

Ecology part 1 AQA Triple Biology

Name:

Class:

Date:

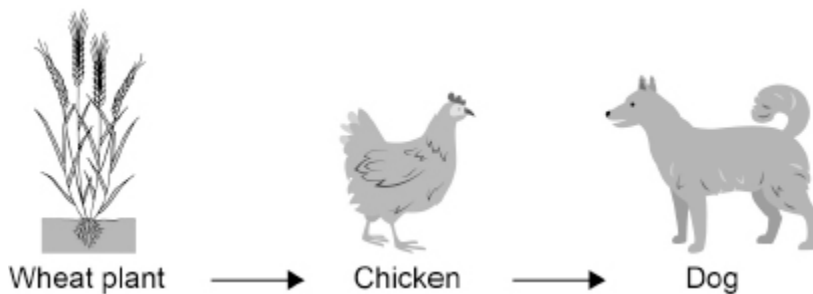
Time: **79 minutes**

Marks: **75 marks**

Comments:

1. A food for pet dogs contains meat from chickens.

The below diagram shows the food chain.



(a) What is the trophic level of the dog?

Tick (✓) **one** box.

1 2 3

(1)

(b) Draw **one** line from each organism to the description of the organism's position in the food chain.

Organism	Description
Chicken	Herbivore
Dog	Producer
Wheat	Secondary consumer
	Tertiary consumer

(3)

(c) Name the process wheat plants use to make glucose.

(1)

(d) Some of the chicken biomass does **not** become part of the dog's biomass.

What is **one** reason why?

Tick (✓) **one** box.

Some of the chicken is used for the dog to grow

The dog produces waste in faeces

The wheat is eaten by the dog

(1)

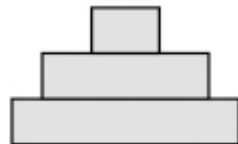
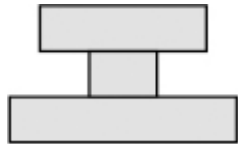
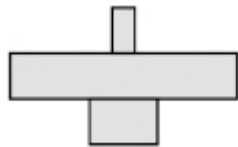
A new dog food has been developed.

The new dog food is made from insects.

The insects in the dog food factory are fed on vegetables.

(e) Which pyramid of biomass represents the vegetables, insects and dogs in this food chain?

Tick (✓) **one** box.



(1)

(f) Beef from cows is used to make some dog food.

Cows release methane.

The company that makes dog food from insects made the statement: 'Dog food made from insects is more sustainable than dog food made from beef.'

Which are **two** reasons that support the company's statement?

Tick (✓) **two** boxes.

Dogs will eat more insects than cows

Farming cows needs more land than farming insects

Fewer cows being farmed will slow down global warming

Fewer insects than cows are needed to produce dog food

The food chain for dog food made from insects has more trophic levels

(2)

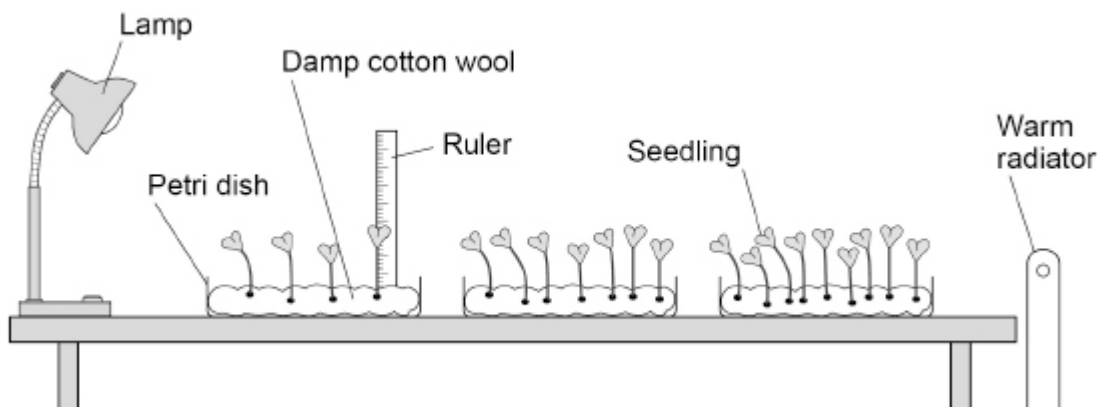
(Total 9 marks)

2.

