

Mark schemes

- 1**
- (a) measure the length / area of the field 1
- (b) use (a) random number(s) (generator)
or
use coordinates method explained 1
- (c) compare their results with another student's results 1
- place more quadrats 1
- (d) $0.25 \times 5 = 1.25$ 1
- $500 / 1.25 = 400$ 1
- $(40 \times 400 =) 16\ 000$
allow 16 000 with no working shown for 3 marks 1
- (e) 11 1
- (f) (quadrat) 5
both quadrat number and correct reason must be given for 1 mark 1
- very few or only 2 growing (here) [9]
- 2**
- (a) 0.67(%)
allow 0.6̇ or 0.7
allow 1 mark for evidence of $(2 \times 10^6) \div (3 \times 10^8)$
or
allow 1 mark for 0.0067 or 0.6 2
- (b) (i) idea that food chains start with plants / producers
allow food chains do not start with animals or larvae are consumers 1
- idea that these make food (for other organisms in the chain)
allow idea that plants / producers photosynthesise or plants / producers get energy from the sun
allow mosquito larvae do not make food / photosynthesise or mosquito larvae do not get energy from the sun 1

- (ii) any **four** from:
- reasoned argument for **or** against release
must refer to at least one advantage and one disadvantage.
*max 3 marks for either only advantages **or** only disadvantages*

advantages:

- fewer mosquitos biting **or** spreading malaria
- fewer people get / die from malaria
allow people won't get / die from malaria
- lower medical costs (for those infected **or** for treatment) **or** less healthcare needed
- better economically for developing / tropical countries.

disadvantages:

- fewer crops reproduce
allow fewer crops pollinated
- poorer crop yield
- possible starvation (of people)
- high cost of GM production / mosquito release
- less food for bats / birds **or** bats / birds die
*allow disruption to food chain / ecosystem **or** reduction of biodiversity*
- gene could 'escape' into other wildlife / species
ignore into plants

4

- (iii) any **three** from:

- gene from bacteria cut out
allow allele for gene
- ref to enzymes (anywhere in process)
allow at any point in process, ie in cutting or in splicing
- (gene) transferred to chromosome of mosquito
allow DNA for chromosome
- at an early stage of development
allow egg / embryo

3

[11]

3

- (a) 88 000

correct answer = 2 marks

allow 1 mark for 1.1 (in 1 m²)

or

allow 1 mark for answer = [candidate's value in 1m²] × 80 000

2

- (b) Place the quadrat in 100 random positions.

1

(c) any **three** from:

must include at least one advantage and one disadvantage for full marks

Advantages:

- less cost / free
- less likely to kill other (harmless species of) plants
- weedkiller may be toxic **or** may cause water pollution
- weedkiller may accumulate up food chains

allow uneven distribution of ragwort so much wastage of weedkiller

Disadvantages:

- volunteers may mistake other species for ragwort
- volunteers may miss plants
- some ragwort left to poison horses
- time consuming
- difficulties getting enough volunteers

if no other disadvantages; allow ref. to issues with volunteers – eg don't turn up / not careful / don't finish the job

3

[6]

4

(a) 160 000

if incorrect answer / no answer:

allow max. 2 for method:

1 mark for mean = total number ÷ area of ten quadrats

eg $\frac{20}{0.625}$ or $\frac{20 \times 8}{5}$ or $\frac{160}{5}$ or 32

1 mark for final answer = mean × field area

eg mean × 5000

3

(b) Improvement: place quadrats randomly

and

Reason: avoid bias / (more) representative / (more) reliable

allow 1 mark if 2 correct improvements but no reasons / only incorrect reasons

1

Improvement: more quadrats

and

Reason: overcome random variation / (more) typical / (more) representative / (more) reliable / repeatable

1

Improvement: larger quadrats **or** repeat when plants are bigger

and

Reason: less likely to miss plants

ignore accurate, valid, precise and fair

ignore anomalies

1

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5

(a) (i) counts / 12

1

$\times 120 \times 80 / \times 9600$

or

\times 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) respiration (by microbes) uses O₂
- 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 / SO₂ / 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]

6

- (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]

7

- (a) any **three** from:

- blackbirds seen in higher % of / more gardens
- multiplying mean number by percentage of gardens seen in shows blackbird is higher

allow 1 additional mark for correct figures showing this, ie 264

sparrows: 305 blackbirds

- only done on one day / month / hour

eg only done in January

- only done in gardens (one bird may prefer a different habitat)
- problem of (correct) identification
- may re-count same ones

if neither point 5 or 6 given allow 1 mark for idea of error / miscounted

- people may quote false numbers / may make it up

3

- (b) (i) 60.3

award 2 marks for correct

answer, irrespective of working

*award 1 mark for $33.5 + (33.5 \times 80 / 100)$ or equivalent with no answer or incorrect answer **or** award 1 mark for 26.8*

2

(ii) any **two** from:

- change in temperature
a comparison is required
eg cooler / warmer / less frost (in 2012)
- fewer predators
- more food **or** less competition for food
- more nesting space **or** less competition for nesting space
- less disease (in 2012)
allow idea that people may be better / worse at identifying birds / goldfinches
allow idea of movement to gardens (due to poor food supply elsewhere)

2

[7]