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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Wednesday 8 January 2020

Afternoon (Time: 2 hours) | Paper Reference **4BI1/1BR 4SD0/1BR**

Biology

Unit: 4BI1
Science (Double Award) 4SD0
Paper: 1BR

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.
- 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 110.
- 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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Answer ALL questions.

1 Organs in the human body have different functions.

(a) Name the organ that produces bile.

(1)

.....

(b) Which organ releases progesterone?

(1)

☒ **A** the brain

☒ **B** the ovary

☒ **C** the pituitary

☒ **D** the testis

(c) Which row of the table correctly shows whether the kidneys and skin are involved in excretion?

(1)

	kidneys	skin
☒ **A**	no	no
☒ **B**	no	yes
☒ **C**	yes	no
☒ **D**	yes	yes

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(d) The stomach is an organ found in the alimentary canal.

Describe the role of the stomach.

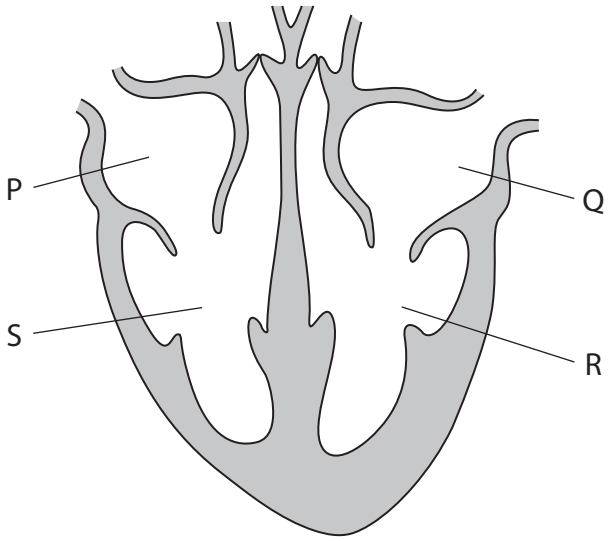
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(Total for Question 1 = 6 marks)

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2 The diagram shows a section through a human heart with the chambers labelled P, Q, R and S.



(a) (i) Which chambers contain deoxygenated blood?

(1)

- ☒ **A** P and Q
- ☒ **B** P and S
- ☒ **C** R and S
- ☒ **D** Q and R

(ii) Explain why two of the valves in this heart are closed.

(2)

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(b) Heart disease is a major risk to health in the United Kingdom.

In a study, the number of people with heart disease was recorded.

The table shows the results of the study.

Age range in years	Number of people with heart disease per 1000 in population	
	males	females
18 to 44	5	3
45 to 64	138	118
65 to 74	305	220
over 75	422	358

(i) Give two conclusions that can be made from this study.

(2)

1 .....

.....

2 .....

.....

(ii) The population of the United Kingdom is 65 million, of which half are male.

Calculate the number of males with heart disease in the age range 18 to 44.

(2)

number of males = ...

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(c) Explain how heart disease can affect a person's health.

(3)

(Total for Question 2 = 10 marks)