A student investigated the effect of light intensity on the growth of seedlings.

Figure 1 shows the equipment.

Figure 1



(a) Which **two** improvements should the student make to the investigation?

Tick (✓) **two** boxes.

Give more water to the seedlings nearest the lamp

Leave some of the seedlings for a few more days

Open a window to let more air in

Put all the dishes the same distance from the radiator

Use equal numbers of seedlings in each dish

(2)

(b) What is the dependent variable in the investigation?

Tick (✓) **one** box.

The height of the seedlings

The mass of cotton wool

The temperature of the room

(1)

(c) In each dish the seedlings compete with each other.

Give **two** factors the seedlings compete for.

1 _____

2 _____

(2)

Figure 2 shows a seedling growing towards a lamp.

Figure 2



(d) What happened to the growth of the seedling on side **P** compared with the growth on side **Q**?

Tick (✓) **one** box.

Side **P** has grown less than side **Q**

Side **P** has grown more than side **Q**

Side **P** has grown the same as side **Q**

(1)

(e) Plant responses are called tropisms.

Which tropism causes the seedling to grow towards light?

Tick (✓) **one** box.

Geotropism

Gravitropism

Phototropism

(1)

(f) Which hormone causes the seedling to grow towards the light?

Tick (✓) **one** box.

Auxin

Insulin

Testosterone

(1)

(Total 8 marks)

3.

This question is about the decay of milk.

(a) Name **two** types of microorganism that cause decay.

1. _____

2. _____

(2)

(b) Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease.

(1)

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.
2. Keep each test tube at a different temperature.
3. Measure the pH of the milk in each tube every day for 12 days.
4. Record the number of days taken to reach pH 5.
5. Repeat steps 1 to 4 with goats' milk and with almond milk.

(c) Give **one** way the pH can be measured.

(1)

(d) Give **two** control variables the student should have used in this investigation.

