

- M1.** (a) (i) 200 kJ  
for 1 mark 1
- (ii) 2  
gains 2 marks  
(if answer incorrect,  $20 / 1000 \times 100$  gains 1 mark) 2
- (b) *ideas that*  
energy lost by animal (pig / cattle) / extra stage / extra trophic level  
in waste materials e.g.  
in muscular activity / movement  
in keeping body temperature higher than surroundings / lost as heat  
*any three for 1 mark each*  
*references to respiration regarded as neutral* 3
- (c) *ideas that*  
controlling (high) temperature of surroundings / keeping indoors / insulating  
reduces energy transferred from animal as heat / animal uses body heat to maintain  
temperature restricting movement (e.g. caging or keeping in darkness)  
reduces muscular contraction / muscular activity  
*each for 1 mark*  
*accept respiration as explanation once only if neither*  
*explanation point has received credit*  
*reject give more food / different food* 4

[10]

**M2.** to reduce energy 'lost' (by movement)  
*accept need less energy*

so more energy is available for growth

*accept prevents loss of body mass to provide energy*  
*accept so need less food*  
*accept get fatter*  
*accept so weight gain*  
*accept so more growth*

[2]

**M3.** (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]**

- M4.** (a) 4 of:  
intensification due to need to improve efficiency of energy transfer;  
has led to developing fast growing crop varieties;  
native plants cannot compete with these;  
for e.g. light/water/minerals;  
effect of herbicides;  
pesticides killing pollinating insects  
*each for 1 mark*

4

- (b) recommend a variety of measures; (can be implied)  
because rotational will allow these species to continue;  
permanent will allow others;  
leading to conservation of a wide range of species  
*each for 1 mark*

4

**[8]**

- M5.** (a) any **two** from:
- diseases spread more rapidly
  - antibiotics can build up in the food chain
- or**
- over use of antibiotics
  - increased use of fossil fuels (to heat the barn)

2

- (b) **Level 2 (3–4 marks):**  
Clear statements made identifying the farming methods which are linked to relevant explanations of how this increases the efficiency of food production.

**Level 1 (1–2 marks):**

Simple statements made identifying the farming methods used, but no attempt to link to explanations of how this increases the efficiency of food production.

**0 marks:**

No relevant content.

**Indicative content**

**statements:**

- kept inside or in a temperature controlled environment
- kept enclosed or in a restricted environment

**explanations:**

- less energy / heat is lost in controlling body temperature
- less energy required for movement
- so more energy is available for growth
- less energy / heat is transferred to the environment

4

- (c)  $(362 - 67 = 295) / 362 \times 100$

1

81 / 81.49 / 81.5

*allow 81 / 81.49 / 81.5 with no working shown for 2 marks*

1

- (d) aboriginal people can eat other foods (so they may not be in food insecurity)

1

we do not know if other (traditional) food sources have declined

1  
[10]



**M6.** (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 CO<sub>2</sub>
- 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 / CO<sub>2</sub> release / carbon footprint  
*ignore ozone*

2

[5]

- M7.** (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]