**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

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*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*

**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]**