

# Ecology part 2 AQA Triple Biology

Name:

\_\_\_\_\_

Class:

\_\_\_\_\_

Date:

\_\_\_\_\_

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Time:

**78 minutes**

Marks:

**75 marks**

Comments:

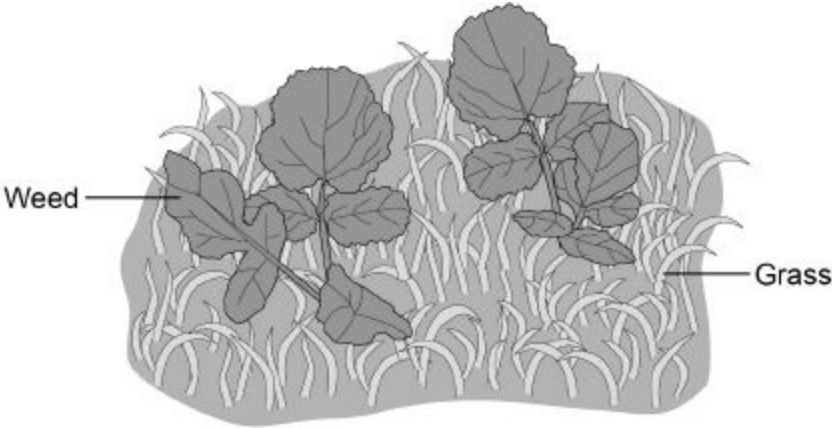
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1.

Some weed killers are selective.

Selective weed killers kill broad-leaved weed plants, but do **not** kill narrow-leaved grass plants.

The diagram below shows some weeds growing on a grassy lawn.



Some students investigated the effect of a selective weed killer on the weeds growing in a lawn. They used 0.5 m × 0.5 m quadrats.

The lawn was 20 metres long and 10 metres wide.

This is the method used.

1. Divide the lawn into two halves, side **A** and side **B**.
2. Place 5 quadrats in different positions on side **A**.
3. Place 5 more quadrats in different positions on side **B**.
4. Count the number of weed plants in each quadrat.
5. Spray side **A** with weed killer solution.
6. Spray side **B** with the same volume of water.
7. Repeat steps 2-4 after 2 weeks.

(a) Suggest a method the students should have used to place each quadrat.

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(1)

(b) Give the reason for the method you suggested in part (a).

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(1)

(c) Explain why the students used water on one side of the lawn instead of weed killer.

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(2)

The table below shows the students' results.

Number of weeds per quadrat				
At start		After 2 weeks		
Side A (Weed killer)	Side B (Water)	Side A (Weed killer)	Side B (Water)	
8	14	3	8	
2	9	4	15	
12	3	0	7	
15	16	2	12	
13	3	1	13	
<b>Mean</b>	10	9	2	<b>X</b>

(d) Calculate the mean value, **X**, in the table above.

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Mean value, **X** = \_\_\_\_\_

(1)

(e) Calculate the percentage decrease in the number of weeds on side **A** after 2 weeks.

Use the following equation:

$$\text{percentage decrease} = \frac{(\text{mean at start} - \text{mean after 2 weeks})}{\text{mean at start}} \times 100$$

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Percentage decrease = \_\_\_\_\_

(2)

(f) One student thought the results were **not** valid.

Suggest **one** improvement the students could have made to the method to make the results more valid.

Give the reason for your answer.

Improvement \_\_\_\_\_

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Reason \_\_\_\_\_

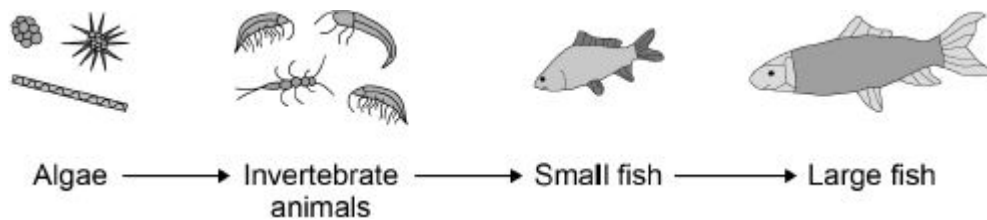
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(2)

(Total 9 marks)

2.

