

M1. (a) circulating / mixing / described **or** temperature maintenance 1

supply oxygen
or for aerobic conditions
or for faster respiration
do not allow oxygen for anaerobic respiration 1

(b) energy supply / fuel / use in respiration
do not allow just food / growth
ignore reference to aerobic / anaerobic
or material for growth / to make mycoprotein 1

(c) respiration
allow exothermic reaction
allow catabolism
ignore metabolism
ignore aerobic / anaerobic 1

(d) (i) any **one** from:

- compete (with *Fusarium*) for food / oxygen **or** reduce yield of *Fusarium*
- make toxic waste products or they might cause disease / pathogenic **or** harmful to people / to *Fusarium*
do not allow harmful unqualified

1

(ii) steam / heat treat / sterilise fermenter (before use)
not just clean
or
steam / heat treat / sterilise glucose / minerals / nutrients / water (before

use)

or

filter / sterilise air intake

or

check there are no leaks

*allow sterilisation unqualified **not** just use pure glucose*

1

(e) any **three** from:

- beef is best or beef is better than mycoprotein
- mycoprotein mainly better than wheat
- more phenylalanine in wheat than in mycoprotein
allow equivalent numerical statements
- but no information given on other amino acids / costs / foods

3

overall conclusion:

statement is incorrect because

either

it would be the best source for vegetarians

or

for given amino acids, beef is the best source

or

three foods provide insufficient data to draw a valid conclusion

1

[10]

M2. (a) e.g.

timber
agriculture
roads / urban development / buildings
any two for 1 mark each

2

- (b) *ideas that (accept reverse arguments)*
increased carbon dioxide content since less during photosynthesis
and locked-up as wood burning increases carbon dioxide content
increased activity of microbes increases carbon dioxide content
oxygen content reduced water vapour content reduced
any five for 1 mark each

5

[7]

M3. Cogently argued based on biological principles, for **and**

against introduction of caterpillar
maximum of 4 pros e.g.
fewer chemicals used therefore less expense
less chemical damage to other plants
consequent benefits to food chains
fewer farm animals poisoned therefore more economic
countryside more varied therefore more attractive to tourists
tourists bring economic advantages
greater variety of habitats therefore greater variety of species

any 4 for 1 mark each

4

cons e.g.
danger to livelihoods if crops destroyed by caterpillar
relatively low chance of success since only one third of schemes
effective world-wide
unlikely to be natural predators therefore ecological balance affected

any 2 for 1 mark each

2

cogently argued case **gains up to 2 marks**

2

[8]

- M4.** (a) increased human population
increased standard of living
each for 1 mark 2
- (b) nutrients absorbed by plants not replaced
each for 1 mark 2
- (c) increased release of carbon dioxide into atmosphere when trees are burned
reduced rate of carbon dioxide removal from atmosphere
increased carbon dioxide absorbs more of energy radiated by Earth
global rise in temperature
each for 1 mark 4

[8]

M5. (a) any **one** from:

- increase / give light
- increase temperature / make warmer

award marks if the method by which these could be done is given
eg leave lights on all night **or** use a heater

- increase / give CO₂
- add fertiliser / nutrients / minerals / named
allow nitrogen
ignore 'food'

1

(b) (i) any **two** from:

- cheaper
allow grow faster / more grown
- better quality / flavour
ignore size
- available all year
accept converse if clear that answer refers to use of British tomatoes
allow 'Fair Trade'

2

(ii) any **two** from:

- greater distance **or** more food miles **or** more transport

idea of more needed only once

- transport needs (more) energy / fuel
- reference to eg greenhouse effect / global warming / pollution / CO₂ release / carbon footprint
ignore ozone

2

[5]

M6. (a) 860

correct answer gains 2 marks

if answer incorrect evidence of $(6100 - 1800) \div 5$

or $4300 \div 5$

or $(900 + 600 + 1000 + 700 + 1100) \div 5$ gains 1 mark

allow ecf from 1 incorrect graph reading

2

(b) *rain ignore references to oxygen / sulfur dioxide / nitrogen oxides / acid
ignore global warming*

Effects of deforestation

deforestation increases the amount of carbon dioxide in the atmosphere

award this point only if linked to deforestation

1

any **two** from:

- due to less photosynthesis **or** less carbon dioxide taken in
or carbon dioxide not locked up in (forest) trees
- due to burning of forest / from machinery
- due to activity of microorganisms / decay

2

Effects of growing palm for fuel

carbon dioxide released when palm oil used as fuel

1

(eventually) CO₂ intake and output might balance out **or** burning palm oil carbon neutral

accept less carbon dioxide than from burning fossil fuels

1

[7]

- M7.** (a) (i) kills / gets rid of / reduces methane bacteria
allow kills / gets rid of / reduces bad bacteria
ignore acts like antibiotic 1
- (ii) less food converted to methane
allow can keep more cattle without further environmental damage
ignore energy 1
- more growth / meat / muscle / milk produced / more profit / fatter animals
ignore references to bacteria and disease 1
- (b) absorbs energy / heat radiated by Earth
allow absorbs / traps energy / heat / from Earth
*do **not** allow absorbs energy / heat from Sun* 1
- some energy / heat reradiated
ignore reflected
*do **not** allow reradiates energy / heat from Sun* 1
- leading to global warming / enhanced greenhouse effect
accept effects of global warming eg melting ice caps
accept methane is a greenhouse gas
ignore references to ozone 1

[6]

M8. (a) any **two** from:

- fewer trees to take in carbon dioxide for photosynthesis
- decomposers / microorganisms respire (as they decay debris) releasing carbon dioxide
- burning of wood releases carbon dioxide

allow carbon dioxide released by burning fossil fuels in vehicles / factories

2

- (b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best – fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a brief description of some steps in the process but the order is not clear with little biological vocabulary used.

Level 2 (3 – 4 marks)

There is a reasonably clear description of the process involving many of the steps and using some biological vocabulary.

Level 3 (5 – 6 marks)

There is a clear, logical and detailed scientific description of the process using appropriate biological vocabulary.

examples of biology points made in the response:

- this contains mineral ions (and organic matter)
- this increases growth of algae / water plants
- the plants / algae (underneath) die
- due to lack of light / photosynthesis / space
- decomposers / microorganisms feed on decaying matter **or** multiply rapidly
- the respiration of decomposers uses up all the oxygen
- so invertebrates die due to lack of oxygen
- this is called eutrophication

6

[8]