AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.4 TROPHIC LEVELS IN AN ECOSYSTEM (PACK 2)

SCORE	PERCENTAGE
/118	%

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Mark schemes

Q1.

(a) 1.67 / $1\frac{2}{3}$

accept 1.6 to 1.7

ignore working or lack of working $\frac{400 \times 100}{24000}$ *for **1** mark*

2

(b) any **three** from:

deduct only 1 mark for any mention of in carnivore

lost as heat **or** keeping body warm

lost in metabolic functions is not enough

lost in respiration

*do **not** accept 'used for respiration*

movement

not eaten parts or individuals / non-edible parts / dead leaves / wood / bones / faeces / urine

ignore 'waste'

ignore references to growth / reproduction

3

[5]

Q2.

(a) (i) vole/small bird/beetle

gains 1 mark

1

(ii) oak trees are large organisms;
therefore their biomass is large; but their numbers are small

each for 1 mark

3

(b) 8 of:
energy stored in chemicals in cells/tissues/growth;
passed up food chain;
less energy stored at each stage in food chain/pyramid level;
because only part of energy taken in used for growth;
some lost in waste;
some used for repair;
used to main body systems;
some lost in respiration;
some converted into other forms of energy;
e.g. movement;
much lost as heat;
by time detritus feeders have used remains;
all returned to environment

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each for 1 mark

8

c1 → animals
c2 → decomposers

2 marks for sequencing and organising the information

2

[14]

Q3.

(a) water

gains 1 mark

oxygen

gains 1 mark

2

(b) e.g.:
some materials/energy lost in animals' waste materials
respiration releases energy
some materials/energy used in maintenance/repair
some energy used for movement
much lost as heat to surroundings
some organisms die (rather than eaten)
reference to detritivors
reference to microbes

each for 1 mark

8

[10]

Q4.

(a) (i) e.g. mussels/caddis loach

for 1 mark

1

(ii) 3 of:
carbon dioxide
water
chlorophyll/chloroplasts
light

any 3 for 1 mark each

3

(b) 6 of e.g.
some plant/animal material not digested by consumers passes out with faeces
respiration releases energy used in movement lost as heat
some 'lower' organisms die energy transferred to decomposers/detritivores
thence to environment

any 6 for 1 mark each

6

[10]

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Q5.

(a) pyramid correct shape labelled

2

(b) warm
moist
oxygen

3

[5]

Q6.

(a) levels in correct order
sizes correct
for 1 mark each

2

(b) (i) working
0.96% (correct answer = 2)
for 1 mark each

2

(ii) 2 of e.g.
heat up leaves
absorbed by non-photosynthetic parts
transmitted through leaves
any 2 for 1 mark each

2

(iii) 3 of e.g.
respiration of primary consumers
movement of p.c.
waste from p.c.
repair/growth of p.c.; heat losses to surroundings
any 3 for 1 mark each

3

[9]

Q7.

(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.

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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]

Q8.

any **five** from:

- the amount of energy (in the biomass of organisms) is reduced at each successive stage in a food chain
- all of prey organism is not consumed
- energy is 'lost' as the organisms' waste materials
- energy is transferred / lost during respiration
- energy is transferred / lost as movement (kinetic energy)
- energy is transferred / lost as heat (thermal energy)
- energy is transferred / lost to the surroundings
- the only energy transferred to a higher level is that which the organisms have used in growing

statements about energy flow the wrong way are neutral

[5]

Q9.

(a) all bars correct for greenfly, ladybird (± one square) and blackbird (less than one square)

1

bars are centred

*do not accept pyramid shape if **all** to left or right of centre*

1

bars are labelled (in correct sequence)

1

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(b) $\frac{1}{12}$ **or** 8.3% **or** 1:12

if answer is incorrect accept correct working out (eg $\frac{50}{600}$) for 1 mark

accept 12 or 12:1 for 1 mark

accept 8.3 for 1 mark (without %)

2

[5]

Q10.

(a) 115

1

(b) any **four** from

less energy lost / used

as heat lost to the atmosphere

since warm indoors

accept temperature controlled

(less energy lost) in movement

since movement restricted

more growth / eggs

*accept prevents loss of body mass **or** gets fatter / weight gain*

4

[5]

Q11.