The diagram below shows a food chain in a river.



(a) Draw **one** line from each scientific term to the correct organism in the food chain.

Scientific term	Organism in the food chain
Apex predator	Algae
Primary consumer	Invertebrate animals
Producer	Large fish
	Small fish

(3)

(b) The table below shows the biomass of the organisms at each stage in the food chain.

Organism	Biomass in arbitrary units
Algae	840
Invertebrate animals	200
Small fish	40
Large fish	10

Calculate the percentage of the biomass of the invertebrate animals that is transferred to the large fish.

Use the equation:

$$\text{percentage} = \frac{\text{biomass of large fish}}{\text{biomass of invertebrate animals}} \times 100$$

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Percentage = \_\_\_\_\_

(2)

(c) A large amount of biomass is lost from the food chain.

Complete the sentences.

Choose answers from the box.

<b>coordination</b>	<b>digestion</b>	<b>excretion</b>
<b>filtration</b>	<b>ingestion</b>	<b>respiration</b>

When the small fish eat the invertebrate animals, not all of this material is broken down during \_\_\_\_\_ .

Materials absorbed from the gut may enter the body cells of the small fish.

These materials are broken down into carbon dioxide and water by \_\_\_\_\_ .

The carbon dioxide and other waste materials from the body cells are removed from the small fish by \_\_\_\_\_ .

(3)

(d) A disease kills many of the small fish.

Why does the number of invertebrate animals increase?

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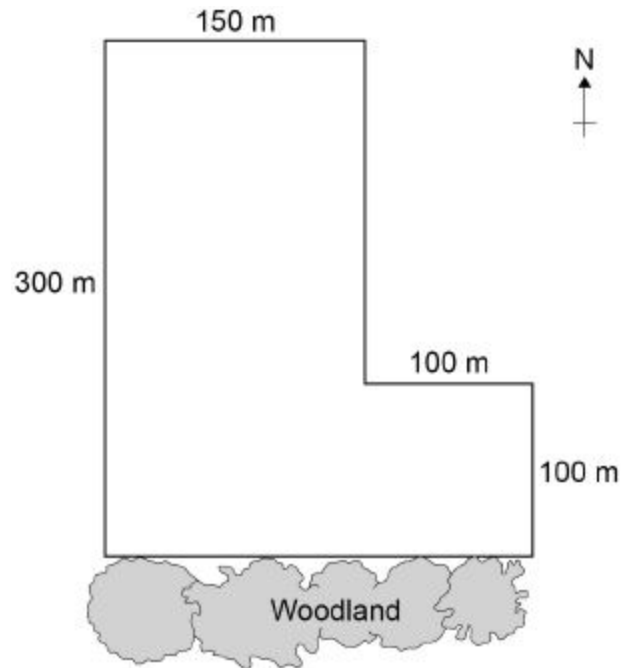
(1)

(Total 9 marks)

3.

Some students investigated the size of a population of dandelion plants in a field.

The diagram below shows the field.



The students:

- placed a 1 m × 1 m square quadrat at 10 random positions in the field
- counted the number of dandelion plants in each quadrat.

The table below shows the students' results.

<b>Quadrat number</b>	<b>Number of dandelion plants</b>
1	6
2	9
3	5
4	8
5	0
6	10
7	2
8	1
9	8
10	11

(a) Why did the students place the quadrats at random positions?

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(1)





(d) Light is an environmental factor that affects the growth of dandelion plants.

Give **two** other environmental factors that affect the growth of dandelion plants.

