Ecology part 5 AQA Triple Biology

Name: _____

Class: _____

Date: _____

Time: **90 minutes**

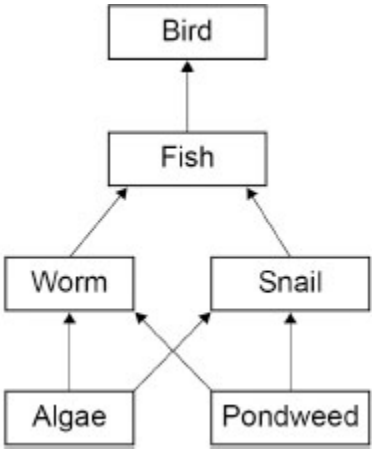
Marks: **85 marks**

Comments:

1. Different species in a habitat may depend on each other for food.

Several food chains may be linked together to form a food web.

The figure below shows a food web in a lake.



(a) Most organisms in the food web get their energy by eating other organisms.

Where does the pondweed get energy from?

Tick (✓) **one** box.

Carbon dioxide ☐

Mineral ions ☐

Sunlight ☐

Water ☐

(1)

(b) Name **one** organism from the figure above that is a primary consumer.

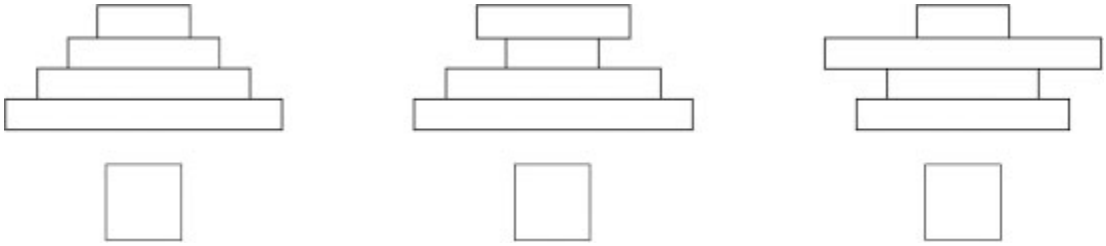
_____

(1)

(c) There are four trophic levels in the figure above.

Which is the correct pyramid of biomass for the food web in the figure above?

Tick (✓) **one** box.



(1)

(d) One of the food chains in the figure above is:

algae → worm → fish → bird

10% of the biomass in each trophic level is transferred to the next trophic level.

What percentage of the biomass in the algae is transferred to the fish?

Tick (✓) **one** box.

10% ☐ 1% ☐ 0.1% ☐

(1)

(e) What are **two** ways that **energy** is lost from organisms in the food chain?

Tick (✓) **two** boxes.

Diffusion ☐

Faeces ☐

Movement ☐

Osmosis ☐

Photosynthesis ☐

(2)

(f) Scientists counted the number of fish, snails and worms in a sample taken from the lake.

The table below shows the results.

	Tally	Number of organisms in the sample
Fish	𝍸	
Snails	𝍸 𝍸 ||	
Worms	𝍸 𝍸 𝍸 𝍸 |||	

Complete the table above.

(2)

(Total 8 marks)

2. Many farmers keep animals such as cows and chickens.

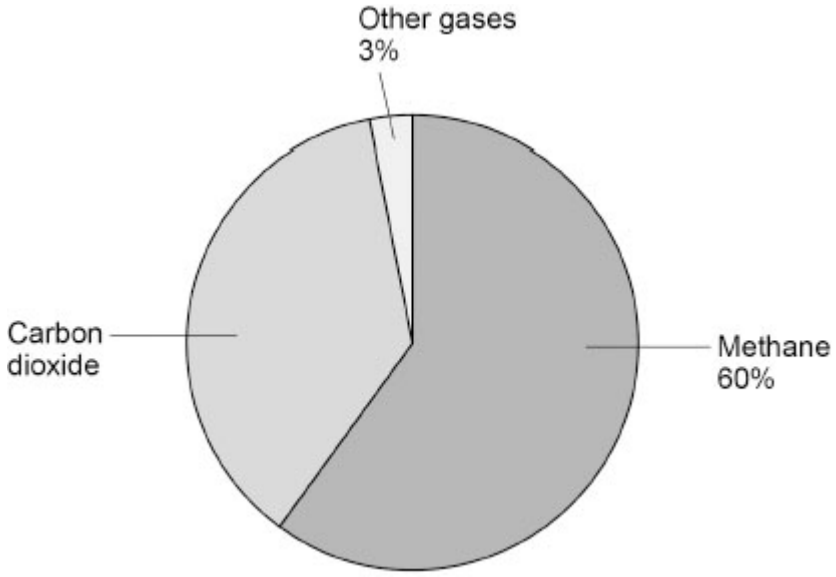
The animals produce a lot of manure (faeces).