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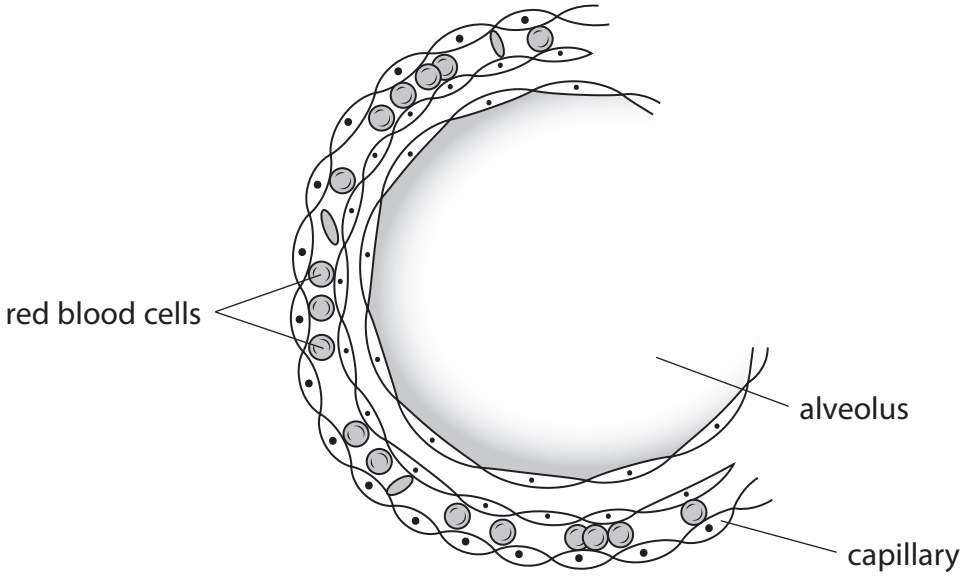
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3 Alveoli are involved in gas exchange.

The diagram shows a section through one alveolus and its associated blood capillary.



(a) Name the organ that contains alveoli.

(1)

.....

(b) There are 5 000 000 red blood cells per mm^3 of blood in the capillary.

Give the number of red blood cells per mm^3 in standard form.

(1)

number = ...

(c) Explain why gas exchange is possible at the alveolus.

(3)

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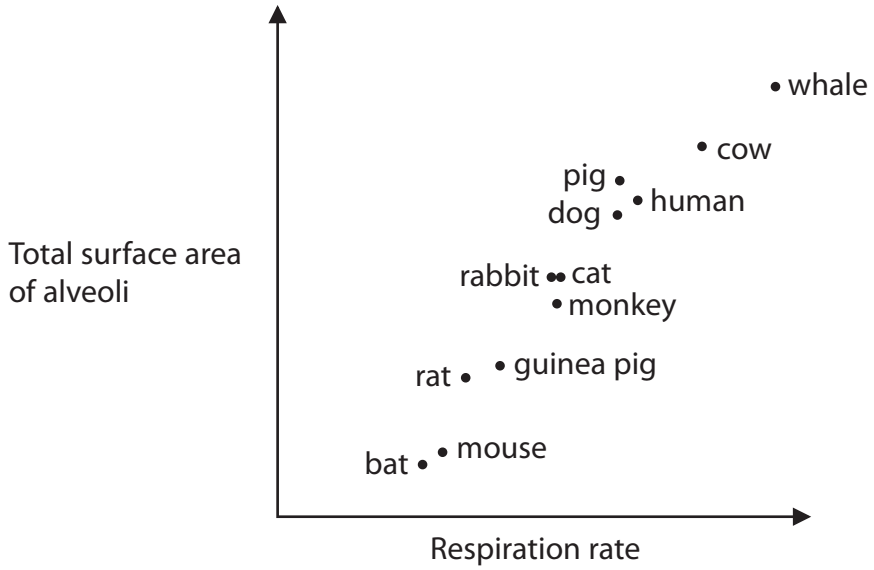
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(d) The graph shows the relationship between the total surface area of alveoli and the respiration rate in different sized animals.



(i) Give two conclusions that can be made from this graph.

(2)

1 .....

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2 .....

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(ii) The respiration rate shown on the graph is measured in cm^3 of oxygen used per minute.

When the respiration rate is measured in cm^3 per minute, a human has a higher respiration rate than a mouse.

When the respiration rate is measured in cm^3 per minute per gram of body mass, a human has a lower respiration rate than a mouse.

Explain why a human has a lower respiration rate than a mouse when the rate is measured in cm^3 per minute per gram of body mass.

