M1. (a) (i) counts / 12

1

× 120 × 80 / × 9600
or
× area of field

1

(ii) (more) quadrats / repeats

1

placed randomly
ignore method of achieving randomness

1

(b) (i) any **three** from:
- temperature / warmth / heat
- water / rain
- minerals / ions / salts (in soil)
  allow nutrients / fertiliser / soil fertility
  ignore food
- pH (of soil)
- trampling
- herbivores
  ignore predators
- competition (with other species)
- pollution qualified e.g. SO_2 / herbicide
- wind (related to seed dispersal).
  ignore space / oxygen / CO_2 / soil unqualified

3

(ii) light needed for photosynthesis

1

for making food / sugar / etc.

1

effect on buttercup distribution eg more plants in sunny areas / fewer plants in shady areas

1

(c) (i) fertiliser / ions / salts cause growth of algae / plants

1

(algae / plants) block light

1

(low light) causes algae / plants to die

1

microorganisms / bacteria feed on / break down / cause decay of organic matter / of dead plants

    *do **not** allow germs / viruses*

1

(aerobic) <u>respiration</u> (by microbes) uses O_2

    *do **not** allow anaerobic*

1

(ii)   sewage / toxic chemicals / correct named example eg metals / bleach / disinfectant / detergent etc

    allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO_2 / acid rain / pesticides / litter

    ignore chemicals unqualified

    ignore waste unqualified

    ignore human waste / domestic waste / industrial waste unqualified

1

(d)   (i)   2

1

(ii)   more food

    allow other sensible suggestion eg more species colonise from tributary streams after forest

1

(iii)   number of stonefly species decreases (from **A** to **B** / **B** to **C** / **A** to **C**) as more pollution enters river / less oxygen

    allow fewer species in more polluted water

    ignore none are found at site C

1

[19]

M2. (a) (i) chloroplast

1

(ii) cell wall

1

(b) (i) osmosis
accept diffusion

1

(ii) cell wall (prevents bursting)

1

(c) (i) carbon dioxide
allow correct formula

1

glucose
allow sugar / starch

1

(ii) any **two** from:

- light sensitive spot detects light
- tells flagellum to move towards light
- more light = more photosynthesis

2

(d) (cell has) larger SA:volume ratio

1

short (diffusion) distance

allow correct description

1

(diffusion) via cell membrane is sufficient / good enough

or

flow of water maintains concentration gradient

1

[11]

M3. (a) (i) 10

1

(ii) any **three** from:

- both increase with distance
- more spp on walls than on trees
- no lichen spp on trees for first 1 km from city
- more steady / less erratic increase on trees than walls (or converse)
- rate of increase increases with distance

3

(b) SO_2 decreases with distance from centre

accept converse

Ignore pollution

1

high SO_2 reduces survival or kills lichen

accept converse

1

(c) (i) any **three** from:

- (line) transect
- quadrat / reference to specific area
- count number of lichens or coverage on trees
- at regular intervals / set distances

3

(ii) (more) Xanthoria nearest road

allow 'nitrogen-loving' for Xanthoria

1

(more) Usnea further from the road

allow 'nitrogen-sensitive' for Usnea

because most nitrogen oxide from vehicles (near road)

or

because nitrogen oxide levels will be falling / less further away (from road)

accept converse

1

[12]

M4.   (a)   gets more light (near surface)

allow warmer (near surface)

allow bladders contain (more) carbon dioxide

1

(so) photosynthesises more

1

(because) bladders aid floating (when tide is in)

or

(so) more biomass / glucose / starch produced

*ref to 'more' needed only once, eg gets more light for photosynthesis gains **two** marks*

if 'more' not given do not award mark on the first occasion

1

(b)   lets angler fish see / attract its prey / mates **or** see predators as it is dark (at 1000m)
or
lets angler fish see / attract prey to get food
or
lets angler fish see / attract mates to reproduce
or
lets angler fish see predators to avoid being eaten

*must be in a correct pair to gain **two** marks*

2

[5]

M5. (a) any **three** from:

- parts of organisms have not decayed
    - *accept in amber / resin*
    - *allow bones are preserved*
- conditions needed for decay are absent
    - *accept appropriate examples, eg acidic in bogs / lack of oxygen*
- parts of the organism are replaced by other materials as they decay
    - *accept mineralised*
- or other preserved traces of organisms, eg footprints, burrows and rootlet traces
    - *allow imprint or marking of organism*

3

(b) (i) teeth for biting (prey)
    must give structure + explanation

1

claws to grip (prey)
    accept sensible uses

1

wing / tail for flight to find (prey)

1

(ii) any **two** from:

- new predators
- new diseases
- better competitors
- catastrophe eg volcanic eruption, meteor
- changes to environment over geological time
    - *accept climate change*
    - *allow change in weather*
- prey dies out **or** lack of food
    - *allow hunted to extinction*

2

[8]