The farmer can put the manure into a biogas generator.

In the biogas generator, microorganisms produce biogas.

(a) **Figure 1** shows the percentages of the gases found in a sample of biogas.

Figure 1



Calculate the percentage of carbon dioxide in the biogas in **Figure 1**.

_____

_____

_____

Percentage of carbon dioxide = _____ %

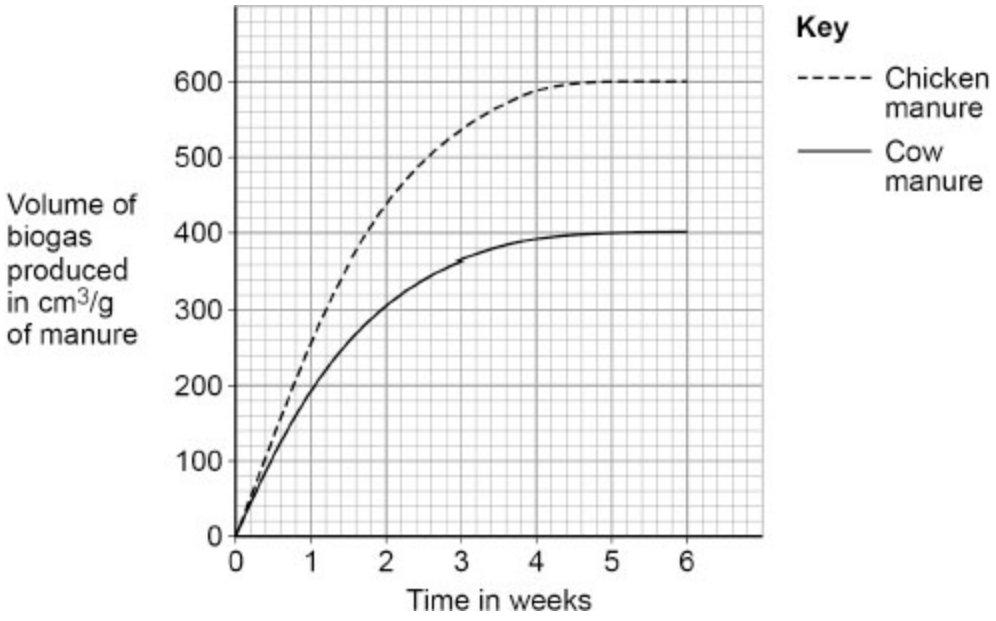
(2)

(b) Scientists investigated biogas production from manure produced by cows and by chickens.

The scientists measured the production of biogas for 6 weeks.

Figure 2 shows the results.

Figure 2



The scientists made **three** conclusions from the results.

Give evidence from **Figure 2** to support each conclusion.

Conclusion 1: 'It is better to use chicken manure than cow manure for making biogas.'

Evidence _____

_____

Conclusion 2: 'Biogas production is fastest in the first week.'

Evidence _____

_____

Conclusion 3: 'After 4 weeks it is a waste of money to run the biogas generator.'

Evidence _____

_____

(3)

Another group of scientists investigated the effect of adding fish fat to the manure used for biogas production.

Fish fat is a waste product from the sea fishing industry.

The table below shows the results.

	Volume of biogas produced in cm^3/g	**Volume of methane produced in cm^3/g**	**Percentage (%) of methane in the biogas**
No fish fat	426	256	60
Fish fat added	999	599	60

(c) Complete the sentences.

Choose answers from the box.

decreases	**stays the same**	**increases**

Each answer may be used once, more than once or not at all.

When fish fat is added, the volume of biogas produced

_____.

When fish fat is added, the volume of methane produced

_____.

When fish fat is added, the percentage of methane in the biogas

_____.

(3)

A farmer has a farm 250 kilometres from the sea.

The farmer has a biogas generator on the farm.

The farmer adds manure to the biogas generator.

(d) The farmer decided **not** to add fish fat to the manure in the biogas generator.

Suggest **one** reason why.

_____

_____

(1)

(e) There is some manure left in the biogas generator.

Explain why the farmer spreads the manure on fields where crops will be grown.

_____

_____

_____

_____

(2)

(Total 11 marks)

3. Students investigated how many daisy plants were growing in a field at different distances from a tree.

This is the method used.

1. Place a 20-metre tape measure on the ground, with the tree at 0 metres.
2. Place a 1 m^2 quadrat on the ground every 4 metres along the tape measure.
3. Count the number of daisy plants in each quadrat.
4. Take a soil sample from each quadrat to find the percentage of water in the soil.

The figure below shows the tree and the tape measure.