(2)

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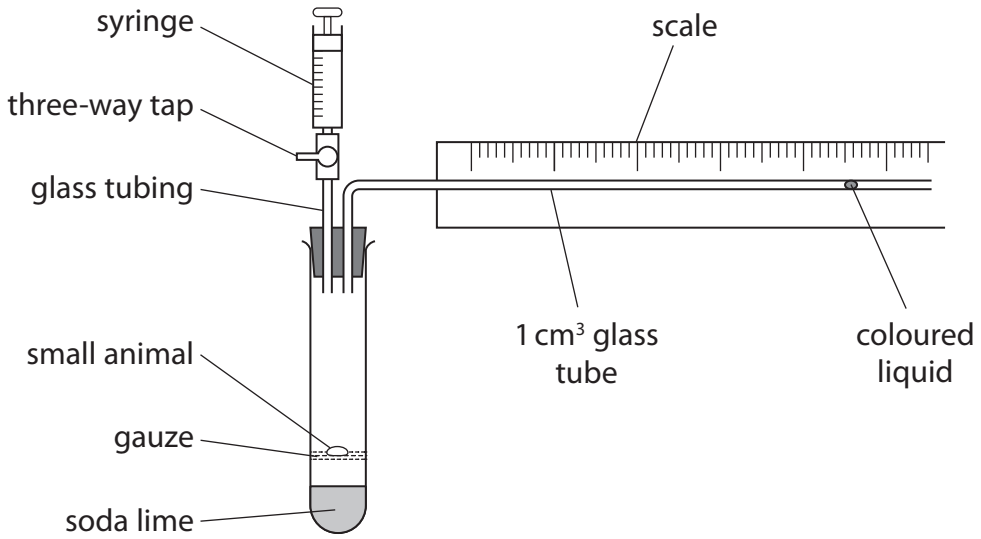
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(e) This apparatus can be used to measure the respiration rate of a small animal.



Explain how the apparatus should be used to obtain reliable data.

(3)

(Total for Question 3 = 12 marks)

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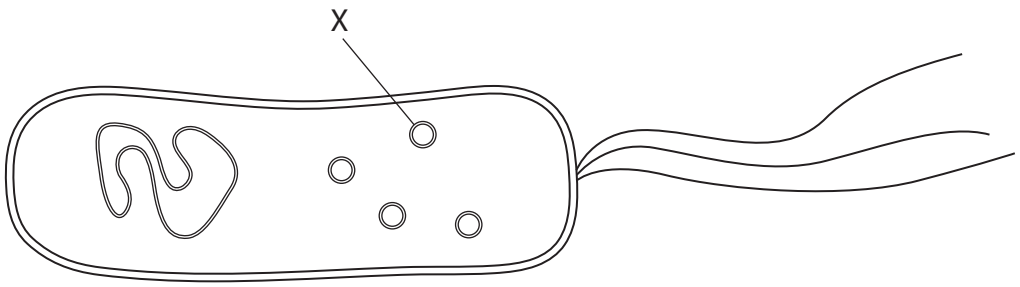
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4 Some bacteria are pathogenic and cause infections.

The diagram shows the structure of a pathogenic bacterium.



(a) Name the part labelled X.

(1)

.....

(b) Antibiotics can be used to cure some infections.

Some bacteria are resistant to antibiotics.

Explain how resistance to an antibiotic occurs and increases in a population of bacteria.

(3)

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(c) The table shows the number of deaths in 2014 caused by bacteria that are resistant to antibiotics.

The table also shows the predicted number of deaths in 2050 caused by resistant bacteria.

Year	Number of deaths $\times 10^6$
2014	0.7
2050	10.0

(i) Calculate the percentage increase in the predicted number of deaths in 2050 compared with the number of deaths in 2014.

(2)

percentage increase = ...

(ii) A doctor claims that if he stops giving antibiotics to any patients who are ill, he can reduce the number of predicted deaths caused by resistant bacteria in 2050.

Comment on this claim.