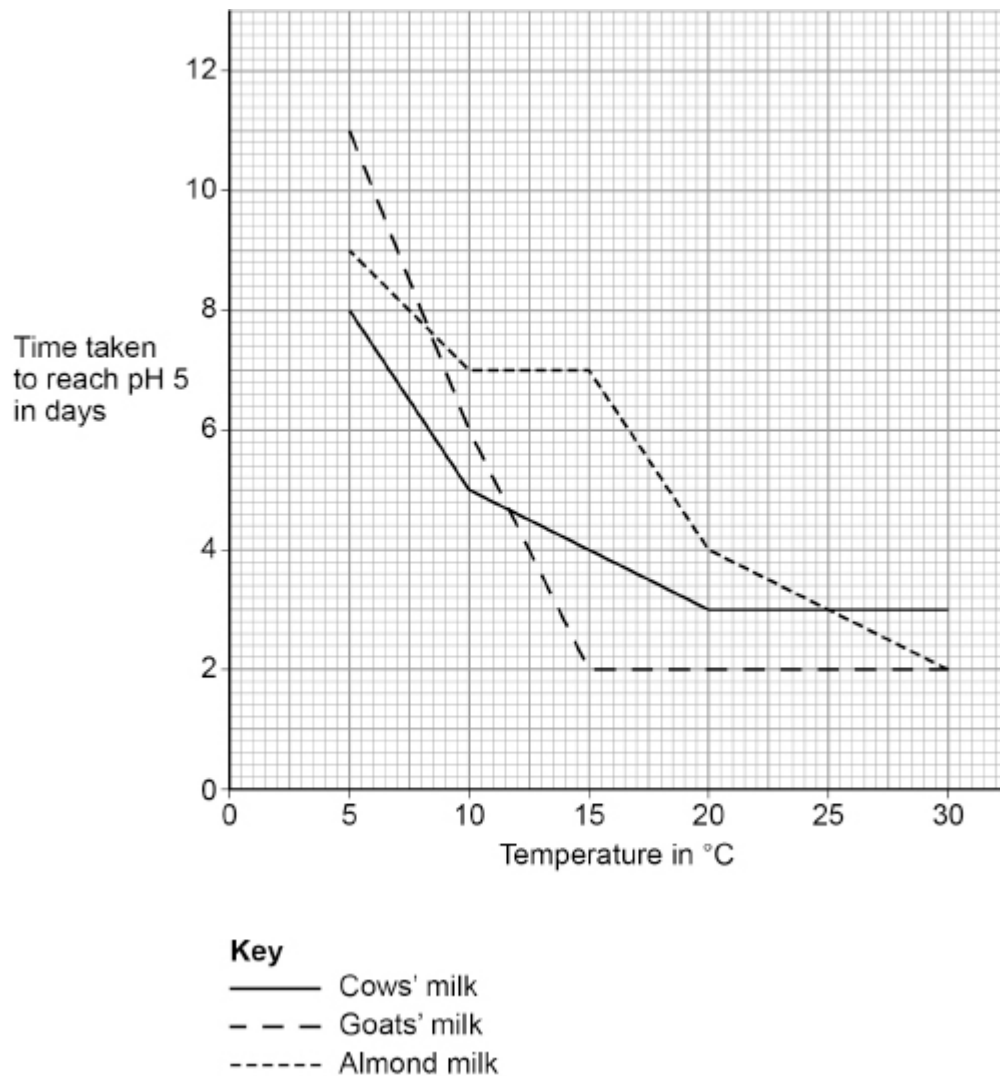
1. _____

2. _____

(2)

The student improved the investigation to produce valid results.

The graph shows the results.



(e) Which type of milk stays fresh the longest at 10 °C?

(1)

(f) Describe the effect of temperature on the time taken for **goats'** milk to reach pH 5.

Use data from the graph above in your answer.

(2)

(g) The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest **one** reason why.

(1)

(h) Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

1 _____

2 _____

(2)

(i) The student said:

'The temperature milk is stored at affects how likely the milk is to cause food poisoning.'

How can the investigation be developed to find out if the student is correct?

Tick (✓) **one** box.

Determine the types of bacteria present in the milk

Record the pH every 12 hours

Use more than three different types of milk

(1)

(Total 13 marks)

4.

A new dog food has been developed that does **not** contain meat from cows, sheep or chickens.

The new dog food contains insects.

The insects in the dog food factory are fed on waste vegetables.

(a) Sketch the pyramid of biomass for the food chain that produces food for dogs from insects.

Label the pyramid.

(2)

(b) Describe **two** reasons why the biomass of the insects eaten by dogs does **not** all become biomass of the dogs.

1 _____

2 _____

(2)

(c) Explain how making dog food from insects could improve **human** food security in the future.

(4)

(Total 8 marks)

5.

Figure 1 shows a flightless bird called the dodo (*Raphus cucullatus*).

Figure 1



The dodo:

- was 1 m tall
- had a mass of 20 kg
- lived in rainforests on a tropical island
- ate fruits
- made its nest on the ground.

A female dodo laid only one egg each year.

Humans arrived on the island in the year 1507. By 1681 the dodo was extinct.

(a) What is the genus of the dodo?

Tick (✓) **one** box.

Animal	<input type="checkbox"/>
Bird	<input type="checkbox"/>
Raphus	<input type="checkbox"/>

(1)

(b) Before the arrival of humans, there were no other large animals living on the island.

Suggest **two** reasons why the dodo became extinct soon after the arrival of humans.

1 _____

2 _____

(2)

Today, humans are cutting down large areas of tropical rainforests.

(c) Suggest **one** use of the land after the trees have been removed.

(1)

(d) Why does the removal of trees cause an increase in carbon dioxide in the atmosphere?

Tick (✓) **two** boxes.

There are fewer animals.

There is less photosynthesis.

There is less respiration.

The soil dries out.

The trees are burned.

(2)

(e) What effect would an increase in carbon dioxide in the atmosphere have on global air temperature?

Tick (✓) **one** box.