This is the method used for finding the percentage of water in each soil sample (step 4):

5. Weigh an empty container.
6. Place the soil sample in the container and weigh again.
7. Heat the container of soil in an oven at 100 °C for several hours.
8. Allow the container of soil to cool and weigh again.
9. Repeat steps 7 and 8 until there is no further change in mass.

(a) Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

_____

_____

(1)

The table below shows the results.

	Distance from the tree in metres				
	4	**8**	**12**	**16**	**20**
Mass of fresh soil in grams	250	266	260	248	252
Mass of dried soil in grams	225	234	209	184	181
Mass of water lost from soil in grams	25	32	51	64	71
Percentage of water in soil	10	12	20	26	**X**
Number of daisies per m^2	0	7	15	28	32

(b) Calculate percentage **X** in the table above.

Give your answer to the nearest whole number.

Percentage **X** (nearest whole number) = _____ %

(3)

(c) Describe the effect of distance from the tree on the percentage of water in the soil between 4 metres and 16 metres.

Use the table above.

(1)

(d) A student concluded:

'As the water content of the soil increases, so does the number of daisy plants.'

Describe **two** changes to the investigation that would increase the validity of the student's conclusion.

1 _____

_____

2 _____

_____

(2)

(e) The percentage of water in the soil is an abiotic factor.

Suggest **three** other **abiotic** factors that might have caused more daisy plants to grow further away from the tree.

Do **not** refer to water in your answer.

1 _____

_____

2 _____

_____

3 _____

_____

(3)

(Total 10 marks)

4. Peat bog is a specialised habitat for some living organisms.

(a) Peat has been removed from peat bogs so that the land can be used for farming or forestry.

Give **two** uses of the peat removed from peat bogs.

1 _____

_____

2 _____

_____

(2)

The destruction of peat bogs can affect biodiversity.

(b) What is meant by ‘biodiversity’?

_____

_____

(1)

(c) Explain how the destruction of peat bogs can affect biodiversity:

- in the local area
- globally.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 9 marks)

5. Carl Linnaeus invented a classification system that places organisms into groups.

(a) What is the name of the largest classification group in Linnaeus's system?

Tick (✓) **one** box.

- Family ☐
- Kingdom ☐
- Order ☐

(1)

(b) Linnaeus gave each species a binomial name.

Which **two** classification groups form the binomial name?

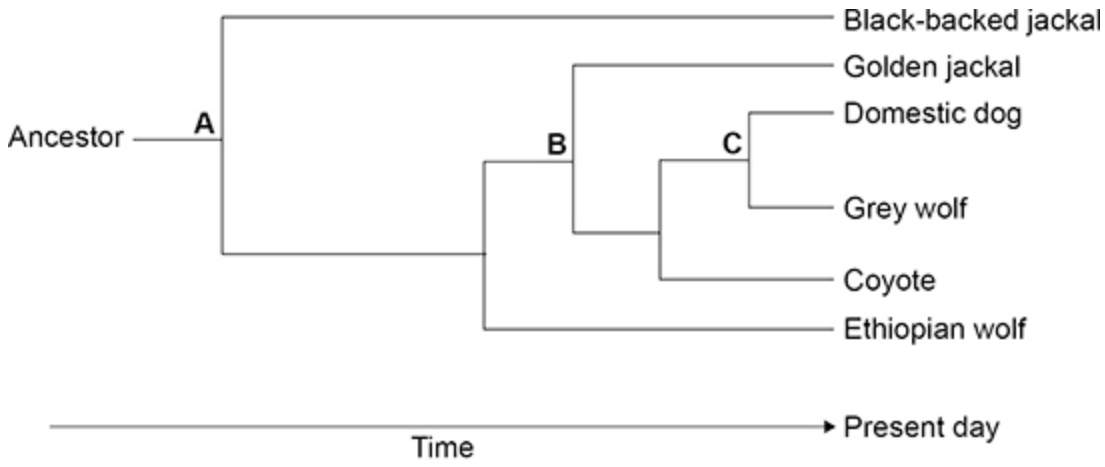
Tick (✓) **two** boxes.

- Class ☐
- Genus ☐
- Order ☐
- Phylum ☐
- Species ☐

(2)

Scientists think that the animals in **Figure 2** all evolved from an ancestor that lived about 6 million years ago.

The figure below shows how the animals may have evolved.



Key

A 6 million years ago
B 3 million years ago
C 32 thousand years ago

(c) What was the **most recent** time that the domestic dog and the golden jackal shared a common ancestor?

Tick (✓) **one** box.

32 thousand years ago ☐

3 million years ago ☐

6 million years ago ☐

(1)

(d) Which present-day animal in above figure is the **most distant** relative of the domestic dog?