1. \_\_\_\_\_

2. \_\_\_\_\_

(2)

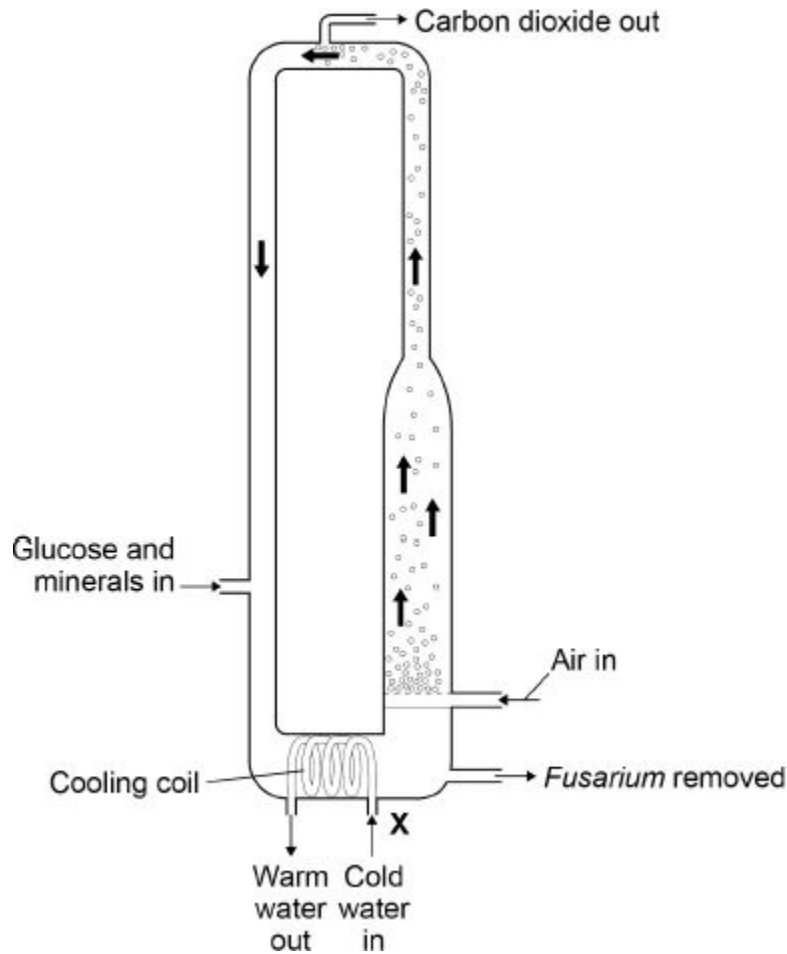
(Total 14 marks)

4.

Mycoprotein is a protein-rich food.

Mycoprotein is made from the fungus *Fusarium*.

The diagram below shows a fermenter used for growing *Fusarium*.



(a) Explain why the fermenter is sterilised before use.

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(2)

- (b) Cold water is pumped through the cooling coil at point X.  
This maintains a constant temperature inside the fermenter.  
Suggest the temperature at which *Fusarium* grows fastest.

Tick **one** box.

5 °C	<input type="checkbox"/>
20 °C	<input type="checkbox"/>
30 °C	<input type="checkbox"/>
85 °C	<input type="checkbox"/>

(1)

- (c) Glucose and bubbles of air enter the fermenter.

The bubbles of air supply oxygen.

Explain why *Fusarium* needs glucose and oxygen.

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(2)

- (d) The bubbles of air also move materials around the fermenter.

Suggest why it is useful for bubbles of air and materials to move around inside the fermenter.

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(2)

(e) 100 grams of chicken meat contains 22 grams of protein.

100 grams of mycoprotein contains 11 grams of protein.

A man ate 100 grams of chicken in one meal.

How many grams of mycoprotein would the man need to eat to get the same mass of protein as in 100 grams of chicken?

Tick **one** box.

