



**Exampro A-level Biology
(7401/7402)**

Name:

Class:

Investigating diversity QP

Author:

Date:

Time: **70**

Marks: **57**

Comments:

- M1.(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 making 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]

- M2.**
- (a) (i) transect line may not go through representative areas / may avoid certain areas; 1
- (ii) large sample;
how random coordinates are generated / how random places chosen; 2
- (b) (i) spread of values around the mean height of the plant; 1
- (ii) smaller plants at higher altitude;
greater the altitude the lower the standard deviation ;
reference to figures to make a comparison; 2 max
- (iii) the plants measured were grown under uniform conditions; 1
- [7]**
- M3.**
- (a) generation of random co-ordinates;
use of 10 or more quadrats;
collection of all dog whelks in quadrat; 3
- (b) greater variation for sheltered population / population A;
range / spread around the mean;
(or converse) 2
- (c) (i) smaller ratio means relatively larger foot / population B has relatively large foot;
better able to grip;
larger / longer shells have greater area exposed / are subject to greater force;
- (ii) wave action limits the max. L / A ratio / extremes;
valid point about age, e.g. greater age range on sheltered shore / live longer on sheltered shore;
(allow shell size marking point in either (c)(i) or (c)(ii) but only credit once) 4 max

- M4.(a)**
1. Antibody and haemoglobin / blood (of different primates) mixed / added / bind;
Neutral: methodology of how the human antibody would be obtained
Neutral: mix antibody and plasma / serum
*Neutral: reference to mixing antibody with **human** haemoglobin / blood*
Reject: idea of injecting (human) antibody into primates
 2. Precipitate / complex / band formed;
 3. Amount of precipitate / complex / thickness of band shows relationship / similarity (in protein / DNA);;
Note: MP3 is worth 2 marks outright on its own as it subsumes MP2. If MP3 is awarded, do not also award MP2 for a total of 3 marks.
Reject: incorrect relationship eg more precipitate = less closely related

3

- (b) (i) (Largest decrease in separation temperature) – no mark
Accept: 'not many' for 'few'
Note: 'fewer hydrogen bonds between complementary bases / base pairs' = 2 marks

1. (So) few(er) hydrogen / H bonds;
2. (So) few(er) complementary bases / few(er) base pairs;
Neutral: fewer bases
Neutral: fewer similar base sequences

2

- (ii) (Same species) have different alleles / different base sequences / (different) mutations / introns / non-coding DNA / multiple repeats;
Q *Reject: different genes*
Neutral: different bases
Neutral: base sequences are not complementary
Q *Neutral: 'junk DNA'*
Neutral: intraspecific variation / genetic differences
Reject: interspecific variation

1

- (iii) Correct answer in range of **9.69** to **9.71(4286)** = 2 marks;;
Accept: 9 690 000 to 9 714 286 for 2 marks
If 10 is shown and an answer in the range of 9.69 to 9.71(4286), award 2 marks
If 10 is shown and an answer in the range of 9.69 to 9.71(4286) is not shown, award 1 mark

One mark for incorrect answers that show any of the following:

(1°C =) **5.7(14286)** (million years)

OR:

$$20\ 000\ 000 \div 3.5$$

OR:

$$20 \div 3.5$$

2

[8]

M5.(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]

M6. (a) (i) EITHER: Correct answer: 3.45 / 3.44 / 3.4 = 2 marks
OR: Understanding of $\Sigma n(n-1)$ / use of
 134 / (2 + 90 + 12 + 30)
 + wrong answer = 1 mark

- (ii) Takes account of number of individuals / abundance / population size (as well as number of species);

1

- (b) The species at A / *F. spiralis* loses less water / loses water less rapidly / loses less mass;

The species at A / *F. spiralis* better adapted to / can survive where exposed for longer / to drier conditions;

The species at A / *F. spiralis* avoids competition For named aspect – e.g. light / substratum / space / CO₂;

ACCEPT converse argument re. F. serratus

3

[6]

- M7.** (a) (i) To cut the DNA;
Reject breakdown, cutting out

1

- (ii) To separate the (pieces of) DNA;

1

- (b) Complimentary base sequence / complementary DNA; binds to both (haplotypes);

Label would show up in both;

Idea of complementarity required

2

- (c) (i) Y chromosome inherited / comes from male parents / only found in males;

1

- (ii) Mitochondria in egg / female gamete / no mitochondria come from sperm / male gamete;

1

- (d) (i) Allows comparison;
Different (sized) areas covered;

2

(ii) Wolves do not eat all of prey animal / do not eat (large) bones / skin;
Inedible parts make up different proportions / wolf eats different proportions;

2

(e) Limited by food / prey; as prey increases so do wolf numbers / positive correlation;

Large range so other factors involved;

2

[12]