_____

(1)

Scientists think the grey wolf and the domestic dog had a common ancestor.

The common ancestor:

- lived about 32 thousand years ago
- is now extinct.

(e) Give **two** possible causes of extinction.

1 _____

_____

2 _____

_____

(2)

(f) 32 thousand years ago, humans hunted other animals for food.

Wolves also hunted other animals for food.

Suggest **one** reason why wolves began to follow groups of humans.

_____

_____

(1)

(g) Some wolves are more aggressive than other wolves.

Describe how selective breeding of wolves could produce a domestic animal that is less aggressive than the wolf.

_____

_____

_____

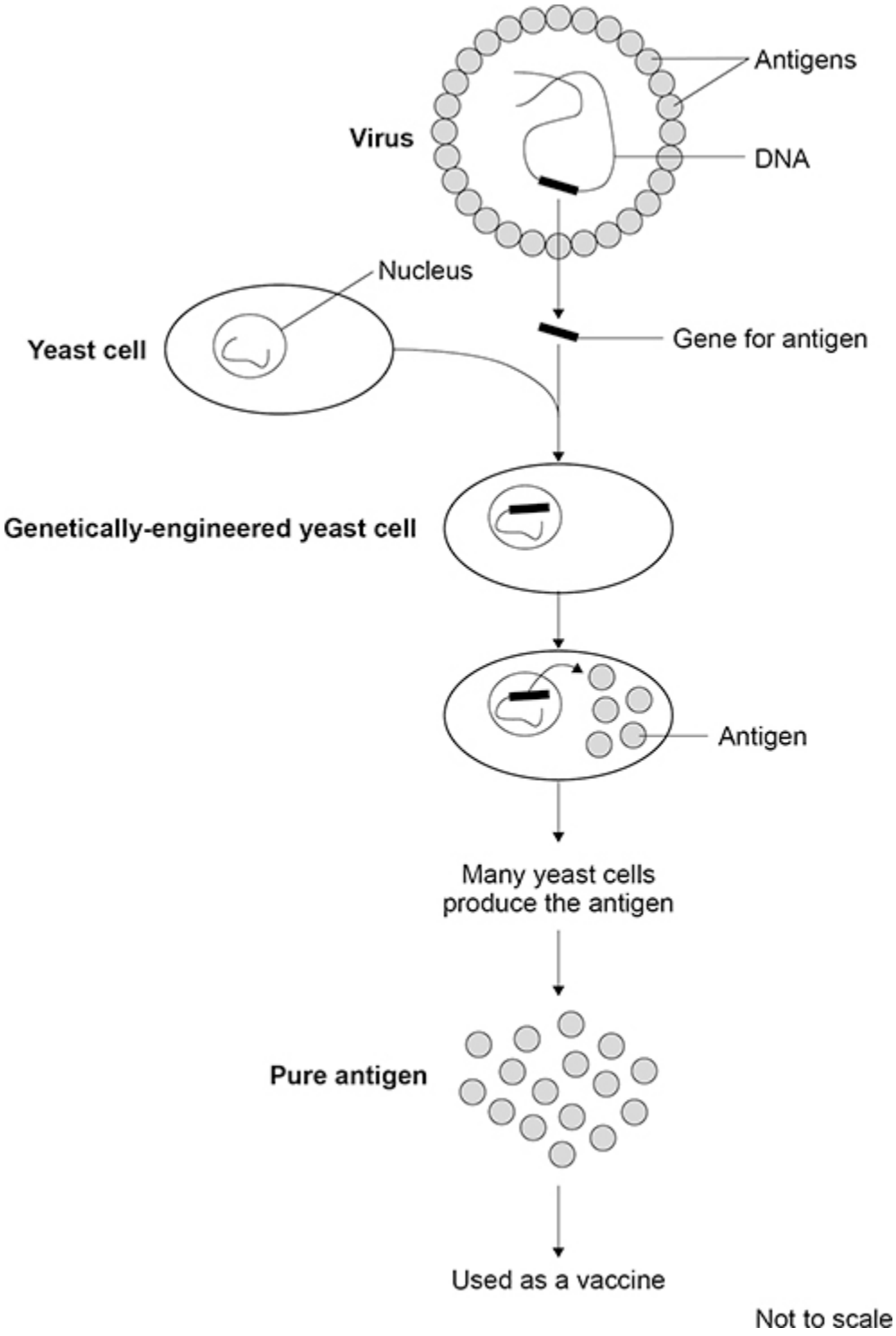
_____

(2)

(Total 10 marks)

6. Genetic engineering can be used for making many useful products.

The figure below shows how a vaccine against a virus can be made by genetic engineering.



Use information from above figure to answer parts (a) and (b).

