

GCSE BIOLOGY

Topic Paper: 7.4 Trophic levels in an ecosystem (biology only)
Part 1 & 2 Mark Scheme

MARK SCHEME



95 Marks



M1.	(a) water	<i>gains 1 mark</i>		
	oxygen	<i>gains 1 mark</i>	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 detritivores reference to microbes		
		<i>each for 1 mark</i>	8	[10]
M2.	(a) glucose/sugar water	<i>for 1 mark each</i>	2	
	(b) (i) 204	<i>for 1 mark</i>	1	
	(ii) 49	gains 2 marks <i>(incorrect answer, but correct method gains 1)</i>	2	
	(iii) 3	gains 2 marks <i>(incorrect answer, but correct method gains 1)</i>	2	[7]
M3.	(a) pyramid correct shape labelled		2	
	(b) warm moist oxygen		3	[5]



- M4.** (a) (i) 5.2
award 2 marks for correct answer, irrespective of working or lack of it
award 1 mark for $62.4 \div 12$ only with incorrect or no answer 2
- (ii) the smaller the (mass of the) bird the more energy is needed (per gram of body mass)
allow converse
ignore figures 1
- (iii) smaller bird has larger surface area : volume / mass ratio
allow converse 1
- so heat / energy lost more quickly
allow lose more heat / energy
*if (a)(ii) describes a trend of more energy with increasing body mass allow **one** mark for idea of more energy needed for flight* 1
- (b) larger birds spend less time feeding
accept converse
allow the less energy they need per day the longer they spend feeding 1
- since they need less food per gram of body mass (to satisfy energy needs) 1
- [7]**

- M5.** (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

each for 1 mark

8

c1 → animals

c2 → decomposers

2 marks for sequencing and organising the information

2

[14]

- M6.** (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]



M7. (a) 0.18

*award both marks for correct answer irrespective of working
if no answer or incorrect answer
allow 1 mark for $45 \times 100 / 25000$*

2

(b) heat / thermal

allow heat from respiration

1

(c) energy / mass / biomass lost / not passed on **or** energy / mass / biomass is used **or** not enough energy / mass / biomass left

ignore reference to losses via eg respiration / excretion / movement / heat

1

a sensible / appropriate use of figures including heron

eg only 2 from frog / to heron

ignore units

1

(d) any **three** from:

accept marking points if candidate uses other terms for microorganisms

(microorganisms) decay / decompose / digest / breakdown / rot

ignore eat

(breakdown) releases minerals / nutrients / ions / salts / named

ignore food

(microorganisms) respiration

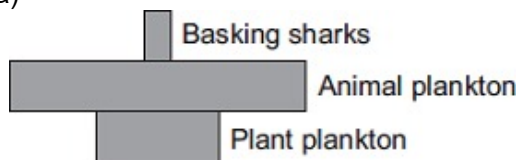
ignore other organisms respiring

(microorganisms / respiration) release of carbon dioxide

3

[8]

M8. (a)



if more than one box is ticked award no mark

1

(b) increasing / higher light / temperature

ignore references to months other than February – April

*do **not** accept mineral / ions increase*

1



more / increased photosynthesis

*for both marks there must be a reference to 'more' at least once
(e.g. 'more light for photosynthesis' gains 2 marks)*

*allow 1 mark for reference to light **and** photosynthesis without an
idea of 'more'*

1

(c) increase due to increase in plant plankton / food

ignore references to months other than April – July

1

decrease due to fall in plant plankton / food **or** decrease as eaten by (basking) sharks

allow decrease as eaten by predators / animals / fish

1

(d) fall due to use / intake by plant (plankton)

ignore ref to no change section of graph

for fall allow March / April

ignore May / February

1

increase due to decay / decomposition / breakdown

for increase allow any month in range August to November

ignore December

1

of dead (plant / animal) plankton

allow of dead organisms / waste

1

[8]

M9. (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

each for 1 mark

8

c1 → animals

c2 → decomposers

2 marks for sequencing and organising the information

2

[14]



- M10.** (a) (i) 0.6 **or** 6×10^{-1}
for correct answer
if no / incorrect answer $\frac{2.4 \times 10^4}{4 \times 10^8} \times 100$
or
 0.006 **or** 6×10^{-3} **gains 1 mark** 2
- (ii) any **two** from:
 reflected
ignore some of light is green
 not absorbed **or** misses chloroplasts / chlorophyll
*allow transmitted **or** passes through leaves*
allow hits other plant parts
 wrong wavelength
 photosynthesis inefficient
accept other limiting factors / named
 allow some lost through respiration / as heat (from respiration) 2
- (b) energy lost via faeces / not digested / waste / excreted (of insect-eating birds) 1
- energy loss via respiration / movement / muscle contraction / heat
 (by insect-eating bird)
accept examples of muscle contraction
*do **not** accept energy used for respiration* 1
- some of (insect eating) bird not eaten but all / most / more of insect is eaten 1

[7]



M11. (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]