(4)

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(Total for Question 4 = 10 marks)

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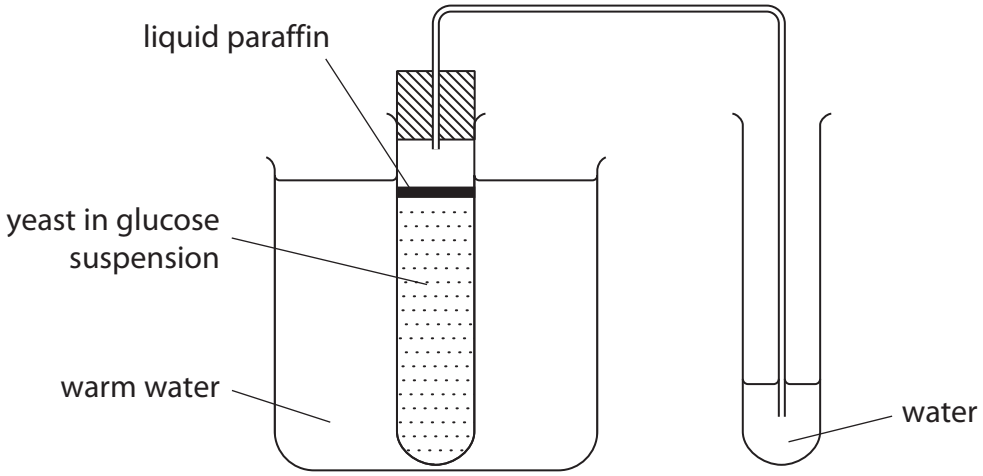
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5 A student investigates the effect of temperature on gas production in yeast.

The student uses this apparatus to count the number of gas bubbles produced per minute at different temperatures.



(a) (i) Name the process in yeast that produces the gas bubbles.

(1)

.....

(ii) What gas is produced by the yeast?

(1)

- ☒ **A** carbon dioxide
- ☒ **B** nitrogen
- ☒ **C** oxygen
- ☒ **D** water vapour

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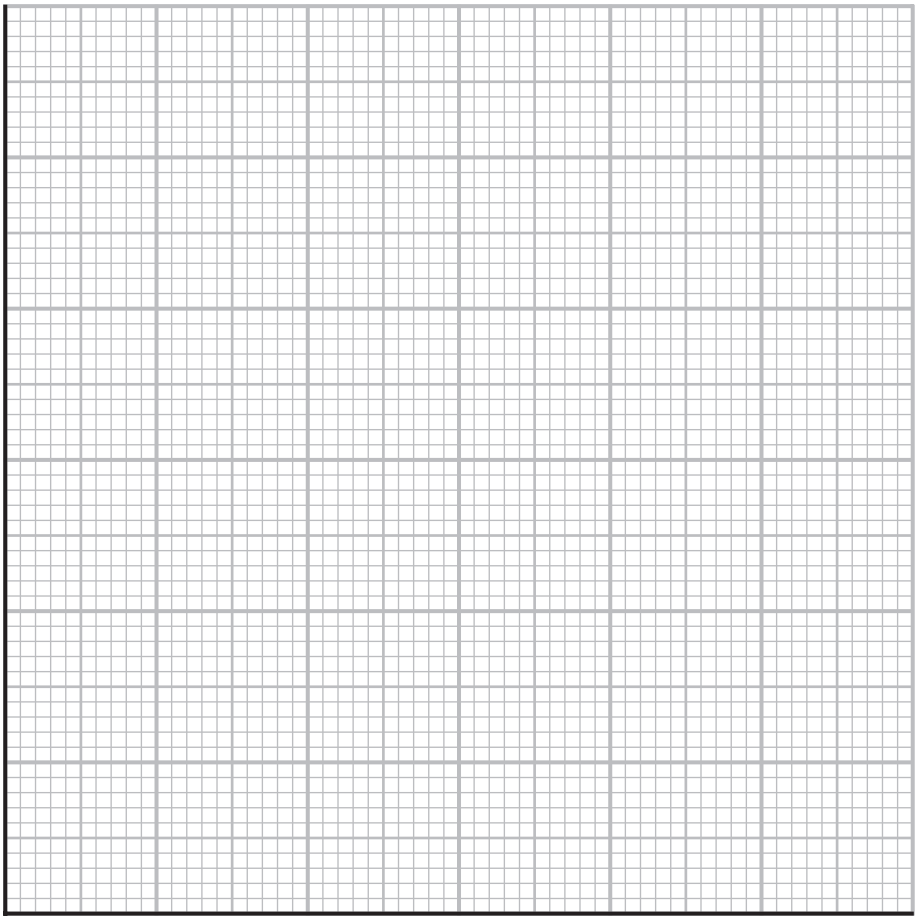
(b) The table shows the student's results.