Decrease

Increase

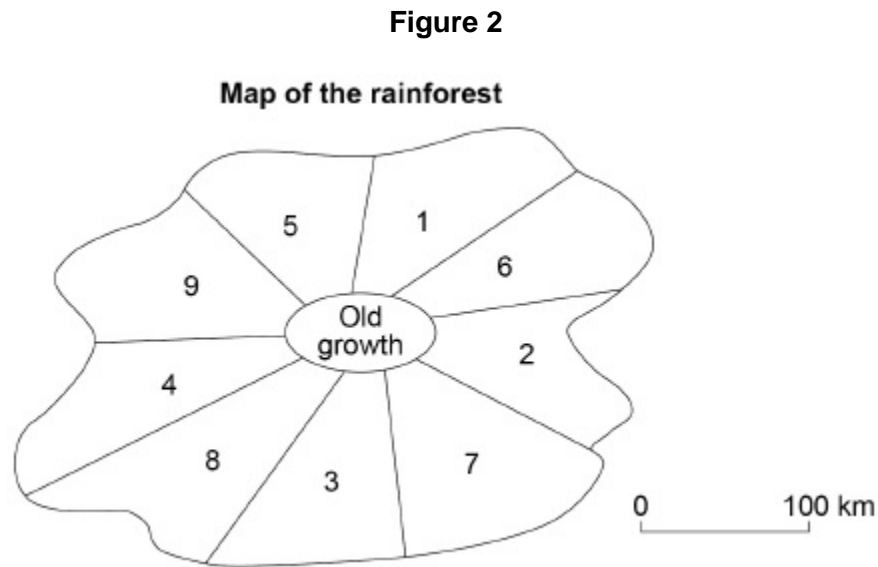
Stay the same

(1)

'Sustainable forestry' reduces the harmful effects of cutting down trees on the environment.

Figure 2 shows a method of 'sustainable forestry'.

Numbers 1–9 show different parts of a rainforest.



The trees are cut down in the sequence 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9

- The trees are cut down in only one area at any one time.
- It takes 30 years to cut down the trees in each area.
- The trees in the 'Old growth' area are never cut down.

(f) How many years would it take to cut down the trees in all of the numbered areas in **Figure 2**?

Number of years = _____

(2)

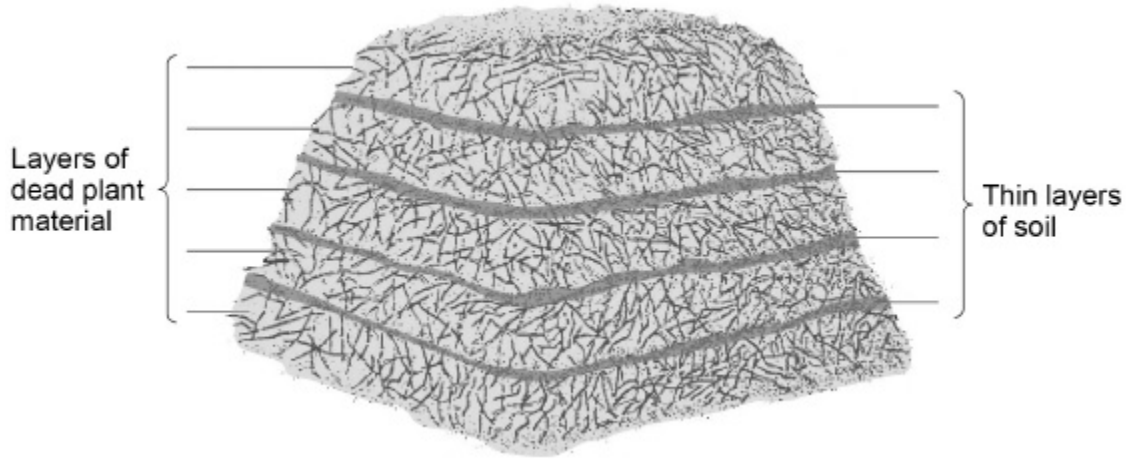
6.

Gardeners sometimes make compost heaps from dead plant material.

The dead plants decay in the compost heap.

Figure 1 shows a compost heap.

Figure 1



(a) The thin layers of soil contain organisms that cause decay.

Which **two** types of organism cause decay?

Tick (✓) **two** boxes.

