

**M1.** (a) methane is produced  
*ignore bad smell* 1

which is a greenhouse gas / causes global warming 1

(b)  $(9.80 / 0.20 = 49 \text{ therefore}) 49:1$  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

**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]

<b>M3.</b>	(a)	(i)	counts / 12	1
			× 120 × 80 / × 9600	
			<b>or</b>	
			× area of field	1
		(ii)	(more) quadrats / repeats	1
			placed randomly	
			<i>ignore method of achieving randomness</i>	1
	(b)	(i)	any <b>three</b> from:	
			• temperature / warmth / heat	
			• water / rain	
			• minerals / ions / salts (in soil)	
			<i>allow nutrients / fertiliser / soil fertility</i>	
			<i>ignore food</i>	
			• pH (of soil)	
			• trampling	
			• herbivores	
			<i>ignore predators</i>	
			• competition (with other species)	
			• pollution qualified e.g. SO <sub>2</sub> / herbicide	
			• wind (related to seed dispersal).	
			<i>ignore space / oxygen / CO<sub>2</sub> / soil unqualified</i>	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

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

*do not allow germs / viruses*

1

(aerobic) respiration (by microbes) uses O<sub>2</sub>

*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<sub>2</sub> / 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

- 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.  
 $\frac{60 \times}{100}$  (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]