Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number	Candidate Number

Time 1 hour 45 minutes

Paper reference **1BI0/2H**

Biology
PAPER 2
Higher Tier

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.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

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.
- Good luck with your examination.

Turn over ▶

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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 The population of native white-clawed crayfish in English rivers is decreasing due to an increasing population of American imported signal crayfish.

Figure 1 shows a white-clawed crayfish.

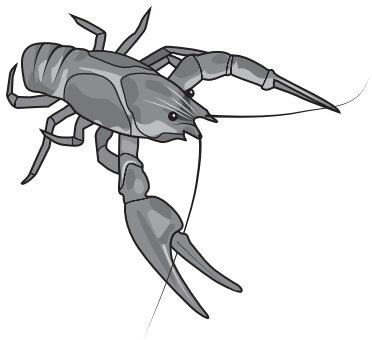

Figure 1

(i) Which term is used to describe the American imported signal crayfish now that it is living in English rivers?

(1)

☒ **A** indigenous species

☒ **B** non-indigenous species

☒ **C** non-invasive species

☒ **D** pathogenic species

(ii) American imported signal crayfish may eat white-clawed crayfish.

Explain **one** other reason why the increasing population of American imported signal crayfish may have caused the decrease in white-clawed crayfish.

(2)

competition between species
(1)

• for resources / named resources (1)

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(iii) The Environment Agency is developing methods of increasing the population of white-clawed crayfish in English rivers.

Which term describes these methods?

(1)

- ☒ **A** mutation
- ☒ **B** conservation
- ☒ **C** predation
- ☒ **D** mutualism

(iv) White-clawed crayfish cannot survive in rivers with a low concentration of oxygen.

Explain how eutrophication can cause the population of white-clawed crayfish to decrease.

(3)

eutrophication causes
oxygen levels to decrease
(1)

• because nitrates levels in the water are increased (1)

• causing an overgrowth of algae (1)

(Total for Question 1 = 7 marks)

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2 Figure 2 shows an area of woodland with some small plants growing in the ground between the trees.

(Source: © Maksym Holovinov/Shutterstock)

Figure 2

(a) Name a group of organisms that break down the dead leaves and release mineral ions into the soil.

(1)

bacteria / fungi / decomposers / prokaryotes

(b) The mineral ions are absorbed from the soil into the roots of plants.

Describe how these mineral ions are transported from the roots to the leaves of the plants.

(2)

(dissolved) in water (1)

• diffusion through the root (1)

(c) A scientist recorded the mean light intensity and the mean number of small plants per m^2 for six 25 m^2 areas of the woodland.

Figure 3 shows the results.

area of woodland	mean light intensity in lux	mean number of small plants per m^2
A	1500	2.7
B	1300	1.6
C	1000	1.1
D	800	0.6
E	550	0.3
F	350	0.1

Figure 3

(i) Explain the effect of light intensity on the number of small plants per m^2.

(2)

as light intensity decreases
the number of (small) plants
(per m2) decreases (1)

• because the (small) plants
will not be able to
photosynthesise enough (1)

(ii) State **one** variable the scientist should have controlled to make sure the light intensity measurements could be compared.

(1)

same time of day (1)

• same meter (1)

(d) The scientist selects an area near the edge of the woodland where many stinging nettles are growing.

This area is partly shaded by the trees.

Describe how the scientist should use a belt transect to investigate how light intensity affects the growth of stinging nettles.

(3)

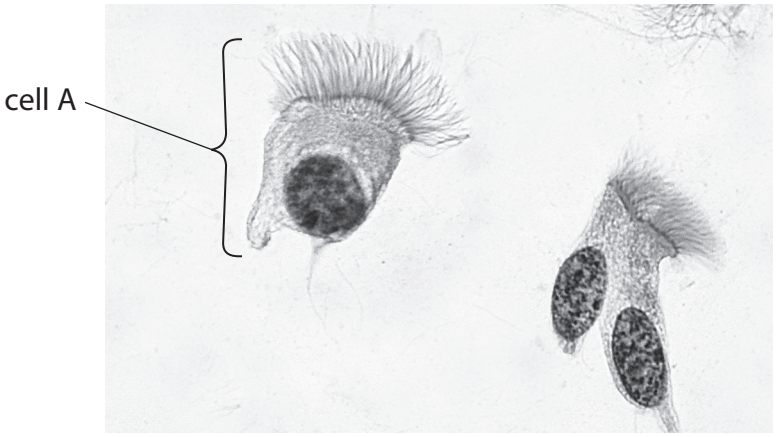
place a quadrat along a {rope / tape} measure (1)

• tape measure to measure along the transect (1)

• measure light intensity at different distances (from the wood) (1)

(Total for Question 2 = 9 marks)

3 (a) Figure 4 shows ciliated epithelial cells from the airways of a human as seen using a light microscope.