- 100 grams
- 110 grams
- 200 grams
- 220 grams

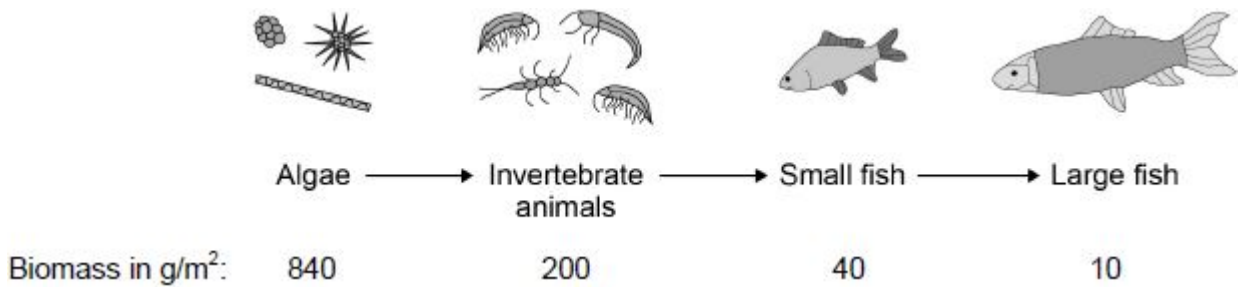
(1)  
(Total 8 marks)

5.

Figure 1 shows:

- a food chain for organisms in a river
- the biomass of the organisms at each trophic level.

Figure 1

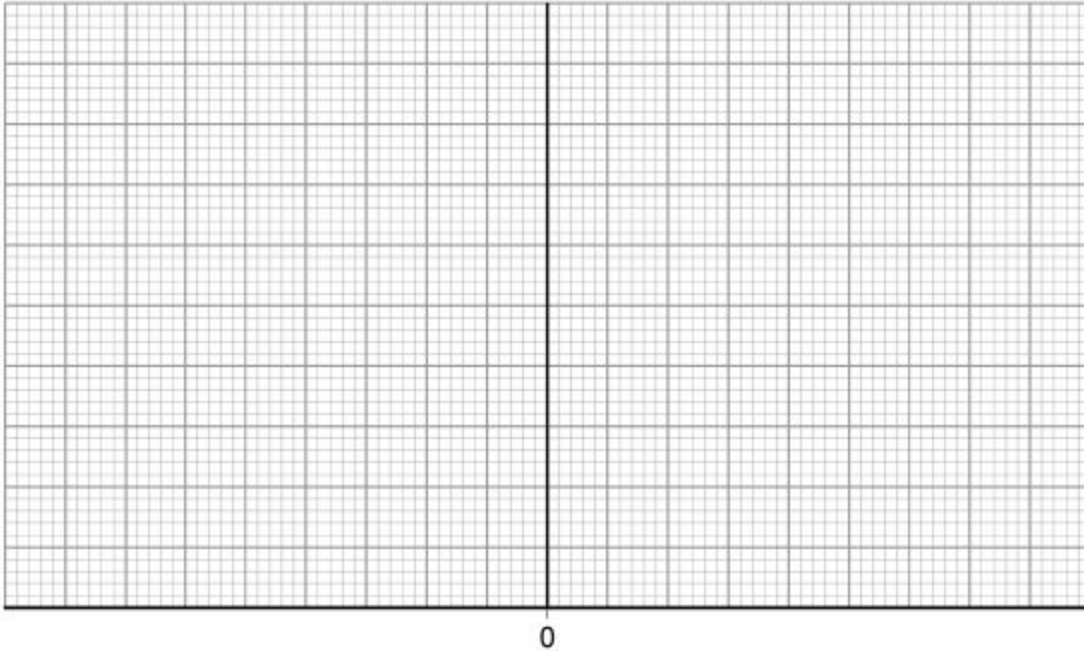


(a) Draw a pyramid of biomass for the food chain in **Figure 1** on **Figure 2**.

You should:

- use a suitable scale
- label the x-axis
- label each trophic level.

**Figure 2**



**(4)**

(b) Calculate the percentage of the biomass lost between the algae and the large fish.

Give your answer to 2 significant figures.

