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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)

Monday 10 June 2024

Afternoon (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 ▶

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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 (a) The table shows some diseases.

Complete the table by writing in the type of pathogen that causes each disease.

(3)

Disease	Type of pathogen
cholera	
AIDS	
athlete's foot	

(b) The passage is about gonorrhoea.

Complete the passage using terms from the box.

(4)

hormonal	antibiotics	contaminated water	virus
sexual intercourse	painkillers	bacterium	barrier

The pathogen that causes gonorrhoea is a ..... .

The pathogen passes from one person to another by ..... .

Gonorrhoea can be prevented by using a ..... method of contraception.

A person with gonorrhoea can be prescribed ..... to kill the pathogen causing the disease.

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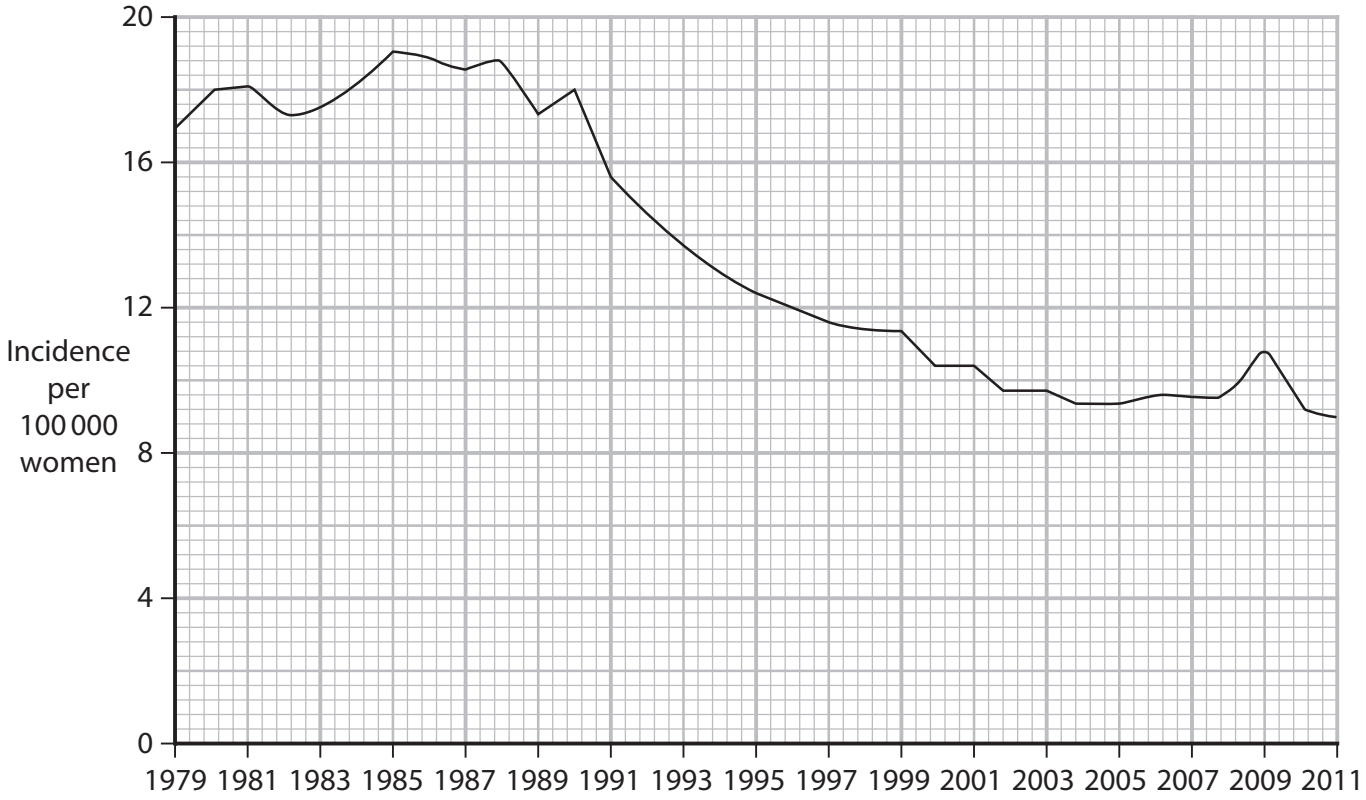
(c) Cervical cancer is a disease that can be caused by a virus.