(Source: © Jose Luis Calvo/Shutterstock)

Figure 4

(i) Draw the cell labelled A in the box below.

Label **three** parts of this cell on your diagram.

(4)

a diagram of the cell that reflects its shape and some of the structures (1)

• with any three cell structures from {nucleus / cytoplasm / membrane / cilia} (3)

(ii) State the function of the ciliated epithelial cells in the airways of the human breathing system.

(1)

to {move/waft} {mucus / bacteria / dust}

(b) Figure 5 shows equipment used to investigate the rate of respiration in maggots.

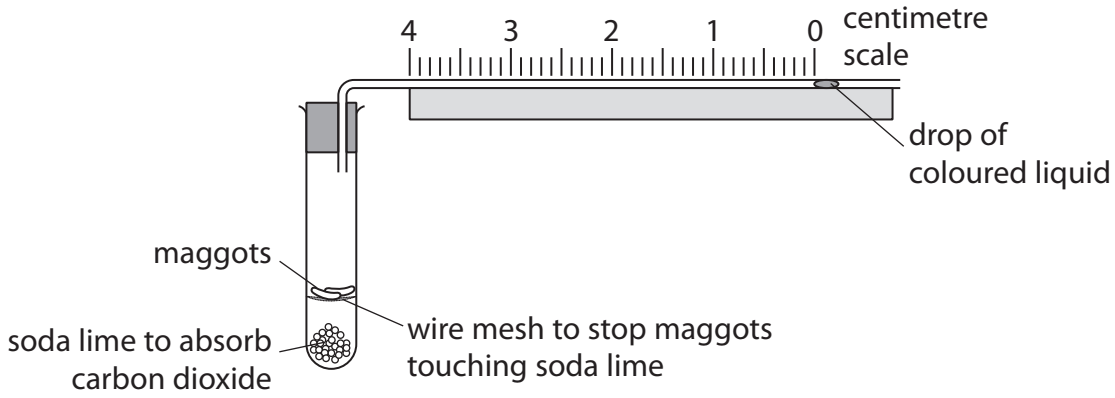


Figure 5

As the maggots respire, the drop of coloured liquid moves towards the test tube.

Figure 6 shows the position of the drop of coloured liquid after ten minutes.

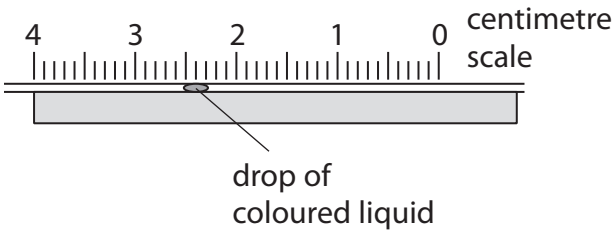


Figure 6

(i) Use information from Figures 5 and 6 to calculate the mean rate of respiration of the maggots in mm per minute.

(2)

measurement
(2.5 – 0 =) 2.5 (cm) (1)

calculation
(25 ÷ 10 =) 2.5 (mm per minute)

..... mm per minute

(ii) Describe a control for this investigation.

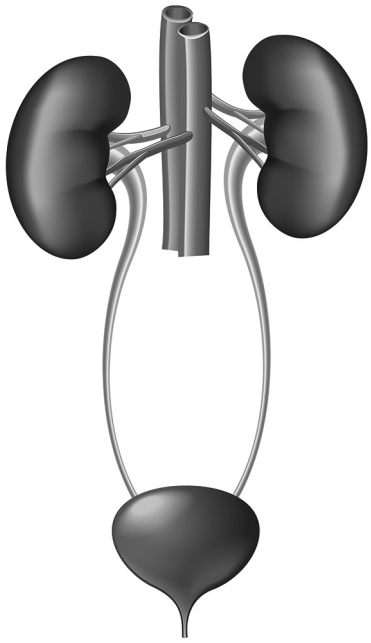
(2)

apparatus set up as the initial investigation (1)

• using {no living organisms / glass beads} instead of living organisms (1)

(Total for Question 3 = 9 marks)

4 Figure 7 shows the human urinary system.



(Source: © La Gorda/Shutterstock)

Figure 7

(a) Urine is made by removing water, urea and salts from the blood.