(a) Which part of the virus is put into the yeast cell?

_____

(1)

(b) Which part of the virus is made by the yeast cell?

_____

(1)

(c) A long time ago, vaccines were made in a different way.

The virus was heated to stop it reproducing.

The vaccine contained whole viruses.

Why might the vaccine containing heat-treated viruses be dangerous?

Tick (✓) **one** box.

The viruses may be inactive.	☐
The viruses may cause an infection.	☐
The viruses will not mutate.	☐

(1)

Genetic engineering can also be used in agriculture.

Weeds are a problem for farmers because the weeds compete with crop plants.

(d) Give **three** factors that the weeds and crop plants compete for.

1 _____

2 _____

3 _____

(3)

Glyphosate is a weed killer used in agriculture.

Genetically modified (GM) maize is a food crop that is resistant to glyphosate weed killer.

Farmers can spray glyphosate on a field to kill the weeds where the GM maize is growing.

(e) Suggest **one** advantage of using glyphosate on fields where GM maize is growing.

_____

_____

(1)

(f) Suggest **one** problem of using glyphosate on fields where GM maize is growing.

Do **not** refer to cost in your answer.

_____

_____

(1)

(Total 8 marks)

7. Evolution of new species occurs by mutation and natural selection.

(a) What is a mutation?

_____

_____

(1)

(b) Describe the process of natural selection.

_____

_____

_____

_____

_____

_____

(3)

(c) Which scientists suggested the theory of evolution by natural selection?

Tick (✓) **one** box.

Alexander Fleming and Carl Woese ☐

Alfred Wallace and Alexander Fleming ☐

Alfred Wallace and Charles Darwin ☐

Charles Darwin and Carl Woese ☐

(1)

(d) The hoverfly and the wasp are insects with bright yellow and black markings.

The figure below shows a hoverfly and a wasp.

Hoverfly

Wasp

The wasp has a sting to defend itself against predators.

The hoverfly does **not** have a sting.

Hoverflies and wasps live in the same habitat.

Explain how having yellow and black markings helps the **hoverfly** survive.

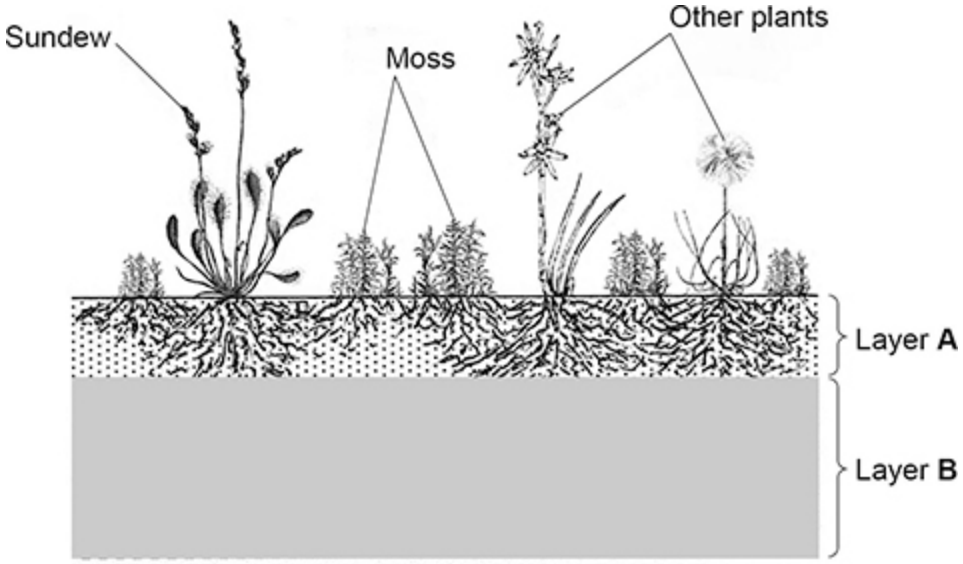
(3)

(Total 8 marks)

8. Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 1 shows a section through part of a peat bog.

Figure 1



Layer **A** contains a lot of air.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

(a) Explain why most of the dead remains of plants in layer **B** do **not** decay.

_____

_____

_____

_____

_____

_____

(3)

(b) The peat bog in **Figure 1** is a stable community.

The moss produces biomass at a rate of 340 g/m^2/year.

What is the approximate biomass of the moss that becomes biomass in primary consumers?

Tick (✓) **one** box.

- 0.34 g/m^2/year ☐
- 3.4 g/m^2/year ☐
- 34 g/m^2/year ☐
- 340 g/m^2/year ☐

(1)

The sundew plant shown in **Figure 1** has leaves with sticky hairs that trap and digest insects.