The graph shows the incidence of cervical cancer per 100 000 women in the United Kingdom between 1979 and 2011.



(Source: https://www.chattopadhyay.co.uk/cervical-cancer/)

(i) Describe the trends shown by the graph from 1979 to 2011.

(2)

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(ii) Calculate the difference in the incidence per 100 000 of women with cervical cancer between 1979 and 2011.

(2)

difference = ... per 100 000

(d) Cervical cancer that is caused by a virus can now be prevented by vaccination.

The table gives information about vaccination.

Which row gives correct information about vaccination?

(1)

	Contents of vaccination	Response by the body	How the pathogen is destroyed
☒ A	antibodies	antigens produced	antigens destroy pathogen
☐ B	antibodies	white blood cells produced	white blood cells destroy pathogen
☐ C	antigens	antibodies produced	antibodies destroy pathogen
☐ D	antigens	platelets produced	platelets destroy pathogen

(Total for Question 1 = 12 marks)

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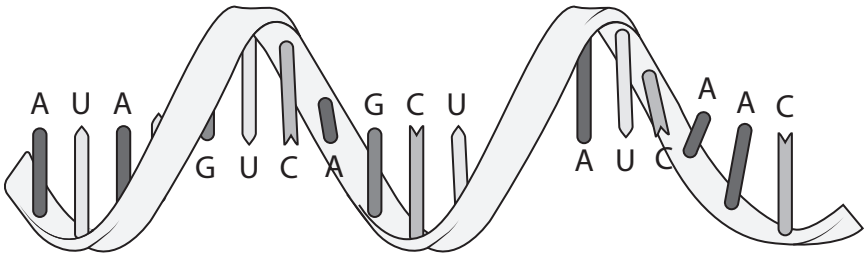
2 (a) The diagram shows a strand of RNA found in a body cell.



(Source: https://upload.wikimedia.org/wikipedia/commons/3/37/Difference_DNA_RNA-EN.svg)

(i) State two places where RNA is found in a cell.

(2)

1 .....

2 .....

(ii) State two differences between RNA and DNA.

(2)

1 .....

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2 .....

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(iii) RNA and DNA are both made of repeating subunits joined in a chain.

Give the name of these repeating subunits.

(1)

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(b) Before a cell divides by mitosis, the DNA inside the cell is replicated.

When DNA is replicated, mutations can happen.

Explain how mutations can affect the final product made.

(3)

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(Total for Question 2 = 8 marks)

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3 Read the passage below.

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

People make lifestyle choices that can sometimes have a negative effect on their health. People who drink too much alcohol are at risk of brain and liver damage, certain types of cancer and mental illness. Liver damage can affect the digestion of fat. Alcohol can also affect the eyes, increasing the risk of developing cataracts that cause the lenses in the eyes to become cloudy. Alcohol is also a depressant. It increases the activity of a chemical in parts of the brain that control balance, speech, motor skills and memory. In addition, alcohol suppresses an area of the brain called the amygdala. The amygdala is responsible for the fight or flight function which prepares the body for action, initiating the release of stress hormones. These hormones increase glucose usage by the brain and other parts of the body.

When a person stops drinking alcohol after years of drinking a lot of alcohol, the amygdala in the brain becomes fully active again, which is the cause of all forms of alcohol withdrawal. Over time, if a person regularly drinks heavily, the central nervous system gets used to the suppressing effect of the alcohol, which means the brain and body are affected if the alcohol level suddenly drops. An individual can go straight into fight or flight mode as the alcohol leaves the system and levels of stress hormones begin to return to normal. Symptoms of withdrawal can be as severe as seizures and hallucinations or less severe symptoms such as loss of appetite and insomnia (an inability to sleep).

(a) Drinking alcohol and diet are two lifestyle choices.

Describe how a lifestyle choice, other than drinking alcohol and diet, can have a harmful effect on health (Lines 1 and 2).

(2)

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(b) Explain how drinking alcohol affects the digestion of fat (Lines 3 to 4).

(2)

(c) State how cataracts affect vision (Lines 4 to 5).

(1)

(d) Name a part of the brain, other than the amygdala, that is affected by alcohol (Lines 5 to 7).

