M1. (a) (i) 200 kJ

for 1 mark

1

(ii) 2

gains 2 marks
(if answer incorrect, 20 / 1000 × 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 <u>oxygen</u>

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

or

for <u>aerobic</u> conditions

or

for <u>faster</u> respiration

1

(b) any **one** from:

- energy supply / fuel
  or use in respiration

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

  ignore reference to aerobic / anaerobic

- <u>material</u> for growth
  or to <u>make</u> mycoprotein

1

(c) (heat / energy) from <u>respiration</u>

allow <u>exothermic</u> reactions

allow description eg <u>breakdown</u> 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 <u>mainly</u> 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

<u>overall conclusion</u>:

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 × 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_2
- 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_2 release / carbon footprint
  ignore ozone

2

[5]

M7. (a) circulating / mixing / described **or** temperature maintenance

1

supply oxygen
or for <u>aerobic</u> conditions
or for <u>faster</u> 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 <u>material</u> for growth / to <u>make</u> mycoprotein

1

(c) <u>respiration</u>

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 / steriliseglucose / 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 <u>mainly</u> 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

<u>overall conclusion:</u>

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]