Use the letter X to label where urine is made.

a labelled line X to either kidne

(1)

(b) Which substance is converted to urea in the liver?

(1)

☒ **A** amino acids

☐ **B** sugars

☐ **C** lipids

☐ **D** potassium ions

(c) A patient cannot remove enough urea from the blood when making urine.

Figure 8 shows a dialysis machine attached to the arm of this patient.

Their blood is pumped out of their arm, passed through the dialysis machine, and then put back into the patient.

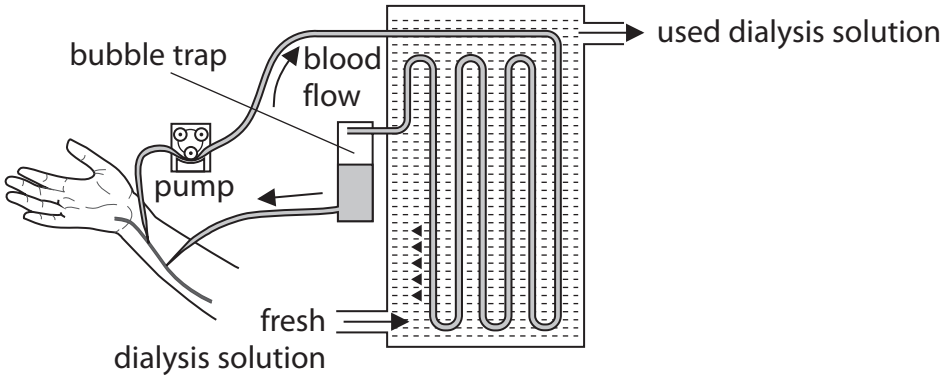


Figure 8

(i) Describe what happens to urea as the blood passes through the dialysis machine.

(2)

blood is filtered (in a dialysis machine) (1)

• urea moves {out of the blood / into dialysis solution} (1)

(ii) Two patients need to have dialysis treatment.

Patient A needs this treatment three times a week.

Patient B needs this treatment once a week.

Give **one** reason why patient B needs dialysis treatment less often than patient A.

(1)

patient B has {kidney failure / disease} which is less advanced than patient A (1)

(d) Describe how to test for glucose in the dialysis fluid.

(3)

add Benedict's solution (to some dialysis fluid) (1)

• {heat / boil / put in water bath} (1)

• see if it turns {green / yellow / orange / red} (1)

(e) Urease is an enzyme that breaks down urea into smaller molecules.

Explain why urease will not break down starch into smaller molecules.

(3)

their shape is complementary to their substrate (1)

• so starch will not fit into the active site (of urease) (1)

• so no reaction can take place (1)

(Total for Question 4 = 11 marks)

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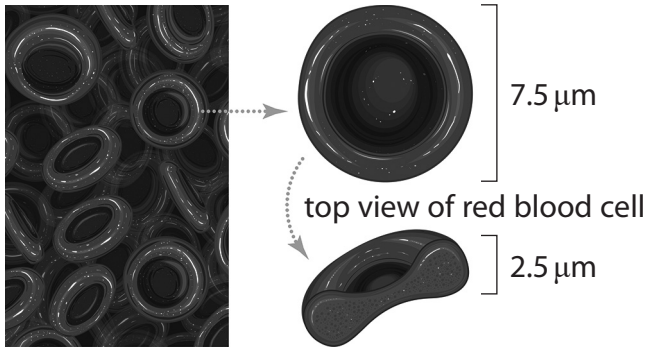
5 Figure 9 shows the structure and actual size of red blood cells (erythrocytes).



(Source: © N.Vinoth Narasingam/Shutterstock)

Figure 9

(a) (i) Calculate the image size of the top view of this red blood cell if this cell is magnified 400×.

Give your answer in mm.

(2)

calculation
(7.5 x 400 =) 3000 (1)

conversion
(3000 ÷ 1000 =) 3 (mm)

..... mm

(ii) Explain how the shape of a red blood cell is related to its function.

(3)

the biconcave disc shape (1)

• results in a larger surface area (1)

• so (more) oxygen can be carried (1)

(iii) State the role of haemoglobin inside the red blood cell.

