

GCSE BIOLOGY

Topic Paper: 7 The environment (Ecology)
Part 1 & 2 Mark Scheme

MARK SCHEME



87 Marks



M1. (a) 3.2

award **both** marks for correct answer irrespective of working
if answer incorrect

$$(55 + 55 + 1.2 + 5) - (110 + 3)$$

or

$$116.2 - 113$$

or

$$(55 + 55 + 1.2 + 5 + 90) - (110 + 93) \text{ gains 1 mark}$$

2

(b) any **one** from:

less carbon dioxide taken in by trees

*ignore carbon dioxide released by trees **or** trees store carbon dioxide*

less photosynthesis

burning trees releases carbon dioxide

decay releases carbon dioxide

1

[3]

M2. (a) circulation / mixing / described

1

or

temperature maintenance

supply oxygen

*do **not** allow oxygen for anaerobic respiration*

or

for aerobic conditions

or

for faster respiration

1

(b) any **one** from:

energy supply / fuel

or use in respiration

*do **not** allow just food / growth*

ignore reference to aerobic / anaerobic

material for growth

or to make mycoprotein

1



- (c) (heat / energy) from respiration
allow exothermic reactions
allow description eg breakdown of glucose / 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 / Fusarium
*do **not** allow harmful unqualified* 1
- (ii) any **two** from:

steam / heat treat / sterilise fermenter (before use)
***not** just clean*
*allow sterilisation unqualified for **1** mark*

steam / heat treat / sterilise glucose / minerals / nutrients /
water (before use)
***not** just use pure glucose*

filter / sterilise air intake

check there are no leaks 2
- (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

or

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

[11]

M3. (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]

M4. any **four** from:

Points for Ethanol:

max 3 marks

renewable fuel **or** carbon neutral **or** uses plant waste

allow petrol is non renewable

less CO / hydrocarbons / SO₂ / NO_x emissions

less named emission

details of what emissions do eg CO is toxic / hydrocarbons
cause smog / SO₂ / NO_x causes acid rain

Points against Ethanol:

max 3 marks

releases less energy

so need to burn more

more fuel loss due to evaporation

need to burn fuel to grow and process crop plants

reduces (land use for) food crops / causes deforestation

Debatable points:

claimed to increase NO_x emissions – but this not observed
by air quality monitoring

takes more energy to produce than it releases – but sugar cane
yields 8:1 / maize yields 1.34:1

4



Conclusion:

sensible conclusion for **or** against ethanol substantiated by information from passage

must reach conclusion using information from the passage

1

[5]

M5. (a) carbon dioxide **and** water vapour
either order

1

(b) less methane

1

because less anaerobic respiration

1

more CO₂

ignore water

1

because (more) aerobic respiration

1

[5]

M6. (a) (i) (initially there is) oxygen

accept:

oxygen hasn't been used up yet (so not anaerobic conditions yet)

1

(so) aerobic respiration (by microorganisms)

accept (because) methane is produced in anaerobic (fermentation)

1

producing CO₂ (which does not burn)

accept there is no methane

ignore inflammable

1

(ii) (peelings had) the most carbohydrate / organic material

answer must be comparative

accept contained more microorganisms / decomposers / bacteria

ignore water

*do **not** allow fat or protein*

1



(b) (i) 0.22 / 0.221
correct answer with or without working gains 2 marks
allow 0.2 for 1 mark
allow 22.1 for 1 mark
allow 0.34 ×65 / 0.65 for 1 mark

2

(ii) (sheep manure) produces a higher volume of biogas / almost double **or**
 produces 0.27 (m³ per kg) more
accept 0.408(7) / 0.41 / 0.409 (m³) from sheep for 2 marks
accept 0.1877 / 0.188 / 0.19 (m³) more than cow's manure for 2 marks

1

(sheep manure) produces biogas with a higher percentage methane **or**
 produces 2% more methane
allow correct difference in volume calculated using 0.408(7) / 0.41 / 0.409 minus answer given in (i) for 2 marks

1

[8]

M7. (a) 1 reduce the number of stages in food chain

1

because there are energy losses at each stage in a food chain

1

2 keep animals indoors

1

so that less energy is used in maintaining body temperature

1

3 restricting movement of animals

1

so that less energy is used in movement

1

NB responses are in pairs

(b) (i) the range of species in a habitat

1

(ii) conserved organisms may have future uses

1

(c) (i) the total mass of each type of food produced

1

(ii) increase by factor of approximately 2 for each

1

(iii) greater carbon dioxide output

1

since takes longer to produce sheep meat

1



- (iv) change in migration patterns 1
- changes in distribution/loss of habitat 1

[14]

M8. (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]

M9. (a) faeces / manure / plants

1

broken down by fermentation /anaerobic respiration

1

into methane

1

(b) cools digester

1

optimum temperature for process less than external temperature

1

(c) temperatures in UK usually below optimum for process

1

heat from fermentation retained in digester to increase rate of reaction

1

[7]

M10. (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]

M11. (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) *ignore references to oxygen / sulfur dioxide / nitrogen oxides / acid rain*
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]

M12. (a) (i) anaerobic respiration

or

fermentation

1

(ii) oxygen is present

accept O₂

*do **not** accept O, O² or O²*

1

aerobic respiration occurs

ignore anaerobic

1

CO₂ from respiration

allow from fermentation

1

(b) high methane after this time

ignore CO₂

1

(c) organic matter / food / nutrients / named eg used up / reactants

allow too hot / accumulation of toxins / named

*do **not** allow products*

ignore energy

1

[6]