

- M1.** (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]

**M2.** (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]**

**M3.** (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 detritivores

reference to microbes

*each for 1 mark*

8

**[10]**

M4. (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]

**M5.** (a) (i) 0.6 **or**  $6 \times 10^{-1}$

*for correct answer*

*if no / incorrect answer*  $\frac{2.4 \times 10^4}{4 \times 10^6} \times 100$

**or**

0.006 **or**  $6 \times 10^{-3}$  *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]

**M6.** (a) 16

*accept correct answer for 2 marks, irrespective of working  
if no answer or answer incorrect accept  $0.64 \times 100 / 4$  (.0) or  
0.16 for 1 mark*

2

(b) insect cold-blooded / not warm blooded **or** does not control body temperature  
*accept mammal warm-blooded / constant (high) body  
temperature / controls body temperature*

1

reference to insect 0.96 (kJ) **and** mammal 12.25 (kJ) transferred by respiration  
**or** relevant calculation of this transfer

*ignore references to other data*

1

(less respiration) so more energy / biomass / food available (for growth of insect)  
*(more respiration) so less energy / biomass / food available  
(for growth of mammal)*

1

**[5]**

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]