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)

Time 1 hour 15 minutes

Paper reference **4BI1/2BR**

Biology

UNIT: 4BI1
PAPER: 2BR

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 70.
- 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 ▶

P69466A

Q:1/1/1/1/1/1/

P 6 9 4 6 6 A 0 1 2 4

Pearson

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

Human kidney disease

Human kidney disease can be caused by infection, high blood pressure, high blood cholesterol levels or diabetes. There is no cure for kidney disease, but suitable treatment can reduce the symptoms and stop the disease getting worse.

The treatments include lifestyle and dietary changes to help you remain as healthy as possible. Medicine is also used to control associated problems such as high blood pressure and high cholesterol levels. Other treatments need to be used for severe kidney disease when the kidneys stop working. These are dialysis and kidney transplants.

Dialysis carries out the excretory function of the kidney. There are two types of dialysis that are commonly used, haemodialysis and peritoneal dialysis. Haemodialysis involves diverting blood into an external machine, where it is filtered before being returned to the body. Peritoneal dialysis (PD) involves pumping dialysis fluid into a space inside your abdomen. Haemodialysis is usually done about three times a week, either at hospital or at home. PD is normally done at home, several times a day or overnight. If the patient does not have a kidney transplant, treatment with dialysis will usually need to continue for life.

PD became an alternative to haemodialysis a few years ago. Many patients prefer the independence PD lets them have. In PD, a soft tube called a catheter is used to fill the abdomen with a dialysis solution. The composition of the dialysis solution is water, glucose, and mineral ions at the same concentration that occurs naturally in the blood. The dialysis solution is prepared according to the individual patient's needs to help regulate their ion balance and remove metabolic waste products.

Inside the abdominal cavity is a natural membrane lining called the peritoneum. This membrane is partially permeable. The waste products and extra fluid and salts pass from the blood through the peritoneum into the dialysis solution. They then leave the body when the dialysis solution is drained. This used solution is thrown away. The process of draining and filling is called an exchange and takes about 30 to 40 minutes. The period that the dialysis solution is in your abdomen is called the dwell time. A typical schedule is four exchanges a day, each separated by a dwell time of four hours.

One form of PD, continuous ambulatory peritoneal dialysis (CAPD), does not require a machine and it is possible to walk around with the dialysis solution in your abdomen. Another form of PD, automated peritoneal dialysis (APD), requires a machine to fill and drain your abdomen. Three to five exchanges are performed during the night while you sleep. The whole process lasts a total of nine hours each night.

(a) Give one way that a person can change their diet to lower their risk of developing high cholesterol (lines 4 to 6).

(1)

(b) One function of the kidney is excretion (line 9). Another function is osmoregulation.

Explain what is meant by the term **osmoregulation**.

(2)

(c) Explain why a person with severe kidney disease will need dialysis to continue for life (lines 15 to 16).

(2)

(d) The peritoneum acts as a partially permeable membrane.

(i) Explain what is meant by a partially permeable membrane (lines 23 to 24).

(2)

(ii) Explain why the dialysis solution must contain purified water, glucose and mineral ions (lines 19 to 21).

(2)

(e) Explain how the composition of the dialysis solution results in the waste products being removed from the blood (lines 21 to 22).

(2)

(f) (i) A person is using APD.

Calculate the percentage of their time used for treatment in a week (lines 33 to 35).

(2)

percentage = ... %

(ii) Suggest why people may prefer to use CAPD instead of haemodialysis (lines 31 to 32).

(1)

.....

.....

(g) Describe how the structures in a human kidney result in the correct substances being retained in the blood.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

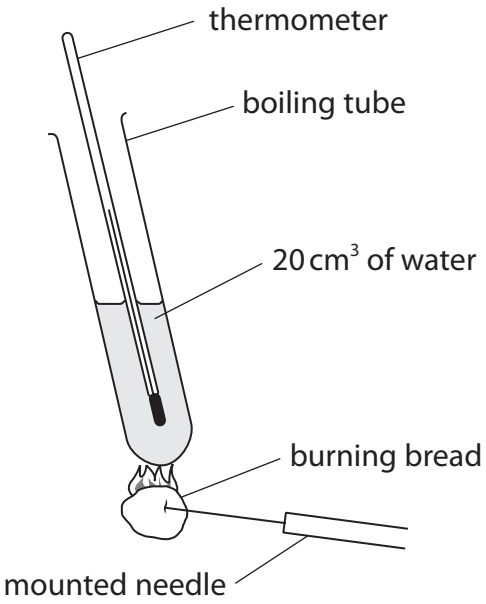
.....

.....

(Total for Question 1 = 17 marks)

2 A student uses this method to measure the energy value of a sample of bread.

- measure the mass of a sample of bread
- put 20 cm^3 of water in a boiling tube
- place a thermometer in the boiling tube and record the initial temperature of the water
- place the sample of bread on a mounted needle
- light the bread sample in a Bunsen flame
- quickly move the burning bread sample and place it directly under the boiling tube
- if the bread stops burning, relight the bread in the Bunsen flame
- place it back under the boiling tube
- repeat until the bread does not burn
- record the final temperature of the water in the boiling tube



The student repeats the experiment 3 times.