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Percentage loss = \_\_\_\_\_

**(3)**



**6.** Cell division is needed for growth and for reproduction.

(a) The table below contains three statements about cell division.

Complete the table.

Tick **one** box for each statement.

Statement	Statement is true for		
	Mitosis only	Meiosis only	Both mitosis and meiosis
All cells produced are genetically identical			
In humans, at the end of cell division each cell contains 23 chromosomes			
Involves DNA replication			

(2)

Bluebell plants grow in woodlands in the UK.

- Bluebells can reproduce sexually by producing seeds.
- Bluebells can also reproduce asexually by making new bulbs.

(b) One advantage of asexual reproduction for bluebells is that only **one** parent is needed.

Suggest **two** other advantages of asexual reproduction for bluebells.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

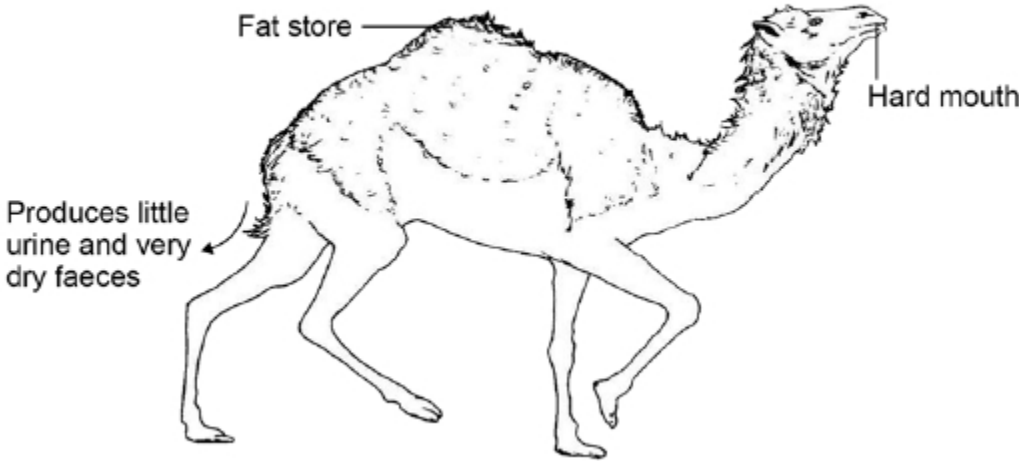


7.

**Figure 1** shows a type of camel called a dromedary (*Camelus dromedarius*).

The dromedary lives in hot, dry deserts.

**Figure 1**



(a) One adaptation of the dromedary is 'temperature tolerance'.

This means that the animal's body temperature can rise by up to 6 °C before it starts to sweat.

Explain how temperature tolerance can help the dromedary to survive in the desert.

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(2)

(b) Three more adaptations of the dromedary are given in **Figure 1**.

Give a reason why each adaptation helps the animal survive in the desert.

Fat store \_\_\_\_\_

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Produces little urine and very dry faeces \_\_\_\_\_