Digestion of the insects releases phosphates and simple compounds of nitrogen that are used by the sundew plant.

(c) What substance can the sundew plant make using the **phosphates**?

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Glycerol ☐
- Starch ☐

(1)

(d) What substance can the sundew plant make using the **nitrogen**?

Tick (✓) **one** box.

Fatty acid	☐
Glucose	☐
Lactic acid	☐
Protein	☐

(1)

(e) Humans have destroyed large areas of peat bog to collect peat.

The peat provides fuel and provides compost for gardeners to use.

The peat comes from layer **B** in **Figure 1**.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

Figure 2 shows the removal of peat from a peat bog.

Figure 2

Explain how the destruction of peat bogs and the use of peat affects the temperature of the Earth's atmosphere.

(4)

(Total 10 marks)

9. Frogs are animals that lay their eggs in water. The eggs hatch as tadpoles.

Students investigated the number of tadpoles in a pond for 8 weeks.

This is the method used.

1. Collect 10 dm^3 of pond water in a bucket.
2. Count the number of tadpoles collected.
3. Put the tadpoles back into the pond.
4. Repeat steps 1 to 3 another three times in different parts of the pond.
5. Repeat steps 1 to 4 at intervals for 8 weeks.

(a) Suggest **one** improvement to the method.

(1)

The table below shows the results.

Sample number	Number of tadpoles in each sample					
	0 weeks	**1 week**	**2 weeks**	**3 weeks**	**5 weeks**	**8 weeks**
1	11	17	8	9	5	0
2	15	11	12	7	0	5
3	23	16	14	10	7	3
4	11	14	16	**X**	4	4
Totals	60	58	50	32	16	12

(b) Value **X** is the number of tadpoles in sample 4, at 3 weeks.

Calculate value **X**.

_____

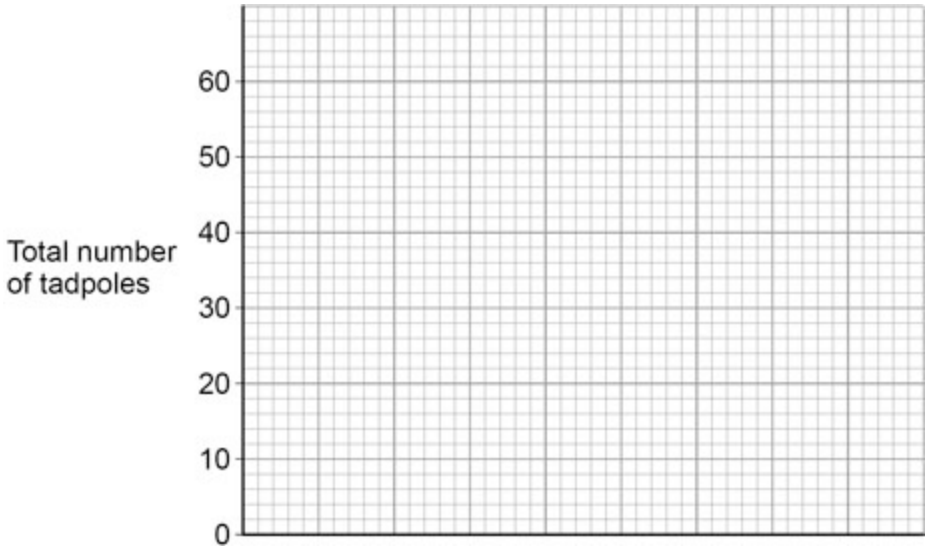
Value **X** = _____

(1)

(c) Complete the figure below to show how the **total** number of tadpoles changed over the 8 weeks.

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data for the **total** numbers of tadpoles from above table
- draw a line of best fit.



(4)

(d) After 0 weeks, no more tadpoles hatched in the pond.

Calculate the percentage of the tadpoles that would still be found in the pond at 4 weeks compared with 0 weeks.

Use information from the figure above.

_____

_____

_____

_____

Percentage of tadpoles found at 4 weeks = _____ %

(3)

(e) After 4 weeks many of the tadpoles had died.

Suggest **two** reasons why the tadpoles died.

1 _____

_____

2 _____

_____

(2)

(Total 11 marks)

1.

(a) sunlight

1

(b) worm
or
snail

1

(c)

1

(d) 1%

1

(e) faeces

1

movement

1

(f) (fish) 3

(snails) 12

(worms) 23

*all correct = **2** marks*
*1 or 2 correct = **1** mark*

2

[8]

2.

