AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.2 ORGANISATION OF AN ECOSYSTEM (PACK 3)

SCORE	PERCENTAGE
/242	%

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Q1.

(a) A higher concentration would be difficult to stir

1

(b) (i) methane

1

(ii) 60

*100 - (5 + 35) but incorrect answer allow **1** mark*

2

(c) (i) aerobic respiration

1

(ii) oxygen

1

[6]

Q2.

(a) (i) without <u>oxygen</u>

ignore reference to air

1

(ii) otherwise difficult to stir / to pump / to transfer

allow prevent 'clogging' owtte

1

(iii) need to stir / pump / heat

1

(b) (i) rises then falls

1

then levels / slight rise

1

quantitative descriptor eg to 80% / max. on day 4 / min. on day 16

accept other valid quantitative descriptor

allow accuracy ± $\frac{1}{2}$ small square

1

(ii) 16 (15.5 to 16.4)

1

(c) oxygen present

1

(CO_2 produced) by <u>aerobic</u> respiration

or not much <u>anaerobic</u> respiration

or not much methane / CH_4 produced

1

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[9]

Q3.

(a) the sun / light / sunshine / solar

allow radiation <u>from the sun</u>
ignore photosynthesis / respiration
apply list principle
*do **not** allow water / minerals / heat*

1

(b) 2.5 (:1)

correct answer with or without working

ignore rounding with correct working
*do **not** allow other equivalent ratios for both marks*
*evidence of selection of 10(insects) **and** 4(frogs) **or** 50 **and** 20 **or** 1 **and** 0.4 for **1** mark*

if no other working allow **1** mark for 0.4:(1) on answer line

2

(c) any **two** from:

*allow for insects **or** frogs*
allow energy for biomass

- some parts indigestible / faeces
- waste / examples of waste eg urea / nitrogenous compounds / urine / excretion
- movement / eg of movement
  allow keeping warm
- heat
- not all eaten / eg of not all eaten
- respiration
  do not accept energy for respiration

2

(d) any **four** from:

- (bodies) consumed by animals / named / scavengers / detritus feeders
- microorganisms / bacteria / fungi / decomposers
- reference to enzymes
- decay / <u>breakdown</u> / decompose / rot
  ignore digest(ion)
- respiration
- carbon dioxide produced

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- photosynthesis
- sugar / glucose produced
  accept other organic molecules
- fossilisation / fossil fuels / named
- combustion / burning
  must be linked with fossilisation / fossil fuels
- (burning) produces carbon dioxide
  allow carbon dioxide produced once only

4

[9]

Q4.

(a) carbon dioxide **and** water vapour
either order

1

(b) less methane

1

because less anaerobic respiration

1

more CO_2
ignore water

1

because (more) aerobic respiration

1

[5]

Q5.

(a) (i) increase / higher / faster / quicker

1

numerical comparison eg from 30 to 60 / by 30 **or** it is 30 at 15°C and 60 at 25°C
*award **2** marks for doubles / goes twice as fast or 30 units <u>more</u>*

1

(ii) any **two** from:

- oxygen / air (in)
  *do **not** accept lets oxygen / air out*
  ignore reference to other substances / light passing in or out
  ignore microorganisms passing in
- for microorganisms / bacteria / microbes / fungi / decomposers
  ignore worms / germs / bugs

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- (for aerobic) respiration
- let heat out
  ignore heat in
- heat kills microorganisms

2

(b) compost contains minerals / nutrients / elements / ions / named
allow improve moisture / drainage
allow nitrogen
ignore CO_2 / food / goodness / fertilisers
*do **not** accept vitamins / glucose etc*

1

[5]

Q6.

(a) methane
accept CH_4 / CH4 / CH^4 extras cancel

1

(b) **anaerobic** respiration **or** fermentation
ignore decay / decomposition / digestion
*do **not** allow aerobic*

1

(c) (i) in range 32 – 33

1

(ii) keep cool(er)
or keep below 40 (°C)
or insulate from heat
allow keep at optimum temperature if (c)(i) < 40

1

high(er) / optimum rate of biogas production
or rate decreases at higher temperatures
or works more efficiently
allow correct reference to rate of enzyme action eg high temperature would denature enzyme owtte

1

(d) increases rate / high rate
allow 'works better'

1

insulates / keeps warm
allow maintains optimum temperature

1

[7]

Q7.

