

M1. (a) any **two** from:

- fewer trees to take in carbon dioxide for photosynthesis
- decomposers / microorganisms respire (as they decay debris) releasing carbon dioxide
- burning of wood releases carbon dioxide
allow carbon dioxide released by burning fossil fuels in vehicles / factories

2

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best – fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a brief description of some steps in the process but the order is not clear with little biological vocabulary used.

Level 2 (3 – 4 marks)

There is a reasonably clear description of the process involving many of the steps and using some biological vocabulary.

Level 3 (5 – 6 marks)

There is a clear, logical and detailed scientific description of the process using appropriate biological vocabulary.

examples of biology points made in the response:

- this contains mineral ions (and organic matter)
- this increases growth of algae / water plants
- the plants / algae (underneath) die
- due to lack of light / photosynthesis / space
- decomposers / microorganisms feed on decaying matter **or** multiply rapidly
- the respiration of decomposers uses up all the oxygen
- so invertebrates die due to lack of oxygen
- this is called eutrophication

6

[8]

- M2.** (a) (i) anaerobic respiration
or
fermentation
1
- (ii) oxygen is present
accept O₂
*do **not** accept O, O² or O²*
1
- aerobic respiration occurs
ignore anaerobic
1
- ^{CO₂} from respiration
allow from fermentation
1
- (b) high methane after this time
ignore CO₂
1
- (c) organic matter / food / nutrients / named eg used up / reactants
allow too hot / accumulation of toxins / named
*do **not** allow products*
ignore energy
1

[6]

M3. (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]

- 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) use of quadrat / point frame
allow description 1
- randomly placed / random sampling
ignore reference to transects 1
- (b) (i) 6 1
- (ii) more light in A / in field / where sunny
ignore sun 1
- more / better / faster photosynthesis in A / with more light
allow converse 1
- (iii) use light meter / measure light intensity in both habitats 1
- take many measurements at same time of the day 1
- or**
- laboratory / field investigation with 2 batches high light and low light (1)
- count or number of flowers in each (1)
counting point is dependent on investigation point
- (c) more glucose / energy available
allow other named product eg protein

allow if more energy produced

1

for growth

dependent on 1st mark

1

[9]

- M6.(a)** (i) to get data re position of seaweed / of organism 1
- in relation to distance from sea / distance down shore / how long each seaweed was exposed 1
- (ii) repeat several times 1
minimum = 2 repeats
- elsewhere along the shore 1
- (iii) bladder wrack is further up the shore (than the sea lettuce) / exposed for longer 1
ignore found in dry areas / on bare rock
- sea lettuce (only) in rock pools / in the sea / (only) in water 1
- (b) gets more light / closer to light 1
allow better access to CO₂
- (so) more photosynthesis 1
allow 1 mark for light for photosynthesis
allow 1 mark for CO₂ for photosynthesis
ignore reference to oxygen for respiration
'more' only needed once for 2 marks

[8]

- M7.(a)** (i) (initially there is) oxygen
accept:
oxygen hasn't been used up yet (so not anaerobic conditions yet) 1
- (so) aerobic respiration (by microorganisms)
accept (because) methane is produced in anaerobic (fermentation) 1
- producing CO₂ (which does not burn)
accept there is no methane
ignore inflammable 1
- (ii) (peelings had) the most carbohydrate / organic material
answer must be comparative
accept contained more microorganisms / decomposers / bacteria
ignore water
*do **not** allow fat or protein* 1
- (b) (i) 0.22 / 0.221
correct answer with or without working gains 2 marks
allow 0.2 for 1 mark
allow 22.1 for 1 mark
allow 0.34×65 / 0.65 for 1 mark 2
- (ii) (sheep manure) produces a higher volume of biogas / almost double **or** produces 0.27 (m³ per kg) more
accept 0.408(7) / 0.41 / 0.409 (m³) from sheep for 2 marks
accept 0.1877 / 0.188 / 0.19 (m³) more than cow's manure for 2 marks 1
- (sheep manure) produces biogas with a higher percentage methane **or** produces 2% more methane
allow correct difference in volume calculated using 0.408(7) / 0.41 / 0.409 minus answer given in (i) for 2 marks

1
[8]

M8. (a) extremophile(s)

1

(b) (i) common (periwinkle) and flat (periwinkle)
either order, both required

1

(ii) (common and flat) both live in the same habitat / area / named area
allow habitats overlap the most

1

(iii) any **two** from:

- would have wrong food
- would otherwise be exposed to (specific) predators
- cannot tolerate extended exposure to air **or** reduced submersion in seawater
allow cannot tolerate temperature / dehydration
- cannot tolerate high salt concentration (in rock pools)
allow low salt concentration (in rock pools)
- cannot compete with small periwinkle

2

[5]