Temperature in °C	Number of bubbles per minute
20	2
25	6
30	8
35	10
40	14
45	20
50	no data
55	2

(i) Plot a graph to show these results.

Join the points with straight lines.

(5)



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(ii) Explain the result at 55 °C.

(2)

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(c) Describe how the student should modify the investigation to obtain a more accurate measure of the optimum temperature.

(2)

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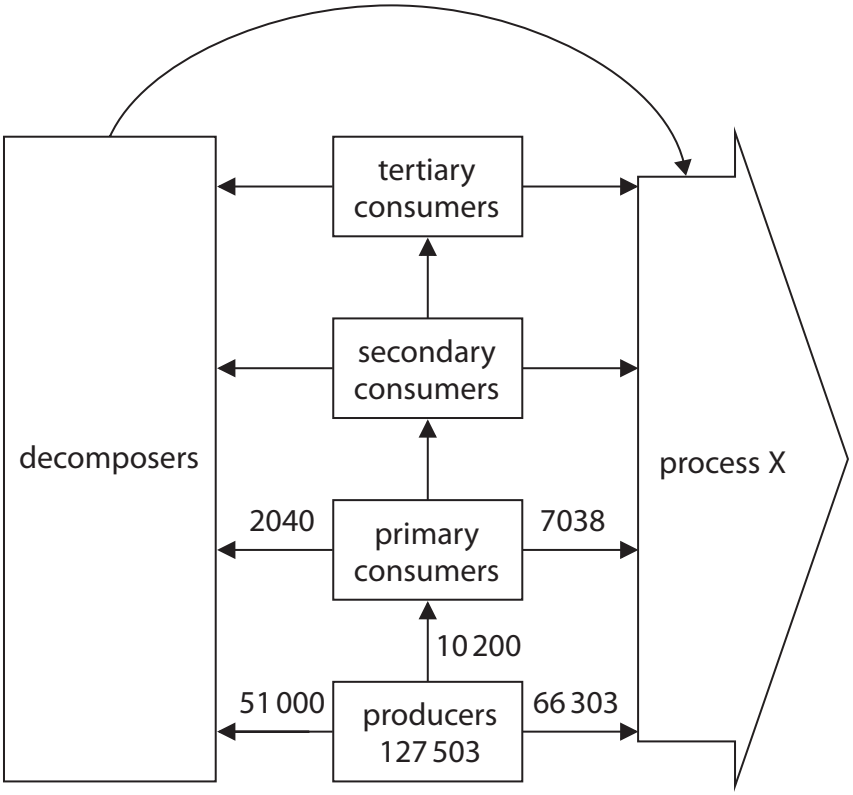
(Total for Question 5 = 11 marks)

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6 The diagram shows some energy transfers along a food chain.

The numbers give the energy transfers in kJ per m^2 per year.



(a) Give the name of process X.

(1)

.....

(b) Determine the energy transferred from the primary consumers to the secondary consumers.

(1)

energy transferred = ... kJ per m^2 per year

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(c) Decomposers can be described as saprotrophs.

(i) Describe how saprotrophs cause decomposition.

(2)

(ii) Forty per cent of the energy in the producers transfers to decomposers.

Only twenty per cent of the energy in the primary consumers transfers to decomposers.

Explain this difference in energy transfer.