(a) (i) **D**

1

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(ii) **A**

1

(b) (i) air / oxygen (can enter)

ignore other factors entering or leaving

1

for (aerobic) <u>respiration</u>

*do **not** accept anaerobic respiration*

1

(ii) (more) minerals / nutrients /salt(s) / ions

or

named mineral / element available

ignore fertility / fertiliser

allow symbols

*allow eg mulching / reducing weeds **or** retain water*

1

[5]

Q8.

(a) (i) methane

apply list principle

allow symbols

1

(ii) <u>anaerobic</u> respiration / (anaerobic) fermentation

ignore decay / decomposition etc

1

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

- manure disposed of
- gains fertiliser (for crops)
- gets (free) fuel **or** cheap supply of energy **or** (free) cooking / heating / lighting

  allow converse

  allow not using wood / trees
- can sell crops at higher price

2

(ii) <u>in the UK</u>

allow converse arguments for Sri Lanka

lower temperature
or
not enough heat

ignore other factor(s)

1

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process is slower
or
enzymes action slower

ignore references to efficiency / 'bacteria working'

1

[6]

Q9.

(a) microorganisms / bacteria / fungi / microbes

*allow named example **or** mould*

ignore decomposers unqualified / germs / maggots / worms

1

(b) it is warm(er) / hot / increased heat / increased temperature

ignore 'sun is hot' unqualified

1

(c) oxygen

1

[3]

Q10.

(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 <u>equivalent</u> 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]

Q11.

(a) methane

1

(b) (insulation maintains) higher temperature / warm(er) /
keeps heat in / prevents heat loss / optimum temperature /
heat increases rate of reaction

*do **not** allow hot(ter) / high temperature*

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ignore same / constant temperature

1

(c) (i) ($)25 000

ignore units
ignore working or lack of working
add 3 figures and subtract 10 000
or
*use of 35 000 and 10 000 but wrong answer for **1** mark*

2

(c) (ii) 8 years = **2** marks

ignore working or lack of working

or

correct answer from (c)(i) = **2** marks

$\frac{200000}{(c)(i)}$ *but wrong answer = **1** mark*

2

[6]

Q12.

(a) (i) 20

1

(ii) 12000

1

(b) area of strips

or

length / width / size of transect

or

number of transects

1

(c) (i) since squirrels mobile

or

squirrels could be counted twice

or

squirrels hide

1

(ii) any **two** from:

- numbers of larders observed likely to be lower than actual

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*do **not** accept squirrels share larders*
or squirrels have more than one larder

- since unlikely that all could be spotted if 5 m away
- old larder
- squirrels moved on / died
- young squirrels
- haven't made a larder

2

(d) (i) 0 to 6.8

1

(ii) any **one** from:

*do **not** accept squirrels prefer blue spruce*

- squirrels prefer blue spruce cones / seeds / nuts as food
- more cones / food
- more nesting sites
- fewer predators / competitors

1

[8]

Q13.

(a) any **two** from:

control variables from information given

- area of bed sampled
- sampling time
- size of net
- kicking action
- net position

2

(b) any **two** from:

must be ideas related to a sample

- some animals not dislodged

ignore reliability etc

- some animals missed / through / escaped net
- invertebrates difficult to identify

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- invertebrates from outside area

2

(c) 10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10

1

(d) any **two** from:

- increased / goes up
  allow increase implied from all data described
- 0 at sample 4
- to (more than) 100

2

(e) mayfly

1

because not found downstream of point where sewage enters stream **or** only in the unpolluted water

1

[9]

Q14.

