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 O_2

*do **not** accept O, O^2 or O^2*

1

aerobic respiration occurs

ignore anaerobic

1

CO_2 from respiration

allow from fermentation

1

(b) high methane after this time

ignore CO_2

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 × 100 / 25000*

2

(b) heat / thermal

allow heat <u>from</u> 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 <u>only</u> **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 workingor lack of it*

*award **1** mark for 62.4 ÷ 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

minimum = 2 repeats

1

elsewhere along the shore

1

(iii) bladder wrack is further up the shore (than the sea lettuce) / exposed for longer

ignore found in dry areas / on bare rock

1

sea lettuce (only) in rock pools / in the sea / (only) in water

1

(b) gets more light / closer to light

allow better access to CO_2

1

(so) more photosynthesis

allow 1 mark for light for photosynthesis
allow 1 mark for CO_2 for photosynthesis
ignore reference to oxygen for respiration
'more' only needed once for 2 marks

1

[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 CO_2 (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 (m^3 per kg) more

accept 0.408(7) / 0.41 / 0.409 (m^3) from sheep for 2 marks
accept 0.1877 / 0.188 / 0.19 (m^3) 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]