(3)

(Total for Question 6 = 7 marks)

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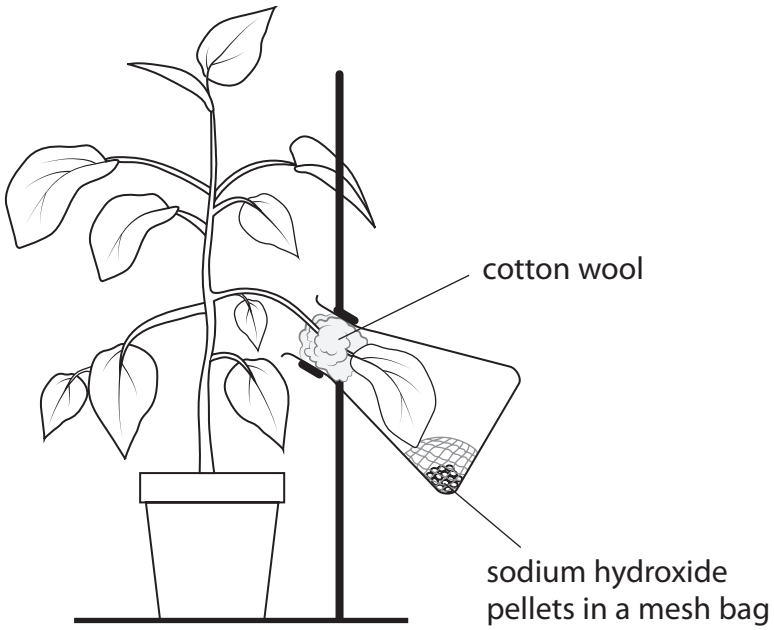
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7 Different factors can affect the rate of photosynthesis in plants.

(a) Give the balanced chemical equation for photosynthesis.

(2)

(b) A student uses this apparatus to investigate the need for carbon dioxide in photosynthesis.



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(i) Explain how the student could use this apparatus to show that carbon dioxide is needed for photosynthesis.

(4)

(ii) The student is told that, after keeping the leaf in the flask for a day, he should cut the leaf into small shapes for testing.

Suggest why this is a good idea.

(2)

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(c) The results of this investigation show whether carbon dioxide is needed for photosynthesis.

Explain how the student could modify his investigation to show that chlorophyll is needed for photosynthesis.

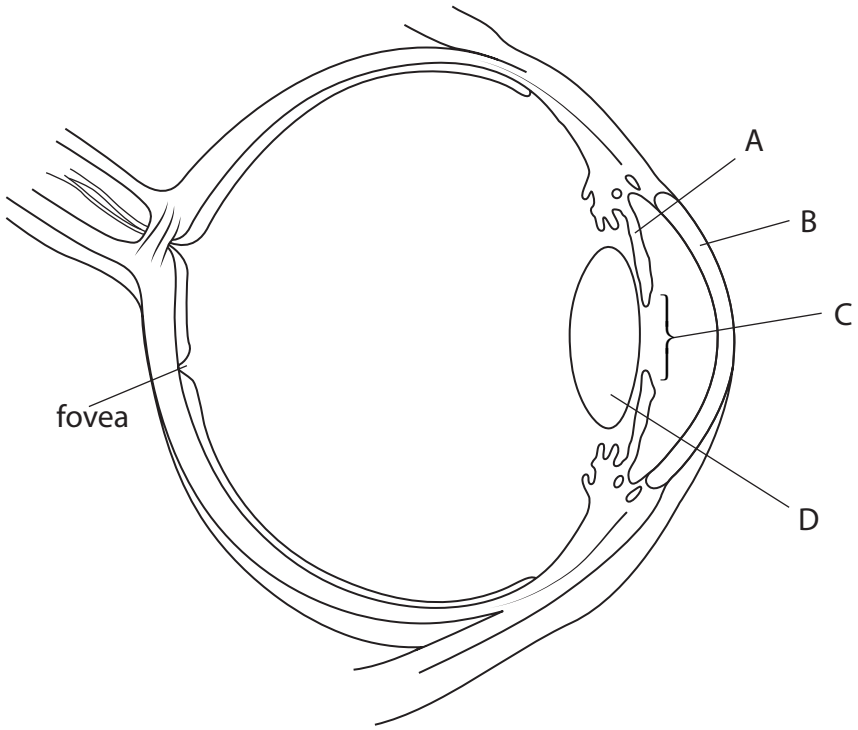
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(Total for Question 7 = 11 marks)

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8 The diagram shows a section through the human eye.



