

- M1.** (a) Population – organisms of one species in an ecosystem/habitat/area;  
Community – organisms of all species / all populations in an ecosystem/habitat/ area; 2
- (b) (i) No immigration/migration (Ignore references to emigration);  
No reproduction (*Ignore references to death*);  
Idea of mixing;  
Marking does not influence behaviour / increase vulnerability to predation;  
Sample/population large enough; max 2
- (ii)  $\frac{96 \times 77}{11}$ ; 672;  
*Correct answer (however derived) scores 2 marks*  
*Incorrect answer with evidence of correct method scores 1 mark.* 2
- (c) Principle of randomly placed quadrats;  
Method of producing random quadrats; (*Reject 'throwing'*)  
Valid method of obtaining no. dandelions in given area (mean per quadrat/ total no. in many quadrats);  
Multiply to give estimate for total field area; max 3
- (d) (i) Niche of A – 1;  
Niche of B – 3;  
Too small for B / too hot for A – 4;  
Too large for A / too cold for B – 2;  
*All four correct = 2 marks; any 2 correct = 1 mark* 2
- (ii) Original population living in one area / 2 species evolved in the area;  
Idea of genetic variability;  
Concept of reproductive isolation;  
Possible mechanism;  
Gene pools become increasingly different;  
Until interbreeding does not produce fertile offspring; max 4
- M2.** (a) (i) ecosystem is (self-supporting) system in which all organisms / community interact with physical environment / community + environment / biotic + abiotic; 1
- (ii) A + B + E + F + G + I; 1

[15]

- (b) pygmy weed competes for CO<sub>2</sub> / light / nutrients; reduction in numbers of original plants;  
some of original plant species lost;  
loss of habitats / niches / shelter / food sources;  
consumers die / some migrate;
- 3 max
- [5]
- M3.** (a) (i) Two marks for correct answer of 1760 (seals per year)  
One mark for incorrect answer showing clear evidence of calculating rate by dividing number by time;  
*Q Note that working mark cannot be awarded unless method is shown clearly and unambiguously*
- 2
- (ii) Fewer whales means more krill;  
More krill-feeding fish;  
More food for seals;
- 2 max
- (b) Data can be collected rapidly;  
Does not require defining individual plants;
- 2
- (c) Change in species composition;  
Greater area of bare ground;  
Lower diversity;  
*Q Credit should not be given for imprecise answers relating to "plants".  
Final point requires specific reference to diversity*
- 3
- (d) Seals produce nitrogenous waste/urine/faeces;  
Produces ammonium ions/nitrates by decomposition/nitrification;
- 2
- [11]
- M4.** (a) (i) Will work in all weather conditions/hairs will stick to it even if shrew/animal is wet/withstand rain;
- 1
- (ii) So shrews come into contact with glue;
- 1
- (b) Avoids bias/allows statistical tests to be carried out;  
*Allow description*
- 1

- (c) (i) Increases the reliability of the measurements;
- If measurements are repeatable, differences less likely to be due to measurement/personal error/anomalies unlikely;  
*Accept advantages of repeatable results. E.g. identifying anomalies/remove errors*
- 2
- (ii) Plot graph/scatter diagram of one set of results against the other;  
**Q** *To gain first marking point, candidates must say what has been plotted.*
- Expect to see points lying close to line/Line should slope upwards/show positive correlation;  
*If what is being plotted is not clear, second point cannot be awarded.*
- OR
- Plot measurement against hair number;
- Look for overlying/corresponding points;
- 2
- (d) (i) One mark for a valid explanation based on individual shrews entering more than one hair tube/many hairs from same shrew/shrews enter without leaving hair;
- 1
- (ii) Rules out differences due to changes in population/changes in environmental conditions;
- That could be produced by births/deaths/migration/specific example of environmental conditions affects results;
- 2
- (e) (A statistical test) determines the probability of results being due to chance;
- Enables null hypothesis/description of null hypothesis to be accepted/rejected;
- Determines whether correlation/result is significant;
- 2 max
- (f) (i) (Curve/line of best fit shows) positive correlation/description of positive correlation;
- 1

- (ii) Curve/line of best fit (almost) parallel to x-axis/horizontal/  
level/no correlation/index is independent of number of shrews;

Hair tubes with positive results when no shrews trapped;

Small size of shrews means shrews may not trigger traps;

2 max

[15]

M5.