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Hard mouth \_\_\_\_\_

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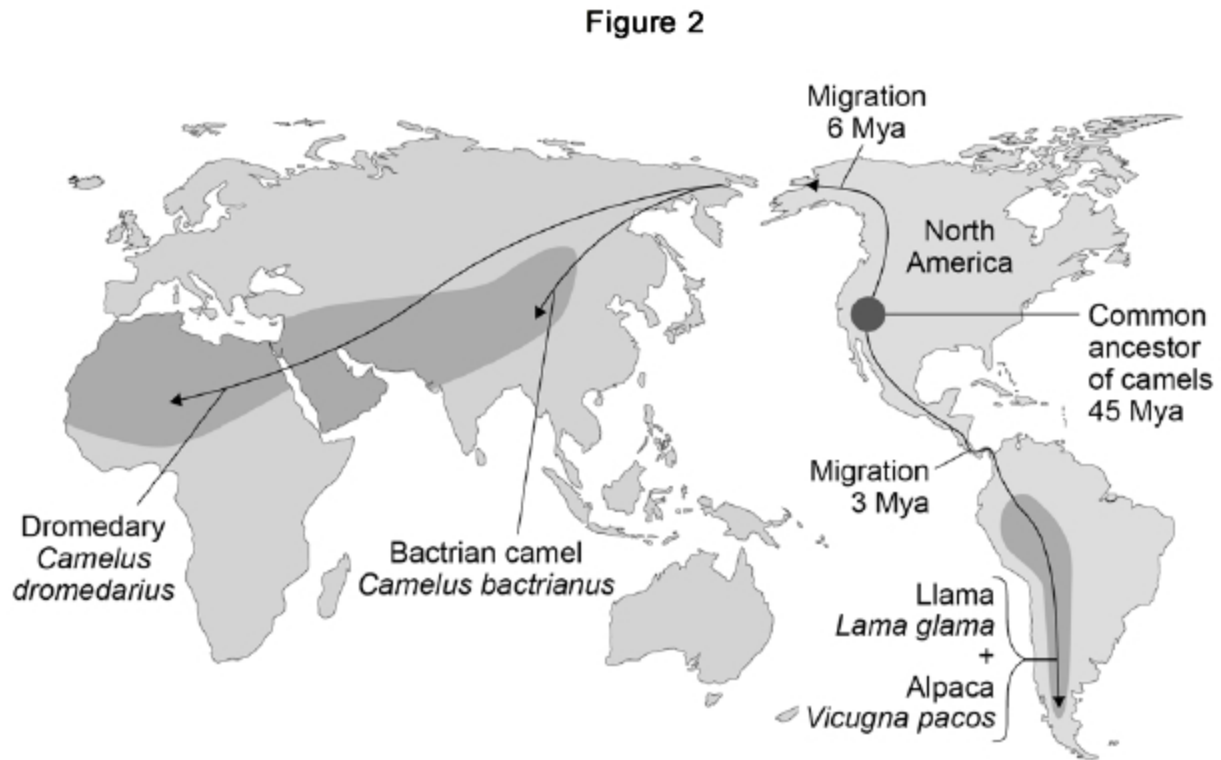
(3)

There are several species of the camel family alive today.

Scientists think these species evolved from a common ancestor that lived in North America about 45 million years ago (Mya).

**Figure 2** shows:

- where four modern species of the camel family live today
- how the ancestors of these camels migrated from North America.



(c) Which **two** of the four modern species of camel do scientists believe to be most closely related to each other?

Give the reason for your answer.

\_\_\_\_\_ and \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

(1)

- (d) Describe the type of evidence used for developing the theory of camel migration shown in **Figure 2**.

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**(2)**

- (e) Explain how several different species of camel could have evolved from a common ancestor over 45 million years.

**(6)**

**(Total 14 marks)**

## Mark schemes

1.

- (a) description of a method to achieve random placement  
*examples could include random number generator or  
random coordinates  
allow throw over the shoulder **or** with eyes shut  
ignore throw unqualified*

1

- (b) any **one** from:

- random (location)  
*allow by chance*
- avoid bias
- obtain valid / representative results  
*allow more accurate / precise mean  
ignore fair test / accurate / precise unqualified*

1

- (c) as a control / comparison

*allow see the difference*

1

**or**

B varies from A in only one factor

*do **not** accept a control variable*

(to) show results (in A) are due to weed killer

*allow to see the effect of the weed killer  
allow so the results are valid*

1

- (d) 11

*allow eleven*

1

- (e)  $\frac{10-2}{10} \times 100$

1

80

*an answer of 80 scores **2** marks*

1

(f) use more quadrats

*allow use larger quadrats*

*allow repeat*

1

original may not be representative **or** reference to weeds being distributed unevenly

*allow mean is more reliable / accurate / precise*

*ignore more valid*

1

**or**

leave for more than two weeks (1)

original may not be representative (1)

*allow mean is more reliable / accurate / precise*

*allow weed killer may take longer than two weeks to*

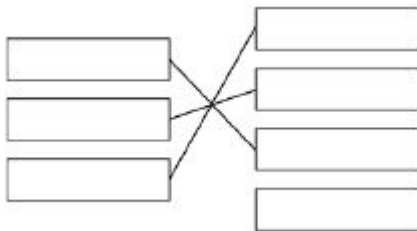
*work (fully)*

*ignore more valid*

[9]

2.

