M1.   (a)   methane is produced

ignore bad smell

1

which is a greenhouse gas / causes global warming

1

(b)   (9.80 / 0.20 = 49 therefore) 49:1

1

(c)   horse (manure)

allow ecf from **11.2**

closest to 25:1 (ratio)

1

(d)   **Level 3 (5–6 marks):**
A detailed and coherent explanation is given, which logically links how carbon is released from dead leaves and how carbon is taken up by a plant then used in growth.

Level 2 (3–4 marks):
A description of how carbon is released from dead leaves and how carbon is taken up
by a plant, with attempts at relevant explanation, but linking is not clear.

Level 1 (1–2 marks):
Simple statements are made, but no attempt to link to explanations.

0 marks:
No relevant content.

Indicative content

statements:
•   (carbon compounds in) dead leaves are broken down by microorganisms / decomposers / bacteria / fungi
•   photosynthesis uses carbon dioxide

Page 2

explanations:
- (microorganisms) respire
- (and) release the carbon from the leaves as carbon dioxide
- plants take in the carbon dioxide released to use in photosynthesis to produce glucose

use of carbon in growth:
- glucose produced in photosynthesis is used to make amino acids / proteins / cellulose
- (which are) required for the growth of new leaves

6

(e)   any **three** from:
(storage conditions)
- (at) higher temperature / hotter
- (had) more oxygen
- (had) more water / moisture
- (contained) more microorganisms (that cause decay)
  allow reference to bacteria / fungi / mould

3

[13]

M2.   (a)   photosynthesis

1

(b)   (i)   140

1

      (ii)   (10 billion tonnes) more added (to atmosphere) than removed
             allow ecf from part (b)(i)

1

[3]

M3. (a) (i) counts / 12

1

× 120 × 80 / × 9600
or
× area of field

1

(ii) (more) quadrats / repeats

1

placed randomly
ignore method of achieving randomness

1

(b) (i) any **three** from:
• temperature / warmth / heat
• water / rain
• minerals / ions / salts (in soil)
allow nutrients / fertiliser / soil fertility
ignore food
• pH (of soil)
• trampling
• herbivores
ignore predators
• competition (with other species)
• pollution qualified e.g. SO_2 / herbicide
• wind (related to seed dispersal).
ignore space / oxygen / CO_2 / soil unqualified

3

(ii) light needed for photosynthesis

1

for making food / sugar / etc.

1

effect on buttercup distribution eg more plants in sunny areas / fewer plants in shady areas

1

(c) (i) fertiliser / ions / salts cause growth of algae / plants

1

(algae / plants) block light

1

(low light) causes algae / plants to die

1

Page 4

microorganisms / bacteria feed on / break down / cause decay of organic matter / of dead plants

> do **not** allow germs / viruses

1

(aerobic) <u>respiration</u> (by microbes) uses O_2

> do **not** allow anaerobic

1

   (ii)   sewage / toxic chemicals / correct named example eg metals / bleach / disinfectant / detergent etc

> allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO_2 / acid rain / pesticides / litter
>
> ignore chemicals unqualified
>
> ignore waste unqualified
>
> ignore human waste / domestic waste / industrial waste unqualified

1

(d)   (i)   2

1

   (ii)   more food

> allow other sensible suggestion eg more species colonise from tributary streams after forest

1

   (iii)   number of stonefly species decreases (from **A** to **B** / **B** to **C** / **A** to **C**) as more pollution enters river / less oxygen

> allow fewer species in more polluted water
>
> ignore none are found at site C

1

[19]

M4. (a) wear a face mask

allow wear gloves

1

(b) **Level 2 (3–4 marks):**
A detailed and coherent plan covering all the major steps. It sets out the steps needed in
a logical manner that could be followed by another person to produce an outcome which
will address the hypothesis.

Level 1 (1–2 marks):
Simple statements relating to steps are made but they may not be in a logical order.
The plan may not allow another person to produce an outcome which will address
the hypothesis.

0 marks:
No relevant content.

Indicative content

Plan:
- cut a specified number of pieces of bread to the same size
- place mould spores on the bread
- the number of mould spores needs to be the same quantity of mould spores on
  each piece of bread
- place bread in different sealable plastic bags
- place in different temperatures (minimum of three) eg fridge, room, incubator
- leave each for the same amount of time eg four days
- measure the percentage cover of mould on each piece of bread
- repeat experiment

additional examiner guidance:
- good level 2 answer will describe how the growth of mould can be measured and
  will give a range of different temperatures to be used
- allow equivalent levels of credit for alternative methodologies that would
  clearly produce a measurable outcome in terms of mould growth at various
  temperatures

4

(c) any **one** from:
- type of mould
- amount of mould (put on each piece of bread)
- amount of air in the plastic bags
- size of the pieces of bread
- type of bread

Page 6

- •   amount of moisture / water added

1

(d)   (56 − 4 = 52) / 5

1

10.4

allow 10.4 with no working shown for 2 marks

1

ecf for incorrectly read figures for 1 mark

(e)   (decomposition occurs at a faster rate when the temperature is higher
or
amount of decomposition is higher when temperature is higher

1

[9]

M5. (a) limiting their movement
or
controlling the temperature of their surroundings

1

reason:
reduces energy transfer

> *if no other marks awarded, allow **1** mark for: 'fit more chickens in same space'*

1

(b) (i) without oxygen

> *ignore 'without air'*

1

(ii) any **two** from:
• ethanol
> *allow alcohol*
• carbon dioxide
• lactic acid.
> ***do not accept** energy / ATP (apply list rule)*

2

(c) enzymes are denatured / change shape

> *ignore microbes are killed*

1

(enzyme) shape is vital for function **or** won't work (as efficiently)

1

(d) (i) 200

1

(ii) 120

> *allow ecf from (d)(i)*
> *e.g.*
> $\frac{60 \text{ x}}{100}$ *(i)*

1

(e) causes global warming

1

one predicted consequence of global warming

> *eg rising sea levels, climate change, change in migration patterns, change in distribution of species*
> **or**

methane is flammable
so might cause fire / damage

*if no other marks awarded, allow methane is a greenhouse gas for **1** mark*

1

[11]