- (a) (i) Method of positioning quadrats,  
E.g. Find direction and distance from specified point/find  
coordinates on a grid/split area into squares;

Method of generating random numbers;

E.g. From calculator/telephone directory/numbers drawn from a hat;

*Last point represents minimum answer*

**Q** Do not credit any method that relies on throwing a quadrat

2

- (ii) Calculate running mean/description of running mean;

When enough quadrats, this shows little change/levels out (if  
plotted as a graph);

Enough to carry out a statistical test;

A large number to make sure results are reliable;

*Ignore terms that are not incorrect*

*Regards large numbers as 10/10% +*

Need to make sure work can be carried out in the time available;

2 max

- (b) Coppice different parts of the wood at different times;

As data show many daffodils flowering 4/5 years after coppicing;

**Q** Second point needs specific reference to the graph, numbers  
and time after coppicing. Accept any correct answer that does this.

2

- (c) Positive correlation between rainfall and flowering/the higher the  
rainfall, the more daffodil flowers;

Negative correlation/the higher the temperature the fewer daffodils  
in flower;

All statistically significant so not likely to be/not due to chance;

2 max

[8]

**M6.** (a) Two marks for correct answer of 59/60;;

One mark for incorrect answer clearly derived from figures of 18, 28 and 38;

*Ignore: any figures after decimal point.*

2

(b) (i) Population changes;

*Reject: population decreases*

As young birds leave nest/join population;

*Reject first point if (young) birds are leaving population/migrating*

2

(ii) (Would be likely to) catch all birds (again) in second sample/sample sizes are the same;

*Neutral: references to breeding*

Birds (in territories and) not mixing with population;

*Accept: idea of the population is divided*

Only estimates number of birds in territories sampled/territory sample not representative (of population);

2 max

(c) (Recording) DNA/base sequence is like marking (animal)/wouldn't need to mark;

(Finding identical/same base sequence) would show animal has been caught/recorded before;

2

[8]

**M7.** (a) (i) Decrease in spadefoot toad;

Decrease in southern toad up to 4 newts per pond, then increase (at 8 newts per pond);

*Allow one mark for answers stating decrease in both toad species*

2

(ii) Predators/newts eat/feed/prey on toad (tadpoles);

Less competition more food/resources/fewer toads feeding on frogs;

*Allow first mark if reference is made to either toad species being eaten.*

*For first mark candidate must clearly indicate that the newts are feeding on the toads. Answers simply stating that newts are increasing and toads are decreasing are not sufficient.*

2

- (b) Fewer toads/tadpoles (as number of predators increases in Figure 1);  
 More food, so are larger/grow more/increase in mass;  
*If candidate clearly indicates fewer frog tadpoles survive, negate the first marking point. However, accept decrease in overall number of tadpoles which may include frog tadpoles.*

2

[6]

- M8.** (a) (i) Fewest people at site R as mean is lowest;  
*Accept use of mean values to show 2.2 is the lowest*  
 Standard deviations do not overlap so significant/not due to chance;  
*Accept use of values/description of standard deviation even in wording 'standard deviation' is not used*
- (ii) There was a probability of less than 0.05/5 in a hundred/5%;  
*In the context of less than*  
*Accept converse: probability of more than 95%*  
 That the difference was due to chance;  
*Look for idea of difference (between sites)*
- (b) (i) (Would not be reliable as) number of species is still increasing;  
*Accept: has not reached peak/maximum or if shown by values*
- (ii) Idea of curve has flattened/no more species found so no benefit/no point/takes unnecessary time/takes unnecessary effort/can get same results with fewer quadrats;  
*Basic idea is of minimising effort.*  
*If values used reward idea rather than accuracy of numbers*
- (c) Combustion/would burn/cause loss of substances (other than water)/named substance/cause loss of dry mass;;  
*Accept: only want water to be lost*  
*Ignore: reference to decomposition*
- (d) Seaweeds/plants are producers/lower/first trophic level/animals are consumers/higher trophic level/feed on seaweeds;  
*Accept relevant position in food chain as trophic level*  
 Loss of energy between trophic levels;  
*Accept: energy transfer is inefficient*  
 As a result of respiration/as heat;  
*Accept: description of trophic levels*  
*Accept: not all seaweed/eaten*