(1)

for oxygen to bind (inside the erythrocyte / red blood cell)

(b) Some blood transfusions contain red blood cells.

Red blood cells are stored in a solution containing 5.0% glucose and 0.9% salt.

Explain why red blood cells cannot be stored in pure water.

(3)

water will move into the erythrocyte (1)

• by osmosis (1)

• down a concentration gradient (1)

(Total for Question 5 = 9 marks)

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6 (a) Methods of contraception include use of hormones and barrier methods.

(i) Which form of contraception is a barrier method?

(1)

☒ **A** oral contraception

☒ **B** female condom

☒ **C** rhythm (calendar) method

☒ **D** contraceptive implant

(ii) State why a barrier method of contraception may be used in addition to a hormonal method.

(1)

barrier methods prevent the transmission of STIs

(b) The combined contraceptive pill contains the hormones oestrogen and progesterone.

(i) State the endocrine gland that releases oestrogen.

(1)

ovary / ovaries

(ii) Explain how high levels of oestrogen and progesterone in the combined contraceptive pill work together to prevent pregnancy.

(4)

inhibits the production of FSH (1)

• FSH causes eggs to mature in the follicle / (no FSH means) no eggs will be matured (1)

• high levels of progesterone inhibit the production of LH (1)

• LH causes ovulation / (no LH) prevents ovulation (1)

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(c) Hormones can also be used to treat infertility.

Explain how clomifene therapy and IVF can improve female fertility.

(4)

clomifene therapy

- clomifene therapy introduces hormones into the body / stimulates hormones {LH / FSH} (1)
- to allow (more) eggs to {develop / be released} (1)

IVF

- IVF involves fertilisation outside the body (1)
- so a fertilised egg cell can be implanted directly into the uterus (1)

(Total for Question 6 = 11 marks)

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7 (a) A hospital patient was tested for diabetes.

A nurse recorded his mass and height.

Figure 10 shows these measurements.

mass in kg	height in metres
124	1.8

Figure 10

Calculate the BMI of this patient using the information in Figure 10.

(2)

substitution
124 ÷ 1.82 (1)

evaluation
BMI = 38.27

BMI = ...

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(b) Blood samples were taken from this patient every four hours.

The glucose concentrations were recorded in Figure 11.

time in hours	blood glucose concentration in milligrams per decilitre
0	100
4	131
8	139
12	90
16	92
20	134
24	137

Figure 11

(i) Describe the trends shown in this data.

(3)

blood glucose concentration increased from {0 – 8 hours / from 100 to 139 / by 39 mg/dL} (1)

• then blood glucose concentration decreased [at 12 hours / to 90 mg/dL / by 49 mg/dL) (1)

• blood glucose concentration increased {at 20 hours / after 12 hours / to 134 mg/dL / by 44 mg/dL} (1)

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(ii) This patient was diagnosed as being type 2 diabetic.

Explain why the blood glucose concentration of this patient remained high from 4 hours to 8 hours.

(3)

the pancreas produced insulin (1)

• but the cells in the {liver / muscles} were resistant to insulin (1)

• so glucose was not taken up by the {liver / muscles / cells} (1)

(iii) This patient did some exercise during these 24 hours.

Explain how the data in Figure 11 shows that this exercise occurred after 8 hours but before 12 hours.

(3)

the blood glucose concentration decreased (at 12 hours) (1)

• because the patient has used up the glucose in his blood (1)

• due to increased respiration (during exercise) (1)

(Total for Question 7 = 11 marks)

8 A student investigated the decomposition of leaves from different types of tree.

(a) Decomposers in the soil convert

(1)

- ☐ **A** nitrogen into nitrates
- ☐ **B** nitrates into nitrogen
- ☒ **C** urea into ammonia
- ☐ **D** ammonia into urea

(b) The student collected and weighed some fresh leaves from a beech tree.

- The leaves were placed on top of soil in a tray.
- This was repeated for leaves from three other types of tree.
- The trays were kept in the same abiotic conditions for 40 days.
- The leaves were reweighed after 40 days.

(i) State **two** abiotic factors that should be kept the same in this investigation.

(2)

1 temperature (1)

2 • water availability (1)

(ii) Explain how this investigation could be improved to make the results more comparable.

(2)

repeat the investigation / have more than one tray of each type of leaf (1)

• obtain more data / to calculate a mean / identify anomalies (1)

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(c) Figure 12 shows the mean rate of decomposition for this investigation.