The table shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 1 g of bread in J
20	33	13	1092	0.25	4368
20	34	14	1176	0.30	3920
21	36			0.20	

(a) To calculate the energy released from the burning bread the student uses this formula.

energy (in J) = mass of water (in g) × 4.2 × increase in temperature (in °C)

They then calculate the energy in joules released by 1 g of bread.

(i) Calculate the increase in water temperature for the third sample of bread.

(1)

temperature increase = ... °C

(ii) Calculate the energy released in joules by the third sample of bread.

[1 cm^3 of water has a mass of 1 g]

(1)

energy released = ... J

(iii) Calculate the energy released in joules by 1g of bread for the third sample of bread.

(1)

energy released by 1 g = ... J

(b) The energy value given on the packaging of the bread is 10 400 J for 1 g of bread.

Comment on why the student's method gives a different value.

(5)

(c) Give two ways that the student could modify this apparatus to achieve an answer nearer to the energy value given on the packaging of the bread.

(2)

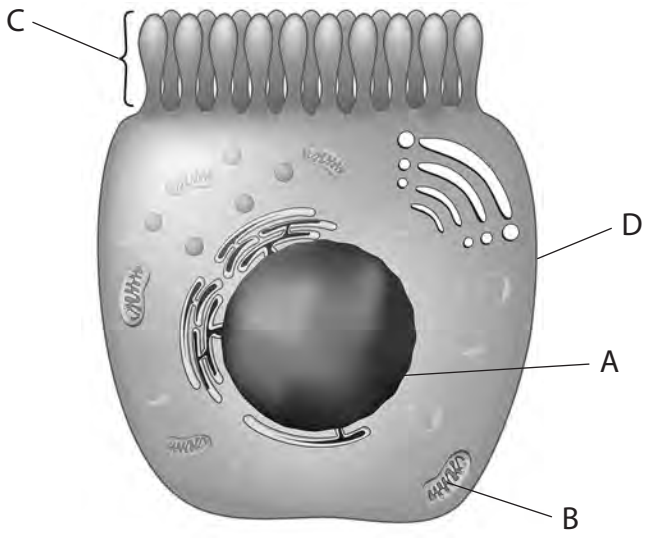
1 .....

2 .....

(Total for Question 2 = 10 marks)

BLANK PAGE

3 The diagram shows a cell found in the lining of the human small intestine.



(Source: © Designua / Shutterstock)

(a) (i) Which of the labelled structures is a microvillus?

(1)

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

(ii) Which of the labelled structures produces ATP?

(1)

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

(b) These cells form the lining of the small intestine.

Explain how the structure of the small intestine is adapted for absorption.

(4)

(c) Cells in the human placenta also have microvilli.

Describe the role of the human placenta.

(3)

(Total for Question 3 = 9 marks)

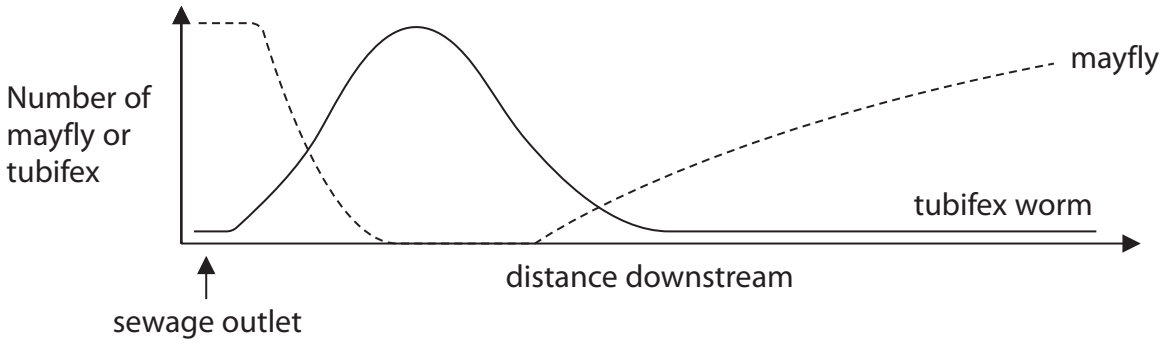
4 Sewage pollution affects the distribution of organisms in a river.

Scientists measured the oxygen level, the number of bacteria, the number of mayfly nymphs and the number of tubifex worms in the river.

The mayfly nymph is an immature form of an insect and the tubifex is a small worm usually growing to a length of about 10 cm.

(Sources: © Hhelene / Shutterstock, © Aldona Griskeviciene / Shutterstock)

The scientists recorded how these measurements changed at different distances from the sewage outlet.



(a) Comment on the changes in the measurements as the distance from the sewage outlet increases.

You should use information from the graphs and your own knowledge in your answer.

