

- 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) 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) No

no mark

if yes max 1 for correct statement

diffusion is down the concentration gradient

accept by diffusion ions would leave the root

1

to enter must go up / against the concentration gradient

or concentration higher in the root

or concentration lower in the soil

1

(b) (i) 0.9 **or** 3.25

for correct answer with or without working

*if answer incorrect 1.3 **or** their rate – 0.4 gains 1 mark*

***or** 130 – 40 **or** 90 gains 1 mark*

2

(ii) (uptake) by active transport

1

requires energy

more energy from aerobic respiration

1

or

more energy when oxygen is present

1

[7]

M4. (a) (i) 120

1

(ii) 11 760 **or**

correct answer from candidate's answer to (a)(i)

correct answer with or without working

if answer incorrect

120 × 98 or

candidate's answer to (a)(i) × corresponding SV gains 1 mark

*if candidate uses dotted line / might have used dotted line(bod) in (a)(i) **and** (a)(ii) no marks for (a)(i) but allow full ecf in (a)(ii) eg 140 × 88 = 12320 gains 2 marks*

2

(b) trained athlete has higher stroke volume / more blood per beat

1

same volume blood expelled with fewer beats

or for same heart rate more blood is expelled

1

(c) increased aerobic respiration

or

decreased anaerobic respiration

allow correct equation for aerobic respiration

accept don't have to respire anaerobically

1

increased energy supply / need

1

less lactic acid formed

or to breakdown lactic acid **or** less O₂-debt

1

can do more work **or** can work harder / faster / longer
accept muscle contraction for work

or less fatigue / cramp / pain

1

[9]

M5. insufficient / no oxygen available 1

for (just) aerobic respiration

or

respires anaerobically

1

[2]

M6. (a) 7.15 to 7.45 am and 7.15 to 7.45 pm
both required, either order
accept in 24 hr clock mode 1

(b) (i) 11 1

(ii) 32.5 to 33
allow answer to (b)(i) + 21.5 to 22 1

(c) any **two** from:

- more photosynthesis than respiration
- more biomass / carbohydrate made than used
allow more food made than used
- so plant able to grow / flower
accept plant able to store food

2

[5]

M7. (a) LHS: carbon dioxide **AND** water

in either order

*accept CO_2 **and** H_2O*

allow CO_2 and H_2O

if names given ignore symbols

*do **not** accept CO^2 / H^2O / Co / CO*

ignore balancing

1

RHS: sugar(s) / glucose / starch / carbohydrate(s)

accept $\text{C}_6\text{H}_{12}\text{O}_6$

allow $\text{C}_6\text{H}_{12}\text{O}_6$

*do **not** accept $\text{C}^6\text{H}^{12}\text{O}^6$*

1

(b) (i) light is needed for photosynthesis

or

no photosynthesis occurred (so no oxygen produced)

1

(ii) oxygen is needed / used for (aerobic) respiration

full statement

*respiration occurs **or** oxygen is needed for anaerobic*

*respiration gains **1** mark*

2

(c) (i) (with increasing temperature) rise then fall in rate

1

use of figures, ie

max. production at 40°C

or maximum rate of 37.5 to 38

1

(ii) $25 - 35^\circ\text{C}$

either faster movement of particles / molecules / more collisions **or** particles

have more energy / enzymes have more energy

1

or temperature is a limiting factor over this range

40 – 50 °C

denaturation of proteins / enzymes

ignore denaturation of cells

ignore stomata

1

- (d) above 35 °C (to 40 °C) – little increase in rate
or > 40 °C – causes decrease in rate

1

so waste of money **or** less profit / expensive

1

because respiration rate is higher at > 35 °C

or

respiration reduces the effect of photosynthesis

1

[12]