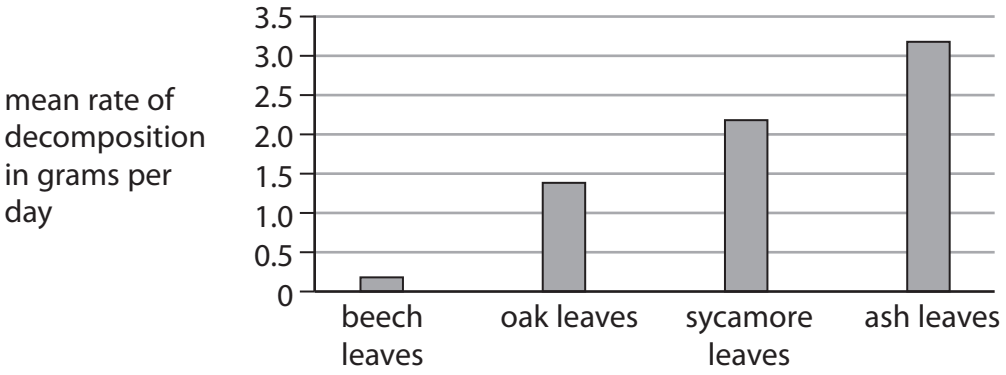

Figure 12

(i) Which leaves would produce compost in the least time?

(1)

☒ **A** beech leaves

☒ **B** oak leaves

☒ **C** sycamore leaves

☒ **D** ash leaves

(ii) The same investigation was extended to include the leaves of a silver birch tree.

The starting mass of the leaves was 28.2 grams.

After 40 days the mass of the leaves was 19.7 grams.

Calculate the rate of decomposition of the leaves of the silver birch tree.

Give your answer to three significant figures and include the units.

(3)

selection
(28.2 – 19.7 =) 8.5 (1)

calculation
(8.5 ÷ 40 =) 0.213
units
grams per day (1)

rate of decomposition .....

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(d) Explain how the concentration of oxygen in a compost bin would affect the rate of decomposition.

(2)

increasing oxygen concentration increases the rate of decomposition (1)

• because there is more respiration (1)

(Total for Question 8 = 11 marks)

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9 Exercise causes changes in the circulation of the blood.

In an investigation, the change in blood flow to different parts of the body during exercise was measured.

All the volunteers used in the study were healthy females of the same age.

Figure 13 shows the results of this investigation.

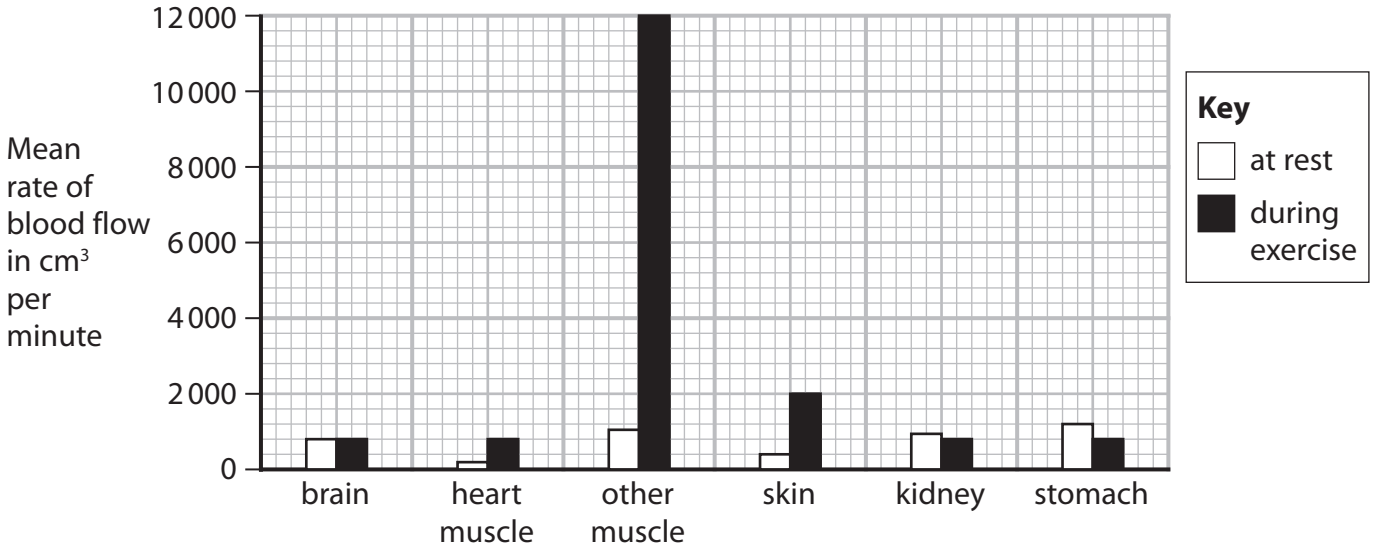

Figure 13

(a) (i) During exercise, the blood flow to the stomach changes.