(a) Name the structures labelled A, B, C and D.

(4)

A .....

B .....

C .....

D .....

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(b) When a person looks directly at an object, light is focused on the fovea of the retina.

(i) A person is reading a book and then looks at a distant object.

Explain the changes that occur in the structures of the eye that allow light from the distant object to be focused on the fovea.

(4)

(ii) Some people develop a condition called age-related macular degeneration (AMD).

This occurs when cells in the fovea of the retina are damaged.

Suggest how AMD affects vision.

(2)

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(iii) Scientists are developing a new treatment for AMD. The treatment involves an operation to replace the damaged cells in the fovea with new cells.

Early results show an improvement in the condition. However, the treatment has only been tested on two patients.

Suggest what else scientists need to do before the treatment is allowed to be used for all patients with AMD.

(2)

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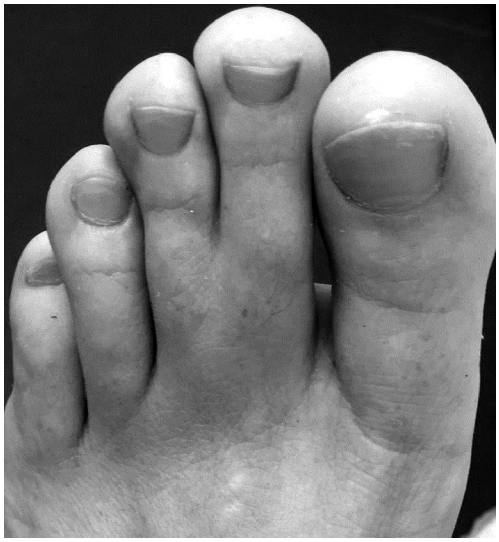
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9 Syndactyly is a condition where fingers and toes are not separated during development.

The photograph shows the foot of someone with syndactyly.



One type of syndactyly is caused by a dominant allele that is inherited from the parents.

(a) A man without syndactyly and a woman with syndactyly have a male child.

The child does not have syndactyly.

(i) Use a genetic diagram to show the genotypes of the parents, the possible gametes and the genotype and phenotype of their child.

Use D to represent the dominant allele and d to represent the recessive allele.

(4)

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(ii) Determine the probability that the second child of these parents will be a girl with syndactyly.

(2)

probability = ...

(b) Another type of syndactyly is caused by a recessive allele.

Explain the differences in the pattern of inheritance between a condition caused by a dominant allele and a condition caused by a recessive allele.

(3)

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(c) Syndactyly is controlled by a single gene that has two alleles.

Most other phenotypes are the result of a different sort of genetic control.

Describe the genetic control of most phenotypic features.

(2)

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(Total for Question 9 = 11 marks)

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10 The body mass index (BMI) is a measure that uses your mass and height to calculate if your mass is appropriate for your height.

BMI is calculated using the formula

$$\text{BMI} = \text{mass in kg} \div (\text{height in m})^2$$

(a) (i) Person X has a mass of 60 kg and a height of 165 cm.

Calculate the BMI of person X.

(2)

BMI = ...

(ii) BMI values can be divided into categories.

The table shows these categories.

BMI value	Category
less than 18.5	thin
18.6 to 24.9	healthy
25 to 29.9	overweight
more than 30	obese

Give the category of person X.

(1)

.....

(b) One problem with the interpretation of BMI measurements is that people have different proportions of muscle compared with fat.

