

**M1.** (a) (i) tick in box of FIRST pyramid

1

(ii) any **one** from:

- less energy / biomass lost / wasted
- greatest biomass / energy for humans  
*ignore human box is bigger*  
*ignore .food. for humans*
- shortest food chain **or** less stages **or** least number of different organisms **or** only one predator **or** only 2 boxes tall **or** least boxes  
*allow only one stage*

1

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

- quicker / more growth **or** grow fatter
- less\* urine **or** less faeces
- less\* heat (lost)
- less\* movement  
*assume for pigs indoors*  
*allow converse if clear for pigs outdoors*  
(\* **do not allow no for less**  
*ignore less space*

2

(ii) any **one** from:

- less cruelty **or** more ethical **or** better animal welfare  
*ignore more natural*  
*ignore ideas referring to against God's will*
- better flavour / quality (of meat)  
*ignore pig health **or** free range / organic*

- less pollution / etc / less fossil fuel used for heating  
*ignore quality of life*  
*assume for pigs outdoors*  
*allow converse if clear for pigs indoors*

1

[5]

**M2.** (a) 30

*award **both** marks for correct answer, irrespective of working  
100 – (33 + 27 + 10) or equivalent for 1 mark*

2

(b) 2 or 1.98

*award **both** marks for correct answer, irrespective of working  
(33 / 100) × 6 or equivalent for 1 mark*

2

(c) respiration

1

(d) (i) less / no heat loss / movement

*do **not** accept 'energy' / warmth unqualified*

1

(ii) any reference to cruelty eg stress to calf / cramped conditions

*ignore references to disease / hygiene*

1

[7]

**M3.** (a) *idea that*

- so they don't get too hot / cold  
*for high temperatures*
- don't lose condition / weight **or** don't become ill
- don't lose too much water / become dehydrated  
(*allow* don't sweat too much)  
*for low temperatures*
- reduce heat loss from pigs
- less energy wasted in maintaining body temperature  
*for 1 mark each*

2

(b)

- reduce energy loss by movement
- so more is available for growth\*  
(\**credit this point if given in (a) but only credit once*)
- don't use body mass to provide energy
- easier to handle / monitor  
*for 1 mark each*

2

(c) *idea that*

- less humane / not natural / cruel / no room to exercise / stressful
- more intensive labour
- increased risk of disease / (often) in contact with faeces
- antibiotic residues in meat  
*any two for 1 mark each*

2

**[6]**

- M4.** (a) (i) bacteria 1
- (ii) 8 1
- (iii) 4 tonnes 1
- (b) (i) mycoprotein contains less fat 1
- or**
- less circulatory problems
- mycoprotein contains (more) fibre
- or**
- reduces colon cancer  
*it = mycoprotein*  
*fat must be comparative* 1
- (ii) beef contains more protein  
*it = beef*  
*must be comparative*
- or**
- better for growth / making cells /  
 enzymes / antibodies 1

[6]

- M5.** (a) (i) cholesterol 1
- fat  
*in this order* 1
- (ii) mycoprotein has (approx) half amount of protein / has 11.8 (g) protein while chicken has 22.0 (g)  
*accept has less protein*  
*ignore less fat* 1
- (b) (i) increased 1
- (±) constant rate **or** (from 0) to 9.2 / by 9.2(cm) **or** about 1 cm a day **or** increase slower at the beginning and / or at the end 1
- (ii) species **A** grows faster / more than species **B**  
**or**  
species **A** has larger diameter **or** is bigger  
**or**  
the growth of species **B** slows down after 6 weeks  
*accept use of approximate figures* 1
- (c) any **two** from:
- pH / acidity / alkalinity  
*ignore references to carbon dioxide / waste products*
  - (speed of) stirring  
*ignore time in the fermenter*
  - oxygen (concentration) / aeration

*ignore initial amount of Fusarium*

- ion concentration / named eg  $\text{-NH}_4^+$   
*allow ammonia*
- pressure

2

[8]

M6. (a) C 1

(b) otherwise species may disappear altogether  
*allow to avoid extinction* 1

(c) any **two** from:

- regulate net size  
*if mesh size specified, must be larger*
- impose fishing quotas
- limit fishing during breeding seasons
- bans on discarding of fish
- bans on fishing in certain areas

2

[4]



**M7.** (a) 3 (.0)

*correct answer, irrespective of working gains 2 marks.  
if the answer is incorrect or there is no answer, award 1 mark  
for use of correct figures (0.5 and 3.5) [and no other figures]*

2

(b) as faeces

*if more than two boxes ticked deduct 1 mark for each  
additional tick*

1

as carbon dioxide from respiration

1

(c) (i) pigs kept inside are kept in small pens

*if more than two boxes ticked deduct 1 mark for each  
additional tick*

1

pigs kept inside are kept warm in the winter

1

(ii) any **one** from:

- faster growth  
*ignore bigger / less flavour / fatty*
- need less food  
*ignore references to movement / energy*
- ready for market sooner  
*ignore ethical arguments*

1

[7]

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

- more milk  
*(about) 50 litres milk compared to (up to) 20 litres / 30 litres more*  
*ignore costs / profit*
- electricity produced
- farmers can keep more cows in the space  
*answers must refer to number of cows and space*

2

(ii) any **two** from:

- less stress for cow **or** not cruel to cow **or** cows have freedom to move around  
*ignore references to ethical / unnatural without qualification*
- crops fertilised
- less disease **or** disease not as easily spread

2

(b) more

1

less

*in this order*

1

**[6]**