(a) points plotted accurately

$+\frac{1}{2}$ *square*

deduct 1 mark per error
ignore the line

2

(b) 30 **or** correct from candidate's graph
accept 30 000 lynx
*do **not** accept 30 000*

1

(c) (i) fall
mark (i) and (ii) separately

1

(ii) fewer hares **or** lack of food
*do **not** accept <u>no</u> hares or food*

1

(d) kills / preys / preys on / hunts / catches
<u>and</u> eats / for food (other) animals
*must have the eat **and** kill for the point*

1

[6]

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Q15.

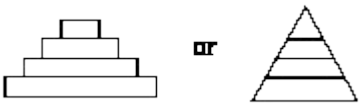
(a) 0.1

ignore working or lack of working

$\frac{88 \times 100}{88\,000}$ *for 1 mark*

2

(b) <u>shape</u>: pyramid with 4 tiers



1

<u>labels:</u>

Plants + Herbivores + Carnivores + Top carnivores
(in sequence – largest to smallest)

allow suitable named examples

*inverted pyramid correctly labelled = **1** mark*

1

(c) more energy / biomass / materials / matter available or less energy lost or energy used up (by herbivores)

***not** just plants*

1

[5]

Q16.

(a) any **three** from:

1960: $\frac{132}{186} \times 100$

71(%)

1970: $\frac{161}{247} \times 100$

65(%)

*if both correct – **3** marks*

*if one correct – **2** marks*

*if neither correct – check working – **1** mark each*

3

(b) **advantages (maximum 3 marks)**

reduced use of coal / oil / non renewable / fossil fuels

less smoke / sulphur dioxide

ignore pollution

cheaper in <u>long term / over 8+ years / few years</u>

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(energy) self-sufficiency idea

fertiliser <u>to help crop growth</u>

accept less fertiliser bought

means of waste disposal

accept any other appropriate responses

disadvantages (maximum 3 marks)

high initial cost

explosion risk

technical **or** training required

accept any other appropriate responses

max 4

(c) (i) suitable scales;

S

1

all plots accurate;

P

1

suitable curve **or** ruled dot-to-dot **or** straight line of best fit

L

*do **not** accept lines through origin line must not be thicker than half square*

1

(ii) insulation / less temperature variation / maintain temperature

*do **not** accept 'kept cool' **or** 'warm'*

1

less chance of microbes being killed /
enzymes denatured **or** keep at optimum temperature **or** maintain high gas production

1

[12]

Q17.

(a) <u>In sequence</u>:

heron
frog
slug
lettuce

1

(b) (i) light / sun

ignore photosynthesis / respiration
cancel mark if water / ions etc given
*do **not** accept heat*

1

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(ii) traps / absorbs light

accept energy for light
*do **not** accept collects / attracts*
*do **not** accept 'traps sun'*

1

(iii) 162

if correct answer, ignore working / lack of working

$\frac{10 \times 1620}{100}$ *for **1** mark*

2

[5]

Q18.

(a) **X** (no mark)

X is more visible **or Y** is more camouflaged

1

(b) (i) so camouflage not changed **or** so not easier to see

1

(ii) 25

1

7

1

(iii) any **one** from:

- eaten (by birds) / died
- mixed in with large number of unmarked moths
- moved away

1

(c) (i) DNA

1

(ii) the gene / allele for being dark / dominant

1

[7]

Q19.

(a) **Quality of written communication**:
ideas given in a sensible order

broken down
giving products (could be CO_2, minerals or gas)
(used by trees)
Q ✓ or Q ✗

1

any **three** from:

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- microorganisms / bacteria / fungi / saprotrophs
- accept saprophytes / saprobionts / detritivores (named)
- digest / break down organic matter / leaves / decompose / reference decomposers / decay / rot
- use of enzymes / correct named example
- absorption by diffusion / active transport
- must be of breakdown products
- respiration / combustion
- release of carbon dioxide

CO_2 can be used (by trees) in photosynthesis

*do **not** accept CO_2 taken in by roots*

3

(b) any **two** from:

- warmth / suitable temperature

  *do **not** accept heat / hot weather*
- damp / water / rain / humid / moisture
- oxygen
- suitable pH

2

[6]

Q20.

