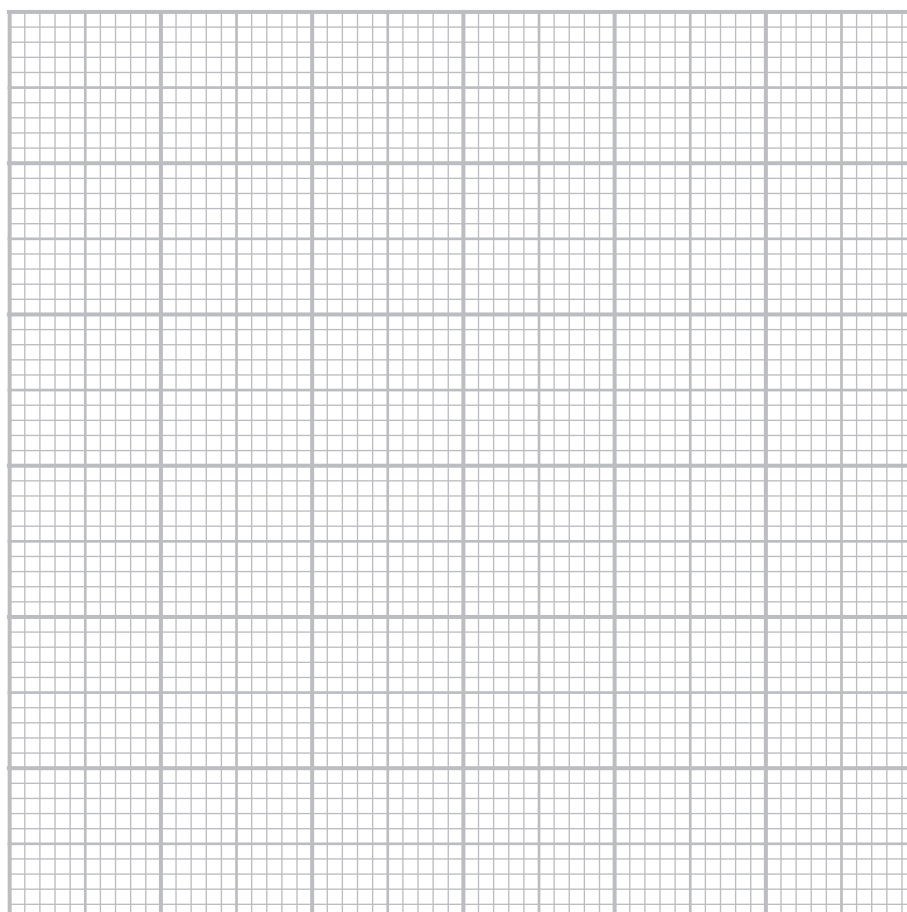
(ii) Calculate the percentage change in the maximum frequency detected by people aged 20 and people aged 50.

(3)

percentage change = ... %

(c) A student suggests this method that could be used to produce the data shown in the table.

• select a person of each age to be tested

• use a signal generator to produce sounds at different frequencies

• record the maximum frequency detected by each person

(i) Give two reasons why this is unlikely to produce valid results.

(2)

1 ....

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2 ....

....

(ii) Describe how the reliability of the results could be improved.

(2)

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(Total for Question 5 = 15 marks)

6 A student uses this method to investigate the effect of different antibacterial cleaners on the growth of bacteria.

- add bacterial culture to sterile agar in a Petri dish using an inoculating loop

- using a pipette, place two drops of an antibacterial cleaner onto a filter paper disc

- repeat using two other filter paper discs, each one soaked with a different antibacterial cleaner

- soak one filter paper disc in distilled water

- place the four filter paper discs onto the sterile agar

- place a lid on the Petri dish

- place the dish into an incubator at 25 °C for 5 days

(a) State the independent variable in this investigation.

(1)

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(b) Give two improvements to this method that will reduce the risk of introducing unwanted microorganisms into the Petri dish.

(2)

1 ....

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2 ....

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(c) Explain why it is important that the Petri dish is incubated at a temperature no higher than 25 °C.

(2)

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(d) Give a reason why the filter paper disc soaked in distilled water is included in the investigation.

(1)

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(Total for Question 6 = 6 marks)

P 7 0 9 7 4 A 0 1 3 2 0

7 Read the passage below.

Use the information in the passage and your own knowledge to answer the questions that follow.

Our body is under constant attack from free radicals. Free radicals are molecules produced during chemical reactions that take place in body cells. Free radicals can change the structure and function of cells and damage genetic material. Some scientific evidence also suggests that free radicals can affect the flow of
5 substances that enter and leave a cell.

Vitamin C is water-soluble and an important component of the daily diet. The recommended intake of vitamin C is 90 mg per day. Vitamin C helps to strengthen the immune system and improves the absorption of iron into the body. Vitamin C is also known as an antioxidant. Antioxidants protect cells from damage by free
10 radicals and other substances by changing the way that free radicals behave.

Water and high temperatures can reduce the vitamin C content of food. For example, 40 g of fresh broccoli provides 80% of the recommended daily intake of vitamin C. The same mass of boiled broccoli provides 60% of the recommended daily intake of vitamin C. Boiling is the biggest cause of vitamin C loss, although
15 baking and frying also lower vitamin C content.

(a) (i) Free radicals can damage genetic material in cells.