Bacteria

Fungi

Grass

Insects

Worms

(2)

The rate of decay in the compost heap depends on several environmental factors.

(b) Explain how the rate of decay would be affected by:

- an increase in oxygen concentration
- a temperature increase from 5 °C to 25 °C

(3)

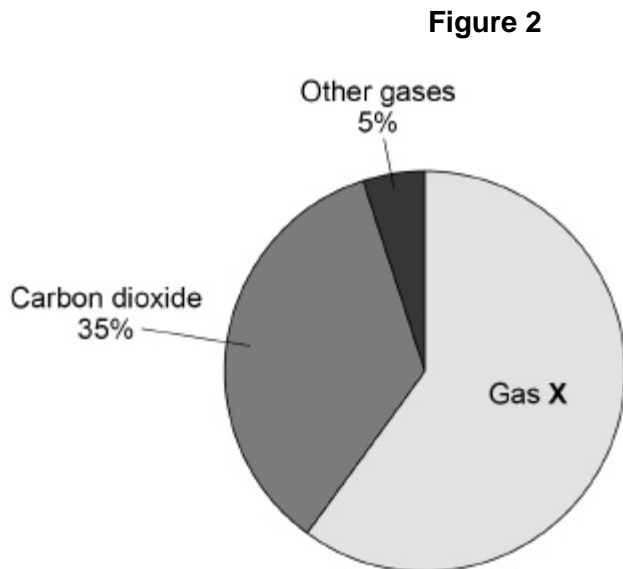
(c) Give **one** environmental factor needed for decay.

Do **not** refer to oxygen or temperature in your answer.

(1)

Dead plant material can also be decayed in a biogas generator.

Figure 2 shows the percentages of the gases found in a sample of biogas.



(d) Gas X is the main fuel gas found in the biogas.

What is gas X?

Tick (✓) **one** box.

Carbon monoxide

Hydrogen

Methane

Nitrogen

(1)

(e) What is the percentage of gas X in the biogas?

Percentage = _____%

(1)

- (f) The dead plant material in the compost heap and biogas generator does **not** decay completely.

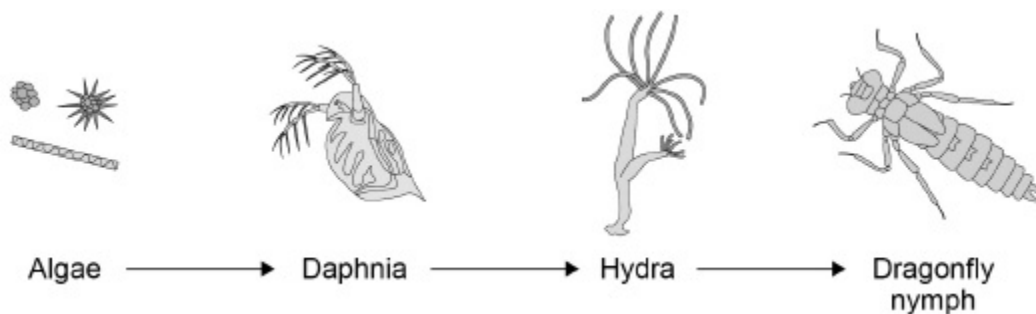
Explain why a farmer might spread the remaining dead plant material onto his fields.

(2)
(Total 10 marks)

7.

Figure 1 shows a food chain in a pond.

Figure 1



- (a) Which term describes the Daphnia in this food chain?

Tick (✓) **one** box.

Apex predator

Primary consumer

Producer

Secondary consumer

(1)

(b) Draw a pyramid of biomass for the food chain.

Label each trophic level.

(2)

(c) Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

(1)

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm³ of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

The table below shows the results.

Sample number	Number of Daphnia in 1 dm ³ water
1	5
2	21
3	0
4	16
5	28

(d) Calculate the mean number of Daphnia in 1 m³ of pond water.

$$1 \text{ m}^3 = 1000 \text{ dm}^3$$

Mean number of Daphnia in 1 m³ of pond water = _____

(2)

(e) The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from part (d).

Give your answer in standard form.