(a)



*extra line from a scientific term cancels the mark*

1

1

1

(b)  $\frac{10}{200} \times 100$

1

5 / 5.0

1

*an answer of 5 / 5.0 scores 2 marks*

(c) digestion

1

respiration

1

excretion

1

*in this order only*

- (d) fewer are eaten (by small fish)  
*allow there are fewer (small) fish eating them*  
*do **not** accept none are eaten*

1

[9]

3.

- (a) there is an uneven distribution of dandelions  
**or**  
 (more) representative / valid  
**or**  
 avoid bias  
**or**  
 more accurate / precise mean  
*ignore accurate / precise unqualified*  
*ignore repeatability / reproducibility / reliability / fair test*

1

- (b) (correct mean per m<sup>2</sup> =) 6 or 6.0

1

(correct field area =) 55 000 (m<sup>2</sup>)

1

mean × area – e.g. 6(.0) × 55 000

*allow incorrect calculated values for mean and / or field area*

1

330 000

*allow correct calculation from previous calculation*

1

$3.3 \times 10^5$

*allow calculated value in standard form*

1

*an answer of  $3.3 \times 10^5$  scores **5** marks*

*an answer of 330 000 scores **4** marks*

- (c) **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

5–6

**Level 2:** The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

**Level 1:** The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

**No relevant content**

0

## Indicative content

- placing of quadrat
- large number of quadrats used
- how randomness achieved – e.g. table of random numbers **or** random number button on calculator **or** along transect
- quadrats placed at coordinates **or** regular intervals along transect
- in each of two areas of different light intensities **or** transect running through areas of different light intensity
- for each quadrat count number of dandelions
- for each quadrat measure light intensity
- compare data from different light intensity

to access **level 3** the key ideas of using a large number of quadrats randomly, or along a transect, and counting the number of dandelions in areas of differing light intensity need to be given to produce a valid outcome

(d) any **two** from:

- temperature  
*allow heat*
- water  
*allow moisture / rain*
- (soil) pH  
*allow acidity*
- minerals / ions  
*allow e.g. magnesium ions **or** nitrate*  
*allow salts / nutrients*
- winds
- herbivores  
*allow trampling*  
*ignore carbon dioxide*  
*ignore space*  
*ignore competition unqualified*  
*do **not** accept oxygen*

2

[14]

4.

- (a) kills microorganisms / bacteria / fungi / viruses / microbes  
*allow to remove microorganisms / bacteria / fungi / viruses / microbes*  
*ignore germs*  
*allow so mycoprotein is not contaminated*

1

(which) compete for food / oxygen

**or**

which make toxins

*allow so mycoprotein is safe to eat*

**or**

which are pathogens

**or**

which might kill the fungus / *Fusarium*

1

- (b) 30 °C

1

- (c) for (aerobic) respiration

*do **not** accept anaerobic*

1

(which) releases energy (for growth)

*do **not** accept produces energy*

*allow glucose is used to make other organic substances*

*e.g. protein*

1

- (d) any **two** from:

so *Fusarium* can

- grow faster / better
- get sufficient food / glucose / minerals

*allow more / enough*

- get sufficient oxygen

*allow more / enough*

- get rid of sufficient carbon dioxide

*allow more / enough*

*allow waste*

- be kept at a (suitable) temperature

*allow to avoid 'clumping'*

2

- (e) 200 grams

1

**[8]**

5.