(a) 12 500

*incorrect numerical answer but clear evidence of correct working e.g. 365 million ÷ 365 ÷ 80 **or** 3285 million ÷ 365 ÷720 credit with (1)*

2

(b) (i) vegetation → (farm) animals → humans

accept any correct variation on this theme e.g. grass → lambs → humans

1

(ii) any **three** linked points from

* less links in the food chain

***or** only one link in the food chain*

* energy 'wasted' **or** 'lost' **or** 'used' at each link

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* energy 'wasted' **or** 'lost' in (the process of) respiration
* energy 'used' to maintain body temperature
* energy 'used' by the animals in movement

3

(c) people will eat more/greater proportion of food from plants

accept people will eat less/smaller proportion of food from animals
do not credit 'everyone will stop eating meat'

1

any **three** linked points from

these marks are independent of the 'prediction' mark
do not credit 'food from plants will become less expensive'

* meat will become more expensive
* only a limited area of land available on the planet (for food production **or** otherwise)
* more people means less land available for food production because some used for housing etc.
* land will become more expensive
* land will have to be used more efficiently

***or** more people will go hungry*
***or** people will (each) eat less*

* livestock farmers will try to improve efficiency
* (leading to) growth of 'factory farming'
* demand for food will rise (total)

3

[10]

Q12.

(food chain) A gives 7200kJ (of useful energy)

***or** 7.2MJ*
***or** 7200000J*
unit essential in each case

1

(food chain) B gives 960kJ (of useful energy)

***or** 0.96MJ*
***or** 960000J*
unit essential in each case
*credit 1 mark if **both** are numerically correct but unit omitted*

1

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same comparison made in **each** case
e.g. for each kilogram of grain

or *refers to more stages in food chain*
results in less efficiency

1

(so) (food chain) A is 7.5 times more efficient than (food chain) B

or *for every unit of useful energy given*
to a person by B, A gives $7\frac{1}{2}$ *units*
or *food chain B is only 13(.3)% as efficient as food chain A*
or *makes a correct comparison in percentage terms*

1

[4]

Q13.

(a) (i) carbohydrate*/fat/protein in cell
(or example e.g. glucose/starch)

for 1 mark

1

(ii) $\frac{21500}{1050000} \times 100$ or 2.(05)%

for 1 mark

1

(b) *ideas that:*
little energy used for growth/most wasted/lost

gains 1 mark

but
only 4% used for new growth

gains 2 marks

evidence/idea that this is repeated at each stage
idea of diminishing return/less energy at each stage

for 1 mark each
(maximum of 3)

3

(c) *idea:*
plants at the start of all food chains
shorter food chain
more efficient/less energy lost/more food
cheaper/more economic
(must bear consequence of at least one of earlier marks)

any three for 1 mark each

3

[8]

Q14.

(a) (i) (tiny green) plants / phytoplankton

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for 1 mark

1

(ii)
- penguin
- shrimp
- cod
- squid

any two for 1 mark

1

(b) Decrease: seals will eat more squid and penguins

for 1 mark

1

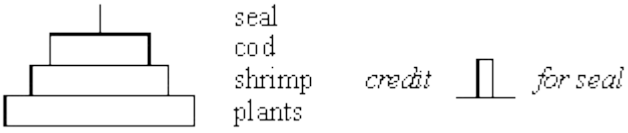
Stay the same:

- more shrimp for squid and penguins
- squid and penguins increase balances the extra eaten by seals
- seals find other prey [allow shrimps]

any two for 1 mark each

2

(c)



allow



- correct / shape (designs need to be to scale)
- correctly labelled with organisms

(if wholly correct but inverted then credit 1 mark)

each for 1 mark



2

[7]

Q15.

(a) Decrease: seals will eat more squid and penguins

for 1 mark

1

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Stay the same:

- more shrimp/food for squid and penguins

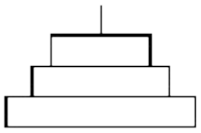
ideas that

- increase in squid and penguins balances the extra eaten by seals
- seals find other prey (allow start to eat shrimps)

any two for one mark each

2

(b)



credit  *for seal*

allow



- correct shape (doesn't need to be to scale)
- correctly with organisms

(if wholly correct but inverted then credit 1 mark)

each for 1 mark

2

(c)

- seals are mammals
- *idea that* seals have (to maintain) a constant body temperature *[allow warm blooded]*
- heat losses to cold seas
- more of food eaten used to replace heat loss

(credit use of figures i.e. 95% loss compared to 90%
or 5% efficient compared to 10%
or 20 : 1 conversion ratio compared to 10 : 1
with 1 mark)

any three for 1 mark each

3

(d) (i) *ideas that*

- reduce number of fishing boats allowed
- breed in captivity and then release
- agree quotas [not an unqualified 'ban']
- avoid breeding areas

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- avoid breeding seasons
- increase size of net mesh/don't catch small fish
- limit catches of shrimps
- cull seals

any two for 1 mark each
[allow any other reasonable answer]

2

(ii)
- breeding areas closer to some countries than others
- difficult to police/easy to cheat/'poach'
- difficult to agree quotas
- some countries eat more fish than others
- best weather for fishing maybe in breeding seasons
- fisherman/trawlers need employment
- big demand for cod

any one for 1 mark
[allow any other sensible response]

1

[11]

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