Number of Daphnia in the pond = _____

(4)

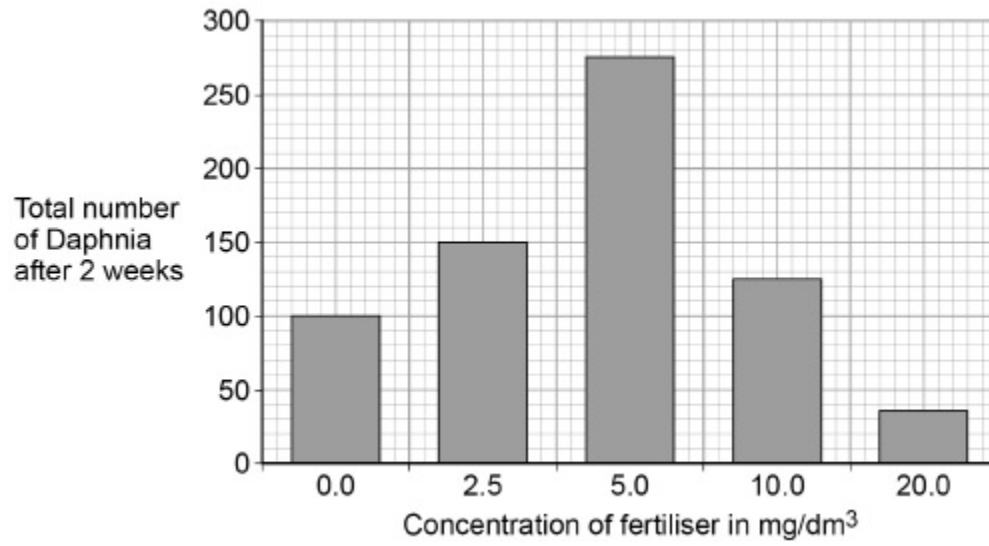
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 2 shows the results.

Figure 2



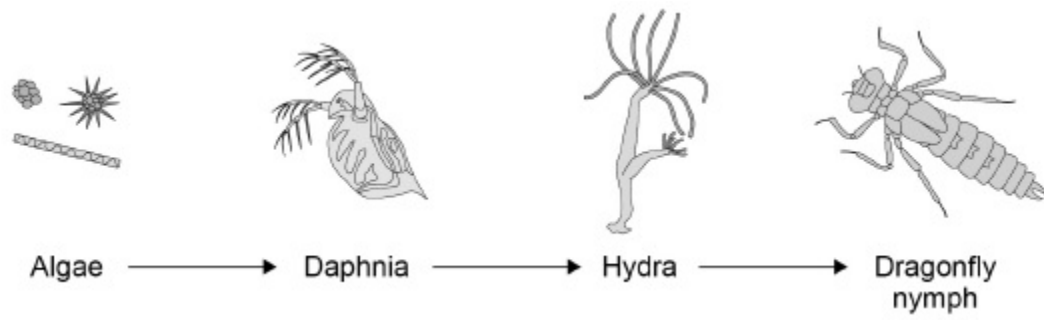
- (f) A concentration of 5.0 mg/dm³ of fertiliser caused a large increase in the population of Daphnia.

Explain why.

(2)

(g) **Figure 1** is repeated below.

Figure 1



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

(2)
(Total 14 marks)

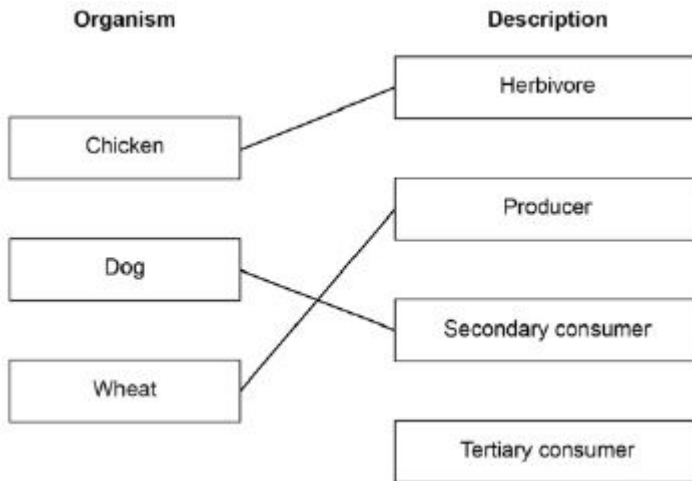
Mark schemes

1.