Muscle has a higher density than fat.

What effect would a high proportion of muscle in your body have on your BMI?

(1)

☒ **A** it would increase your BMI

☒ **B** it would decrease your BMI

☒ **C** it would not affect your BMI

☒ **D** it would make your BMI negative

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(c) Some diets reduce carbohydrate intake and other diets reduce lipid intake.

(i) Explain how these diets can result in a reduction in body mass.

(3)

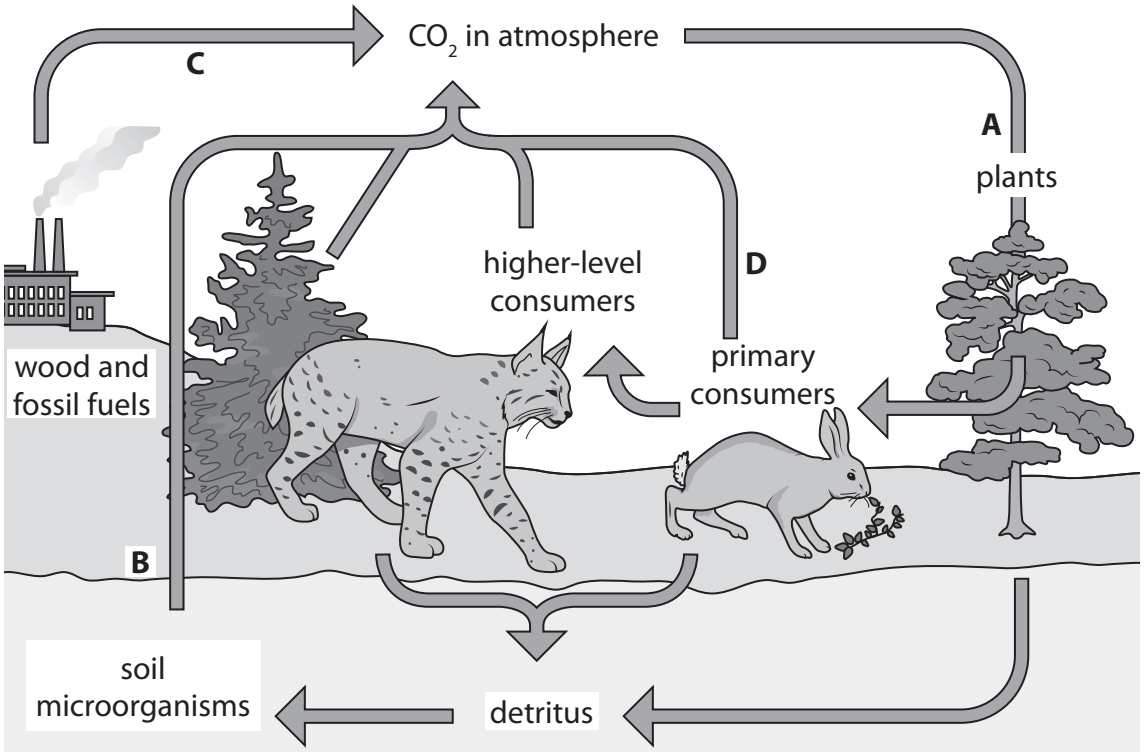
(ii) Explain why diets are more effective at reducing BMI if combined with regular exercise.

(3)

(Total for Question 10 = 10 marks)

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11 The diagram shows a cycle that is important for the recycling of biological molecules. Processes in the cycle are labelled A, B, C and D.



(a) (i) Give the name of this cycle.

(1)

.....

(ii) Which process reduces CO_2 in the atmosphere?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(iii) Name the two groups of microorganisms that carry out process B.

(2)

1 .....

2 .....

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(b) The breakdown of dead plant material by microorganisms is affected by many factors.

Design an investigation to determine the temperature at which plant material is broken down most effectively.

Include experimental details in your answer and write in full sentences.

(6)

(Total for Question 11 = 10 marks)

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