(a) 100 – 60 – 3

1

37 (%)

allow 100 – 63

1

(b) *(conclusion 1)*
(chicken manure) produces more biogas
or
(chicken manure) produces biogas at a faster rate

allow correct pairs of data for chicken and cow eg 600 for chicken and 400 for cow

1

(conclusion 2)
more biogas produced (in the first week)
or
the line / graph is steep (in the first week)

allow use of figures from graph for chicken / cow to illustrate 'more'

1

(conclusion 3)
no (more) biogas produced
(after 4 weeks)
or
not much more biogas produced (after 4 weeks)

allow the line / graph levels off (after 4 weeks)

1

(c) increases

1

increases

1

stays the same

in this order only

1

(d) any **one** from:

- transport costs money

  allow it is too far to transport

  allow it takes too long to transport

- fish fat costs money

  allow uneconomic

- fish fat has an unpleasant smell

- fish fat attracts animals

1

(e) so plants / crops grow faster / better

1

(because manure) releases / contains minerals / ions / salts

allow named mineral / ion(s) / salts

allow (because manure):

- *retains water in soil*
- *improves drainage*
- *insulates / keeps warm*
- *suppresses weed growth*
- *improves soil structure*

ignore nutrients / nitrogen / food / carbon dioxide

if no other marks awarded allow 'it is a fertiliser' for ***1*** *mark*

1

[11]

3. (a) to remove all / the water

allow to make sure there is no water left

allow to make sure the soil is (completely) dry

ignore to remove water unqualified

1

(b) $\frac{71}{252} \times 100$

1

28.1(746…)

1

28 (%)

allow student's incorrectly calculated percentage using mass data for 20 metres, rounded to nearest whole number

1

(c) as distance increases the percentage of water increases

allow positive correlation

allow as one increases the other increases

allow as one decreases the other decreases

ignore directly proportional

1

(d) any **two** from:

- repeat (at each distance) **and** calculate a mean
- test at intermediate / further distances
- test around more / different trees
- test at different angles around the (same) tree

allow repeat (at each distance) ***and*** *remove / identify anomalies*

allow test more areas

2

(e) any **three** from:

- light (intensity)
- temperature

*if neither awarded allow shade for **1** mark*

ignore sun

- type of soil
- pH (of soil)

allow acidity / alkalinity (of soil)

- minerals / ions (in soil)

*allow salts **or** named examples of ions, such as nitrate*

allow fertiliser

ignore nitrogen / nutrients

- wind (intensity / direction)
- oxygen in soil

ignore (availability of) space

ignore carbon dioxide

3

[10]

4. (a) for burning / combustion

allow as a fuel

1

as compost

allow for growing plants

ignore as fertiliser

allow to improve soil drainage / texture / quality

allow as a building material

allow as animal feed / supplement

1

(b) the variety of (all) species on Earth

or

the variety of (all) species in a habitat / area / ecosystem / community

allow the number of (all) species on Earth

allow the number of (all) species in a habitat / area / ecosystem / community

1

(c) **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5-6

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical thinking. The resulting account is not fully clear.

3-4

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

1-2

No relevant content

0

Indicative content

- (destruction of peat) causes decrease in biodiversity locally / globally

Local effects

- causes death / extinction of (local) populations / species
  - (due to) loss of (specialised) habitat
  - (so) lack of food
  - (so) lack of shelter

- causes migration of (local) populations / species
  - (due to) loss of (specialised) habitat
  - (so) need to find food
  - (so) need to find shelter

Global effects

- (removal of peat) releases (trapped) carbon dioxide
- (removal of peat) releases (trapped) methane
- burning peat releases carbon dioxide
- decay of peat releases carbon dioxide (from respiration of microorganisms)
- decay of peat releases methane (from anaerobic respiration of microorganisms)

  - (causes) global warming **or** greenhouse effect
  - (causes) climate change **or** extreme weather
  - (causes) melting ice caps **or** rising sea levels **or** flooding
  - (causes) drought / desertification **or** changing rainfall patterns
  - (causes) loss of food / habitats
  - (so) migration patterns change
  - (so) some species / organisms become extinct

For **Level 2**, must refer to local and global effects with an explanation.

For **Level 3**, must give an explanation for local and for global effects supported by other details for local and / or global effects.

[9]

5. (a) kingdom

1

(b) genus

1

species

1

(c) 3 million years ago

1

(d) black-backed jackal

ignore jackal

*do **not** accept golden jackal*

1

(e) any **two** from:

- drought
- ice age
- global warming

*if none of these awarded, allow **1** mark for climate change*

ignore weather

- volcanic activity
- asteroid collision

*if neither of these, allow catastrophic event **or** natural disaster for **1** mark*

- (new) predators

allow named example

allow hunters

- (new) disease / pathogen

allow named example

- competition for food

allow lack of food

- competition for mates

allow lack of mates

ignore competition unqualified

- lack of habitat or habitat change

ignore environment change

ignore isolation

ignore pollution

2

(f) any **one** from:

- wolves ate humans
- wolves get left-over food from humans
- humans gave food to wolves

1

(g) breed the least / less aggressive wolves

1

breed (least / less aggressive) offspring

ignore repeat breeding of the original pair(s)

1

[10]

6.