(a) 3

1

(b)



additional line from a box on the left negates the mark for that box

3

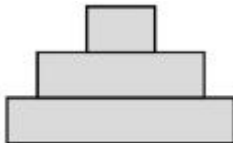
(c) photosynthesis

1

(d) the dog produces waste in faeces

1

(e)



1

(f) farming cows needs more land than farming insects

1

fewer cows being farmed will slow down global warming

1

[9]

2.

(a) put all the dishes the same distance from the radiator

1

use equal numbers of seedlings in each dish

1

(b) the height of the seedlings

1

- (c) any **two** from:
- light
 - water
 - mineral(s) / ions / salts
- allow nitrate / magnesium / nitrogen / nutrients*
allow space
ignore food
ignore carbon dioxide / oxygen
ignore heat

2

- (d) side **P** has grown less than side **Q**

1

- (e) phototropism

1

- (f) auxin

1

[8]

3.

- (a) bacteria

allow singular

1

fungi

allow mould

ignore microbes / germs / decomposers
*do **not** accept viruses*

1

- (b) fatty acid(s)

1

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

- universal indicator (paper / solution)

allow UI (paper / solution)

ignore pH paper unqualified

- pH meter

allow pH probe

ignore datalogger unqualified

ignore Cresol red

ignore phenolphthalein / litmus

1

(d) any **two** from:

- volume of milk
allow amount of milk
- exposure to air / oxygen
- sterilise test tubes
allow bungs on test tubes
- treatment of milk before investigation
allow example such as pasteurised or not
- freshness / age of milk (at start)
- time of day pH was measured
allow starting pH of milk

2

(e) almond (milk)

1

(f) as temperature increases up to 15 °C the time taken (to reach pH 5) decreases

allow converse

1

above 15 °C the time taken (to reach pH 5) stays the same

if no other mark awarded allow 1 mark for as temperature increases the time taken (to reach 5 °C) decreases and then stays the same

1

(g) any **one** from:

- bacteria / microbes / microorganisms / fungi dividing faster (when warmer)
allow converse if clearly describing 5 °C
allow number of bacteria / microbes / microorganisms / fungi increasing (when warmer)
allow more bacteria microbes / microorganisms / fungi
- reactions (in the bacteria) are happening faster (to decay milk)
- (because there is) more (kinetic) energy
allow particles move faster
allow more collisions between particles
- enzyme activity is higher (at 10 °C than at 5 °C)
allow enzymes work faster
ignore enzymes work better

1

(h) any **two** from:

- different concentration / type of fat / lipid
allow different amounts of fat / lipid
- different concentration / type of proteins / carbohydrate / sugar
allow different amounts of proteins / carbohydrate / sugar
- different (amount / type of) bacteria present
- may have been pasteurised by a different process
allow may have been treated in different ways (before the investigation)
- different starting pH
ignore different oxygen concentration

2

(i) determine the types of bacteria present in the milk

1

[13]

4.

(a) triangular pyramid with 3 levels

1

correct labels: (waste) vegetables / plants; insect(s); dog(s)
*do **not** accept additional incorrect labels*

1

(b) any **two** from:

- carbon dioxide from respiration (from dog)
allow carbon dioxide breathed out (by dog)
- urea from excretion (from dog)
allow urea in urine (from dog)
- not all parts (of insects) are absorbed / digested (by dog)
allow faeces from egestion (from dog)
ignore references to loss of energy
*if no other mark awarded allow **two** factors without descriptions for 1 mark*

2

- (c) less land required 1
- (so) more space for crops (for humans)
allow more meat (from cows etc) for humans 1
- less methane (from animals) therefore less global warming
allow less methane from rotting vegetables in landfill 1
- (therefore) less harmful effects of global warming on (human) food production
allow example such as less flooding of farmland
allow may lead to the development of more foods for humans made from insects 1

[8]