Calculate the percentage change in blood flow to the stomach in response to exercise.

Give your answer to the nearest whole number

(3)

selection
(1200 - 800 =) 400 (1)

calculation
400 ÷ 1200 = 33.33 (1)

significant figures
(-) 33%

..... %

(ii) Suggest **two** other variables that should be controlled in this investigation.

(2)

1 length of exercise (1)

2 • intensity of exercise (1)

*(iii) Explain the changes in blood flow, shown in Figure 13, that are caused by exercise.

(6)

increased blood flow

- pump more blood
- increased blood flow to the heart muscle
- increased blood flow to the other muscles
- to deliver more oxygen and glucose
- for increased respiration
- releasing more energy for exercise
- to remove more carbon dioxide
- to remove more lactic acid
- increased blood flow to the skin
- to help cool the body

decreased blood flow

- decreased blood flow to the kidney
- decreased blood flow to the stomach
- to allow more blood to flow to the working muscles

same blood flow

- blood flow to the brain remains the same
- as the brain needs a constant amount of oxygen and glucose to function

(Total for Question 9 = 11 marks)

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10 (a) Commercial growers can use plant hormones to artificially ripen fruit and produce seedless fruit.

(i) Which is the name of the plant hormone used in fruit ripening?

(1)

☒ **A** auxin

☒ **B** gibberellin

☒ **C** sucrose

☒ **D** ethene

(ii) Which plant hormone can commercial growers spray fruit with to produce seedless fruit?

(1)

☒ **A** auxin

☒ **B** gibberellin

☒ **C** sucrose

☒ **D** ethene

(b) The effect of applying weed killer containing plant hormones to fields of wheat was investigated.

In field A, the weed killer was applied each year for five years.

In field B, no weed killer was applied for the five years.

Each field was 1000 m^2 and all other conditions remained the same.

The results are shown in Figure 14.

field	wheat yield in kg per 100 m^2				
	2015	2016	2017	2018	2019
A	54	52	48	49	50
B	32	28	34	33	34

Figure 14

Comment on the effect of using weed killer containing plant hormones in this investigation.

(3)

fields with the weed killer had a higher crop yield (1)

• the difference in crop yield varies (1)

• this must be caused by some other external factor / named factor (1)

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*(c) Figure 15 shows a pot plant before it fell over and the same pot plant two weeks after it fell over.

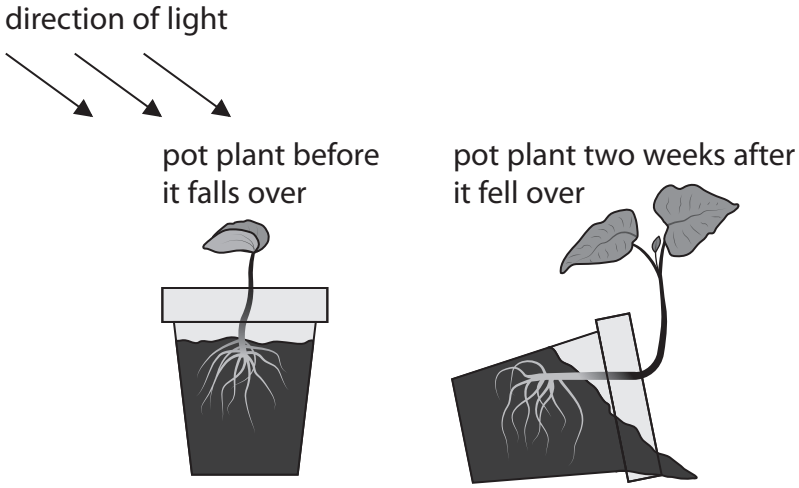

Figure 15

Explain how hormones in the roots and shoots of plants caused this directional growth.

(6)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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