(1)

(e) Explain how alcohol acts as a depressant on the nervous system (Line 5).

(3)

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(f) After a person stops drinking alcohol, the amygdala becomes fully active again.

The release of stress hormones, such as adrenaline, returns to normal.

Give two effects of adrenaline on the body.

(2)

1 .....

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2 .....

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(Total for Question 3 = 11 marks)

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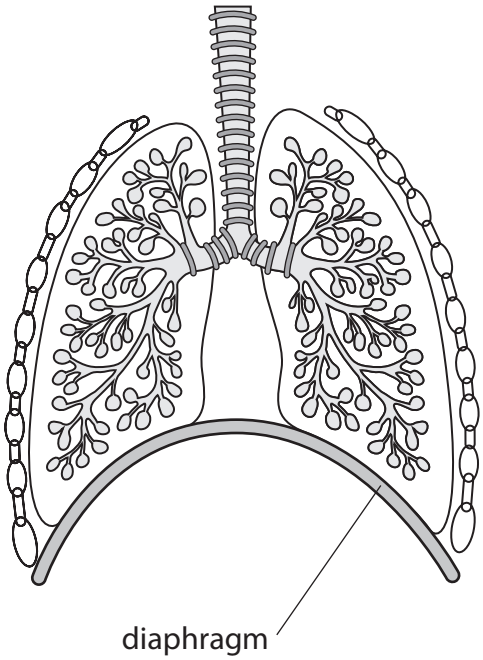
4 (a) The diagram shows the human lungs.



(i) Add the following labels on the diagram

(3)

- trachea
- bronchus
- alveoli

(ii) Give four features of the lungs that adapt them for gas exchange.

(4)

1 .....

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2 .....

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3 .....

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4 .....

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(b) A spirometer can be used to test lung function.

(i) Describe how a spirometer is used to obtain values for tidal volume.

(4)

(ii) Asthma is a condition that causes the tubes in the lungs to narrow.

A person without asthma has a vital capacity of 4600 cm^3.

People with severe asthma have a 30% lower vital capacity compared with a healthy person.

Calculate the vital capacity of a person with severe asthma.

(2)

vital capacity of a person with severe asthma = ... cm^3

(Total for Question 4 = 13 marks)

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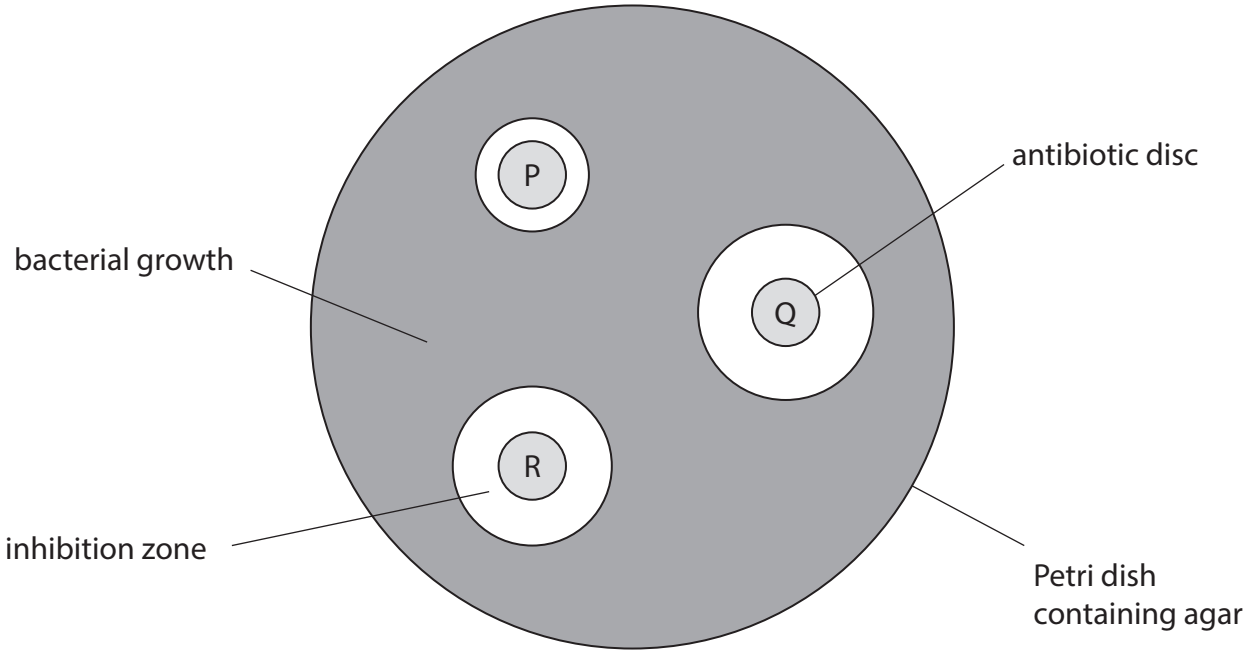
5 (a) A student investigates the action of three different antibiotics, P, Q and R, on the growth of bacteria.