(a) gene (for antigen)

allow DNA / allele for antigen

ignore DNA / allele unqualified

1

(b) (pure) antigen(s)

1

(c) the viruses may cause an infection

1

(d) any **three** from:

- (sun) light
  ignore sun
- water
  allow moisture / rain
- ions / minerals / salts
  allow a named example
  *allow **two** named ions for **2** marks*
  ignore nutrients / food
- oxygen in the soil
  ignore carbon dioxide
- space

3

(e) crop plants grow better

or

crop plants have higher yield

ignore reference to competition

1

(f) any **one** from:

- may kill / harm / poison **other** plants
  ignore it is poisonous unqualified
- may pollute streams / rivers / soil
- may kill / harm / poison humans / animals
  allow may alter taste of (GM) maize
  allow may reduce biodiversity
  ignore reference to cost

1

[8]

7. (a) a change in:

- DNA
- base code **or** nucleotide sequence
- base (in DNA)
- gene / allele
- part of a chromosome
- number of chromosomes
- genetic code / material

ignore genetic information / variation

ignore reference to amino acids or proteins

1

(b) any **three** from:

allow in terms of an example

ignore mutation

- variation (between members of a species)
- better adapted survive
- (better adapted or survivors) reproduce
- pass on (favourable) allele(s) / gene(s) / mutation(s)

allow survival of the fittest

allow converse

*ignore passing on genetic material **or** chromosomes **or** characteristic*

3

(c) Alfred Wallace and Charles Darwin

1

(d) hoverfly looks like a wasp

allow pattern of the markings is similar (on the hoverfly and wasp)

ignore predator / animal thinks the hoverfly is a wasp

1

predator / animal avoids **wasps** so it does not get stung

1

(so) predator / animal does not attack / eat hoverfly

allow correctly named predator

ignore bite / harm

1

[8]

8.

(a) lack of oxygen for (aerobic) respiration

*do **not** accept ref to respiration in dead plants*

1

(so) less / no energy (released)

*do **not** accept energy produced / made / created*

1

(for) microorganisms / bacteria / fungi / microbes / decomposers

OR

low pH denatures enzymes (1)

allow low pH / acidity reduces enzyme activity

(so) less / no (chemical) reactions / metabolism / respiration **or** less **/** no energy released (1)

*do **not** accept energy produced / made / created*

in microorganisms / bacteria / fungi / microbes / decomposers (1)

1

(b) 34 g/m^2/year

1

(c) DNA

1

(d) protein

1

(e) increase in temperature

allow global warming

allow heat (energy) is trapped

1

(because) carbon dioxide is released (from the peat bog)

1

(because) carbon dioxide is produced by burning / decay of peat

ignore reference to greenhouse gases

ignore methane is released from burning / decay of peat

allow fewer plants to take in carbon dioxide (for photosynthesis)

1

(because) methane is released (from the peat bog)

1

[10]

9.

(a) any **one** from:

- collect more samples each time
- collect samples more frequently

allow suggested time interval

- use a bigger bucket / sample
- do not return tadpoles until after the fourth sample
- sample at the same time of day
- randomise collecting positions
- collect at range of depths
- standardised sweeps with a net instead of a bucket

allow a method to avoid double counting tadpoles

1

(b) 6

if no answer on line, allow answer in the table

1

(c) correct linear scale and axis labelled weeks

scale must use at least half available space

1

all points plotted correctly

allow a tolerance of ±½ small square

*allow 4 or 5 correct plots for **1** mark*

2

curved line of best fit

ignore line drawn point to point

1

(d) correct value at 0 and 4 weeks from line on student's graph, eg 60 and 22

allow a tolerance of ±½ small square

1

correct calculation eg

$\frac{22}{60} \times 100$

1

36.7

allow 37 or 36.6...

allow correct calculation using values from the student's graph

if no line drawn on Figure allow a calculation based on values of 60 and 24 for up to full marks

if line drawn on Figure but data from table used (60 and 24) only mp2 and mp3 can be awarded 1

1

(e) any **two** from:

- disease / (named) pathogens
- being eaten **or** predators
- lack of food

  allow competition for food

  ignore competition unqualified

- low oxygen (concentration in water)

  allow eutrophication
- change in temperature
- change in pH
- (some of the) pond dried out
- toxic chemical

  allow lack of space

  allow named example such as sewage / fertiliser

  ignore pollution

  ignore waste

2

[11]