(5)

(b) Scientists often use information about the organisms present in a habitat as an indication of the level of pollution and as a measure of biodiversity.

(i) Explain what is meant by the term **biodiversity**.

(2)

(ii) Suggest how the number of mayfly nymphs and the number of tubifex worms can be used to indicate the level of pollution.

(2)

(Total for Question 4 = 9 marks)

5 (a) The table gives some information about different hormones.

Hormone	Organ that releases hormone	Location of target cells	Effect on target cells and tissues
FSH			growth of follicle
LH	pituitary	ovaries	
progesterone	ovaries	uterus	
	testes		growth of body hair

Complete the table by giving the missing information.

(6)

(b) Give three differences between hormones and neurotransmitters.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(Total for Question 5 = 9 marks)

6 Scientists can now produce farm animals by cloning. Since Dolly the sheep was born in 1996 many different species have been cloned.

The form of cloning used is called somatic cell cloning.

The first ever clone of a champion racehorse was announced in 2005 in Italy.

The foal was cloned from Pieraz, a world champion in long-distance horse races.

(a) Describe the stages scientists could use to clone a male horse.

(4)

(b) Pieraz was castrated (had his testicles removed) at a young age.

Explain why this stopped him reproducing normally but did not stop him being used to produce a foal by cloning.

(3)

(c) Suggest why horseracing does not allow the use of non-natural methods of breeding, including cloning.

(1)

.....

.....

.....

(d) State one difference between cloning an organism and genetically modifying an organism.

(1)

.....

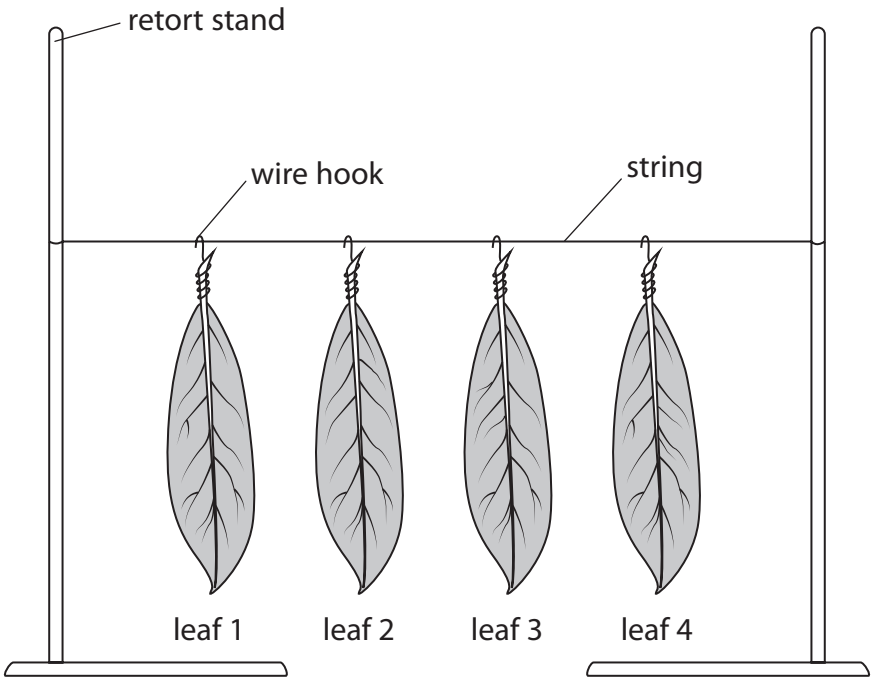
.....

(Total for Question 6 = 9 marks)

BLANK PAGE

7 A student uses this method to investigate the water loss from leaves.

- select 4 leaves of equal size from the same species of plant
- wrap thin wire around the leaf stalk of each leaf and use the remaining wire to produce a hook
- cover the upper surface on leaf 1 with petroleum jelly
- cover the lower surface on leaf 2 with petroleum jelly
- cover the upper surface and the lower surface on leaf 3 with petroleum jelly
- do not cover leaf 4 with petroleum jelly
- record the mass of each leaf
- attach the leaves, by their wire hooks, at intervals along a horizontal string
- remove the leaves from the string after 3 hours
- record the new mass of each leaf



(a) (i) Which of these is the independent variable in this experiment?

(1)

- ☒ **A** leaf size
- ☒ **B** leaf surface covered
- ☒ **C** mass lost
- ☒ **D** time

(ii) State why leaves of the same species were selected.

(1)

.....

.....

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

Leaf	Surface covered	Initial mass in g	Final mass in g	Percentage change in mass (%)
1	upper surface	3.2	2.4	25
2	lower surface	3.2	3.0	6.3
3	both	3.1	3.0	
4	none	3.1	2.2	29

(i) Calculate the percentage change in mass for leaf 3.

(2)

percentage change = ... %

(ii) Explain the differences in water loss from the four leaves in the student's experiment.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 7 = 7 marks)

TOTAL FOR PAPER = 70 MARKS

BLANK PAGE

BLANK PAGE

BLANK PAGE