Describe one effect that this could have on body cells. (lines 2 and 3)

(2)

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(ii) Suggest how antioxidants, such as vitamin C, allow cells to function normally. (lines 5 and 6 and lines 8 to 10)

(2)

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(iii) Calculate the mass, in grams, of boiled broccoli that should be eaten to provide the recommended daily intake of vitamin C. (lines 12 to 14)

(3)

mass = ... g

(b) DCPIP is a chemical used to determine the amount of vitamin C in food.

Describe a method, using DCPIP, to compare the amount of vitamin C in fresh orange juice with that in boiled orange juice.

(5)

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(Total for Question 7 = 12 marks)

8 (a) Duchenne muscular dystrophy (DMD) is a sex-linked genetic disorder caused by a gene mutation.

The symptoms of DMD are caused by the absence of a protein called dystrophin.

Explain how a gene mutation can result in the absence of dystrophin.

(4)

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(b) The diagram shows the inheritance of Duchenne muscular dystrophy in one family.

parents

generation 1

generation 2

🔵 female with DMD

◐ female carrier

○ female without DMD

⬛ male with DMD

⬜ male without DMD

P 7 0 9 7 4 A 0 1 6 2 0
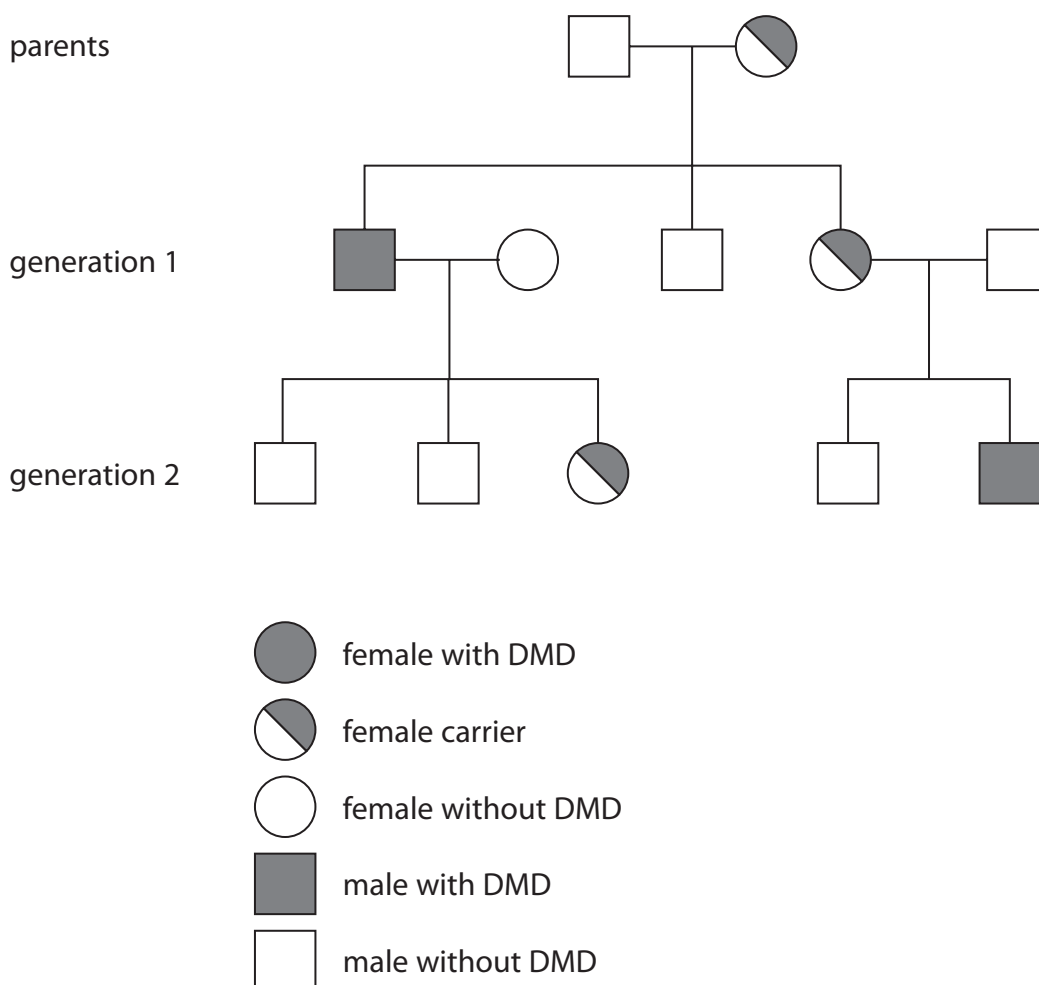
(i) Explain what is meant by a carrier of DMD.

(2)

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(ii) Explain how the diagram shows that DMD is caused by a recessive allele.

(3)

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(iii) Draw a genetic diagram to show the inheritance of DMD from the parents
to generation 1.

Use X^D for the dominant allele and X^d for the recessive allele.

(2)

(Total for Question 8 = 11 marks)

9 (a) Hepatitis is a disease of the liver.

This disease can be caused by drinking too much alcohol.

Explain the damaging effects of alcohol on the liver.

(3)

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(b) Hepatitis B is one type of virus that can cause hepatitis.

Describe the reproduction of a hepatitis B virus.

(6)

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(c) Vaccinations can be used to prevent the spread of hepatitis.

Explain how vaccines can help people become immune to hepatitis.

(3)

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(Total for Question 9 = 12 marks)

TOTAL FOR PAPER = 90 MARKS