(a) (i) (predator) lion

1

(prey) antelope

1

(ii) light

accept other positive indications

1

(iii) <u>in sequence (top to bottom):</u>

lion
antelope
grass

1

(b) (i) bacteria / fungi / saprotrophs

accept moulds / decomposers / microorganisms / microbes / saprophytes / saprobionts

1

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(ii) aerobic

1

moist

1

warm

accept other positive indications1

1

(iii) carbon dioxide

1

mineral salts

1

[10]

Q21.

(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'

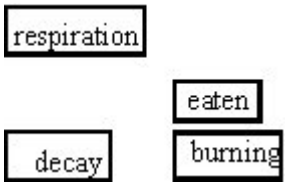
ignore references to growth / reproduction

3

[5]

Q22.

(a) **1** mark for each



4

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(b) (i) digests **or** breaks down **or** decays
dead (organic) material

accept rots for digests

accept plants for dead organic material

*do **not** accept 'live on' **or** 'decompose'*

1

(ii) bacteria **or** worms **or** maggots

*accept microbes but **not** germs **or** viruses*

1

[6]

Q23.

(a) (i) squirrels eat nuts;

each for 1 mark

owls eat squirrels

(2 marks for energy flow)

2

(ii) hazel tree

gains 1 mark

1

(iii) 1 squirrel population would decrease;
because fewer nuts available as food

each for 1 mark

2

2 owl population would decrease;
because fewer squirrels available as food

each for 1 mark

2

(b) (i) digested/broken down;

(ii) by microbes/reference to worm action;

each for 1 mark

2

(iii) March
warmer/increased activity of worms/microbes;

each for 1 mark

2

[11]

Q24.

(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

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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

each for 1 mark

8

c1 → animals
c2 → decomposers

2 marks for sequencing and organising the information

2

[14]

Q25.

(a) e.g.:
competition for light because potamogeton plants taller
competition for nutrients taller plants may have longer roots

each for 1 mark

4

(b) descriptions of:
measuring tape or similar quadrat
method of estimating cover (inside quadrat)

each for 1 mark

3

[7]

Q26.

(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

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some organisms die (rather than eaten)
reference to detritivors
reference to microbes

each for 1 mark

8

[10]

Q27.

(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]

Q28.

(a) glucose/sugar water

for 1 mark each

2

(b) (i) 204

for 1 mark

1

(ii) 49 **gains 2 marks**

(incorrect answer, but correct method gains 1)

2

(iii) 3 **gains 2 marks**
(incorrect answer, but correct method gains 1)

2

[7]

Q29.

(a) pyramid correct shape labelled

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2

(b) warm
moist
oxygen

3

[5]

Q30.

(a) soil contains the microbes which will decay the dead material

for 1 mark each

2

(b) lets in air/oxygen oxygen speeds up decay process

for 1 mark each

2

[4]

Q31.

(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]

Q32.

(a) 1 mark for each correct set of plots

for 1 mark each

2

(b) (i) number of voles/amount of food

for 1 mark

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1

(ii) e.g. increased number of owls
new disease

for 1 mark each

2

[5]

Q33.

(a) (i) D

(ii) A

(iii) B

for 1 mark each

3

(b) W

for one mark

1

[4]

Q34.

pros e.g.:

gum trees survive therefore less soil erosion
therefore food webs not disrupted
if no culling, whole Koala population may die
easier to cull because Koalas are difficult to catch

cons e.g.:

Koala's 'right to life' / ethical issue
better to transfer to reserves on mainland than kill
could use tranquillisers to catch without killing
could allow population to stabilise naturally

max 4 of the above; max 3 pros or cons.

[4]

Q35.

(i) 0.25 × 100 / 25

gains 1 mark

but
1%

gains 2 marks

2

(ii) muscle contraction / limb movement / moving around / chewing
heartbeat / breathing / internal muscle activity

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maintaining body temperature / keeps body warm
active uptake synthesising substances (*reject* growth)

any three for 1 mark each

3

[5]

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