- 5.** (a) Raphus 1
- (b) any **two** from:
- humans hunted / killed / ate the dodo **or** dodo easy to catch
 - humans ate / collected eggs
 - humans ate the dodo's food
 - animals brought by humans ate dodo / eggs
allow examples – eg cats / dogs / pigs / rats
 - diseases introduced by humans **or** by imported animals
 - humans destroyed dodo's habitat / nests
allow deforestation 2
- (c) any **one** from:
- growing crops / biofuels
allow farming / agriculture
 - grazing animals
 - building houses
allow other correct examples – eg building roads
 - quarrying / mining
 - dumping waste 1
- (d) there is less photosynthesis
 the trees are burned 1
1
- (e) increase 1

(f) *an answer of 270 scores 2 marks*

9 × 30

1

270

1

(g) **Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

3-4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1-2

No relevant content

0

Indicative content

- displaced animals can move to adjacent areas
- where suitable habitat is found **or** where the trees have not been cut down

- seeds return to deforested area
- from other (forested) areas

- plants / trees begin to grow back
- so provide food / shelter / nest sites / suitable habitat for animals

- animals return to re-growing area
- from other (forested) areas

- sufficient time for regeneration

- old growth area is a source of recolonising organisms

[13]

6.

(a) bacteria

1

fungi

1

(b) both increase rate

1

because oxygen is needed for (aerobic) respiration **or** oxygen is used to release energy

*do **not** accept anaerobic
ignore energy produced*

1

as increased temperature causes faster reactions

*allow named example
eg respiration
allow increased rate of enzyme action*

1

(c) water

*allow H₂O / H2O / moisture / rain
do **not** accept H²O / H2O*

1

(d) methane

1

(e) 60

allow sixty

1

(f) so plants / crops grow faster / better

1

(decays further and) releases / contains mineral ions / named example

*allow releases / contains nutrients
ignore nitrogen / food / carbon dioxide
allow as a fertiliser
allow retains water in soil
allow improves drainage
allow insulates / keeps warm
allow suppresses weed growth
allow improves soil structure*

1

[10]

7.

(a) primary consumer

1

(b) correct shape: 4 tiers with largest at bottom and smallest at top

1

correctly labelled:

dragonfly / nymph

+ hydra

+ daphnia

+ algae

in this order

or allow:

3rd-order or tertiary consumer or apex / top predator or (trophic level) 4

2nd-order or secondary consumer or (trophic level) 3

1st-order or primary consumer or herbivore or (trophic level) 2 producer

or (trophic level) 1

allow for 2 marks inverted pyramid if correctly labelled

1

(c) any **one** from:

(Daphnia biomass smaller because)

- non-digestible parts (of algae) or lost in faeces

ignore waste

- not all absorbed
- lost in urine / urea
- used in respiration **or** lost as carbon dioxide / CO₂
allow excretion
allow (to supply energy) for movement / warmth
allow used to supply energy
- algae not all eaten **or** eaten by other organisms
- some algae decompose

1

(d)

an answer of 14 000 scores 2 marks

14

1

14 000

allow evidence of an incorrectly calculated mean $\times 1000$

allow 1.4×10^4

1

(e)

*an answer of 2.625×10^4 or 2.63×10^4 or 2.6×10^4
scores 4 marks*

an answer of 26250 scores 3 marks

allow ecf from part (d)

(volume of pond =) 1.875 or $2.5 \times 1.5 \times 0.5$

*an incorrect answer for one step does **not** prevent
allocation of marks for subsequent steps*

1

$14\ 000 \times 1.875$

allow ecf from part (d)

1

26250

1

2.625×10^4

allow 2.63×10^4 or 2.6×10^4

1

(f) increased (growth / reproduction of) algae

1

(more algae so) more food for Daphnia

*allow fertiliser toxic to Hydra (1) (so) fewer Daphnia
eaten (1)*

1

(g) (Hydra have) less food

1

because (graph shows) fewer Daphnia (with more fertiliser)

*allow other valid suggestions, eg
fertiliser toxic to Hydra (1)*

or

*fertiliser causes growth of algae (on surface) which
block light and so die and decay*

or

eutrophication (1)

*(decay / eutrophication) uses up oxygen (so lack of
oxygen for Hydra) (1)*

1

[14]