(a) x-axis: scale + labelled, including units

*scale  $\geq \frac{1}{2}$  width of graph paper label: biomass in g/m<sup>2</sup>*

1

bar widths correct

*$\pm \frac{1}{2}$ -square each side*

*allow 1 mark if 3 correct*

2

all 4 bars correctly labelled

*large fish + small fish + invertebrate (animals) + algae*

**or**

*(trophic level) 4 + 3 + 2 + 1*

**or**

*tertiary consumer + secondary consumer + primary consumer + producer*

*ignore bar heights*

1

(b)  $\frac{840 - 10}{840} \times 100$

*allow equivalent calculation*

1

98.809523... / 98.810 / 98.81 / 98.8

1

99

*allow answer given to two significant figures from an incorrect calculation in step 2*

1

*an answer of 99 scores 3 marks*

(c) inedible parts / example

*allow eaten by other animals **or** not all organisms eaten*

**or**

egested / faeces

*allow not digested*

*allow excretion / urine*

*ignore waste*

**or**

respiration / as CO<sub>2</sub>

*ignore energy losses*

*ignore movement*

1

(d) bacteria decay organic matter / sewage / algae / dead plants

1

(by) digestion

*allow example such as starch broken down to sugar*

**or**

*protein broken down to amino acids*

1

(and) bacteria respire aerobically

**or**

respire using oxygen

1

(which) lowers oxygen concentration (in water)

**or**

fish have less oxygen

*allow reduced respiration of fish*

1

(so) reduced energy supply causes death of fish

*allow toxins in the sewage kill fish*

*ignore pathogens or (pathogenic) bacteria cause*

*disease in fish and kills them*

1

[13]

6.

(a)

	statement is true for		
	mitosis only	meiosis only	both mitosis and meiosis
all cells produced are genetically identical	✓		
in humans, at the end of cell division each cell contains 23 chromosomes		✓	
involves DNA replication			✓

3 correct = 2 marks

2 correct = 1 mark

0 or 1 correct = 0 marks

2

(b) any **two** from:

*ignore references to one parent only*

- many offspring produced
- takes less time  
*allow asexual is faster*
- (more) energy efficient
- genetically identical offspring  
*allow offspring are clones*
- successful traits propagated / maintained / passed on (due to offspring being genetically identical)
- no transfer of gametes or seed dispersal  
*allow no vulnerable embryo stage*  
*allow no need for animals*
- not wasteful of flowers / pollen / seeds
- colonisation of local area  
*must imply local area*

2

(c) genetic variation (in offspring)

1

(so) better adapted survive

*allow reference to natural selection or survival of the fittest*

1

(and) colonise new areas by seed dispersal

**or**

can escape adverse event in original area (by living in new area)

*must imply new area*

1

many offspring **so** higher probability some will survive

1

*allow bluebell example described (max 3 if not bluebell)*

**[8]**

**7.**

(a) less sweating so less water loss

1

(as) no / little water available in desert

1

- (b) (fat store) can be metabolised / respired to water 1
- (little urine...) conserve water 1
- (hard mouth) not damaged by spines on plants / on food  
**or**  
 not damaged by hard / dry food 1
- (c) dromedary / *C. dromedarius*  
**and** bactrian / *C. bactrianus*  
*no mark for the names, but must be identified*  
**because**  
 same genus  
*ignore 'both are Camelus'* 1
- (d) any **two** from:
- the fossil record
  - oldest fossils in N. America  
**or**
  - newer fossils in S. America / in Asia / in Africa  
*allow numbers for ages (45 Mya **and** 3 Mya / 6 Mya)*
  - chemical / DNA analysis of living species  
*allow radioactive dating of fossils* 2
- (e) isolation of separate camel populations by sea  
**or**  
 by mountains 1
- habitat variation / described between populations  
*allow examples – biotic (e.g. food / predators) or abiotic* 1
- genetic variation / mutation in each population 1
- 45 million years is sufficient time to accumulate enough mutations 1
- natural selection  
**or**  
 better adapted survive to reproduce 1
- pass on favourable allele(s)  
*allow gene(s)* 1