

- M1.(a)** 4: 1
- (b) 2.68(6).
If answer incorrect:
 $\Sigma n(n-1) = 242 = 1 \text{ mark}$
 $N(N-1) = 650 = 1 \text{ mark}$ 2
- (c) 1. Take more samples and find mean;
 2. Method for randomised samples described.
Allow larger area = 1 mark 2
- [5]**
- M2.(a)** Species richness measures only number of (different) species / does not measure number of individuals. 1
- (b) Trees vary in height. 1
- (c) 1. Index for canopy is 3.73;
 2. Index for understorey is 3.30;
 3. Index in canopy is 1.13 times bigger;
If either or both indices incorrect, allow correct calculation from student's values. 3
- (d) 1. For *Zaretis itys*, difference in distribution is probably due to chance / probability of being due to chance is more than 5%;
 2. For all species other than *Zaretis itys*, difference in distribution is (highly) unlikely to be due to chance;

3. Because $P < 0.001$ which is highly significant / is much lower than 5%.

3

[8]

- M3.(a)** 1. Kingdom, Phylum, Class, Order, Family;
2. *Luscinia svecica*.

1 mark for each correct column

*Allow Genus and Species if both placed in box for species
but not if both placed in genus box*

2

- (b) Number of different alleles of each gene.

*Accept number of different base sequences (found) in each
gene*

1

- (c) 1. Has greater proportion of genes / percentage of genes showing diversity;
2. Percentage is 35% compared with 28% / proportion is 0.35 compared with 0.28.

*Allow correct figures that are not rounded up, i.e., 34.9% /
0.349 and 27.8% / 0.278*

2

[5]

- M4.(a)** 1. Draw grid over (map of) area;
2. Select squares / coordinates at random.

2

- (b) 1. No emigration / immigration;
2. No losses to predation;
3. Marking does not affect survival;
4. Birth rate and death rate equal;
5. (In this case) all belong to one population.

2 max

- (c) 1. Only glows brightly with UV, so doesn't make insects more visible;
 2. So doesn't affect / increase predation;
OR
 1. Glows brightly with UV marking visible;
 2. So makes it easy to pick out labelled insects.

2

- (d) 10 130.
 Tolerance of ± 1

$$N = \frac{M \times C}{R} = 1 \text{ marks}$$

2

- (e) 1. Scientists removed large numbers of insects (which were not returned) from same area / same population;
 2. Affecting ratio of marked to unmarked.

2

[10]

- M5.(a)** 1. Number of (individuals of) each species;
Accept: 'population' for 'number'
 2. Total number of individuals / number of species;
Accept: 'species richness'
MP2 allows for other types of diversity index

2

- (b) (i) (Shows) results are due to the herbicide / are not due to another factor / (to) compare the effect of using and not using the herbicide / shows the effect of adding the herbicide;
Neutral: allows a comparison
Neutral: ensures results are due to the independent variable
Reject: 'insecticide'
Accept: 'pesticide'

1

- (ii) 1. (More) weeds killed **so** more crops / plants survive / higher yield / less competition;

2. High concentrations (of herbicide) harm / damage / kill / are toxic to crops / plants;
Accept: 'pesticide'
Neutral: 'insecticide'
Accept: use of figures (eg 400+)

2

- (iii)
1. Reduced plant diversity / fewer plant species / fewer varieties of plant;
Accept: 'weed' for 'plant'
Neutral: fewer plants
Accept: only one crop species remains
 2. Fewer habitats / niches;
Q *Neutral: fewer homes / shelters*
 3. Fewer food sources / varieties of food;
Neutral: less food

3

[8]

M6.1. Carbon dioxide combines with ribulose biphosphate / RuBP;

2. Produces two glycerate (3-)phosphate / GP;
Accept: any answer which indicates that 2 x as much GP produced from one RuBP.
3. GP reduced to triose phosphate / TP;
Must have idea of reduction. This may be conveyed by stating m.p. 4.
4. Using reduced NADP;
Reject: Any reference to reduced NAD for m.p.4 but allow reference to reduction for m.p. 3.
5. Using energy from ATP;
Must be in context of GP to TP.
6. Triose phosphate converted to glucose / hexose / RuBP / ribulose biphosphate / named organic substance;

[6]