The diagram shows the results of the investigation.



(i) Which is the independent variable in this investigation?

(1)

- ☒ A the mass of bacteria added
- ☒ **B** the size of the inhibition zone
- ☒ **C** the type of antibiotic added
- ☒ **D** the mass of agar in the Petri dish

(ii) Give two procedures that the student should use to reduce the risk of contamination by unwanted bacteria.

(2)

1 .....

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2 .....

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(iii) Explain which is the most effective antibiotic.

(2)

(iv) The student concludes the bacteria are resistant to antibiotic P.

Explain how antibiotic resistance occurs in bacteria.

(4)

(b) Decomposers are microorganisms such as bacteria and fungi that do not cause disease.

Describe the role of these microorganisms in the environment.

(2)

(Total for Question 5 = 11 marks)

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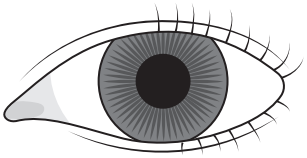
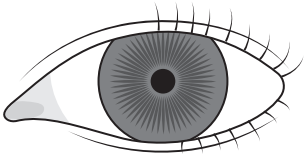
6 The diagram shows how the size of the pupil changes in different light intensities.



Dim light



Bright light

(a) Describe a method that could be used to investigate how the size of the pupil changes in different light intensities.

(3)

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(b) A student calculated the area of the pupil in bright light to be 7.1 mm^2.

Using information from the diagram, calculate the area of the pupil in dim light.

[for a circle, area = πr^2 $\pi = 3.14$]

(3)

area of pupil in dim light = ... mm^2

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(c) (i) Explain how the size of the pupil is adjusted from bright light to dim light.

(3)

(ii) Explain the adjustment made to the pupil when moving into dim light.

(2)

(Total for Question 6 = 11 marks)

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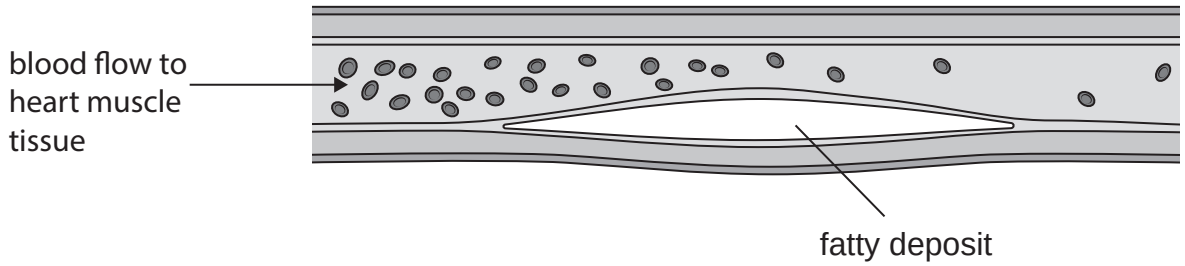
7 (a) The diagram shows a fatty deposit in an artery carrying blood to the heart muscle.



(Source: adapted from https://www.heartandstroke.ca/heart-disease/conditions/atherosclerosis)

Explain how a build-up of a fatty deposit in an artery carrying blood to the heart muscle can cause heart disease.

(4)

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(b) People with obesity are more at risk of heart disease than those who are overweight.

The chart shows the percentage of men and women in the United Kingdom who were either overweight or obese in 2018.



(Source: https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/2018/summary)

(i) In 2018 there were 66.5 million people living in the UK. Of these people, 33 million were men.

Calculate how many more women than men were classified as obese.

(3)

extra number of women = ...

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(ii) Describe a calculation that could be used to determine if a person is obese.

(3)

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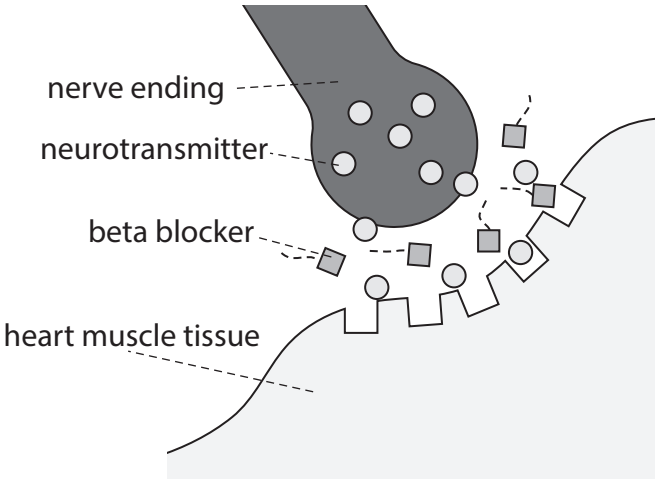
(c) The diagram shows a junction between a neurone and heart muscle.



(Source: Adapted from: https://study.com/academy/lesson/what-are-beta-blockers-uses-types-examples-side-effects.html)

Use the diagram to explain how beta blockers can reduce the risk of heart disease.

(3)

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(Total for Question 7 = 13 marks)

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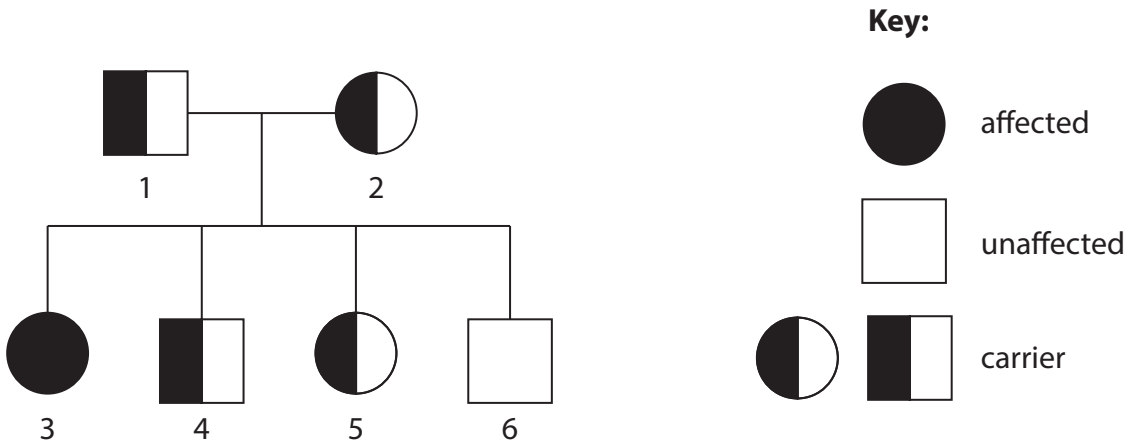
8 (a) The diagram shows the inheritance of cystic fibrosis in a family.



(Source: Adapted from https://cysticfibrosiszaw2.weebly.com/)

(i) Which individual is homozygous recessive?

(1)

- ☒ A 1
- ☒ **B** 3
- ☒ **C** 5
- ☒ **D** 6

(ii) How many individuals have a heterozygous genotype?

(1)

- ☒ A 1
- ☒ **B** 2
- ☒ **C** 3
- ☒ **D** 4

(iii) Explain why carriers of cystic fibrosis do not have symptoms of the disease.

(2)

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(iv) Draw a genetic diagram to show how two parents can have a 1 in 4 chance of having a child with cystic fibrosis.

Use F for the non-cystic fibrosis allele and f for the cystic fibrosis allele.

(4)

(b) Describe how gene therapy can be used to treat cystic fibrosis.

(3)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 90 MARKS

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