2

2

1

1

1

2 max

- (e) (i) The site/site U with most people/34.6 has the largest ratio/3.24;  
*Accept: as number of people increases, ratio increases*

(Large value of ratio due to) large biomass ÷ small number/large size ÷ small number/biomass greater than abundance;

*Explanation of seaweed ratio*

2

- (ii) 1. Fewer larger animals/more smaller animals where more people/more disturbance;  
*Principle*
2. 0.09 linked to 34.6/appropriate link between row 4 and row 1;;  
*Use of data*
3. Larger animals affected by human activity;  
*Accept: converse*
4. Smaller animals are young animals;  
*Accept: converse*
5. Fewer species of seaweed (with disturbance);  
*Accept if shown by figures*
6. (So) fewer niches/habitats (for large animals);  
*Accept idea of disturbance/damage to niche/habitat*

4 max

[15]

- M9.** (a) (Number of) organisms of one species in a habitat/same place;

1

- (b) (i)  $B + I = D + E / (B + I) - (D + E) = 0 // (B - D) + (I - E) = 0$ ;  
*Allow word equations.*

1

- (ii)  $B + I > D + E / (B - D) + (I - E) > 0 // (B + I) - (D + E) > 0$ ;

1

- (c) (i) Improved medical care/improved nutrition/improved sanitation/water treatment/lower infection rates/less disease;  
*Allow any specific examples of improved health or medical care e.g. vaccinations, health education*

1

- (ii) Correct answer of  $108\,605\,000 = 2$  marks;;  
 $107\,000 \times 15/107$  million  $\times 0.015/1605\,000/$   
 (deaths)  $535\,000$  and (births)  $2140\,000$ ;

2

[6]

- M10.** (a) All organisms of one species in a habitat/area/place/at one time;  
*Accept group*

1

- (b) (i) From curve **C**;

Find age as a percentage of a maximum/find value when  $5000/50\%$  still alive;

(Use to) calculate as a percentage of  $95/\text{Answer} = 85$  years;

**Q** *This question tests quality of written communication. Marks may be awarded for calculating the answer but this must be supported by adequate explanation making the points listed.*

*If curve A or B are given, figures for last mark point are*

*A 8*

*B 50*

*All three +/- 2*

3

- (ii) More disease/poor food supplies/poor sanitation/poor medical care;  
*Overcrowding not enough*

High death rate among the young/in childhood/curve drops steeply at first/in first 40;

*Ignore ref to years or percentage*

2

[6]

- M11.** (a) (i) *suitable reason for birth rate increase;*  
*examples,*  
 more people survive to reproductive age;  
 better pre-natal care / health care of mother;  
 better nutrition of mother;

1 max

- (ii) *suitable reason for death rate fall;*  
*examples,*  
 better nutrition;  
 better sanitation;  
 (widespread) introduction of health care;  
 better post-natal care (mother or child);  
 vaccination programmes;

1 max

- (b) (i) birth rate decreasing;  
as the death rate constant but births minus deaths is falling; 2
- (ii) reduces population growth until 1989/90 (as more (net) emigration); increases population growth from 1989/90 (as more (net) immigration); 2
- [6]**

- M12.** (a) (i) 1931;  
smallest difference between birth and death rate; 2
- (ii) rate of increase =  $34.3 - 22.0 = 12.3$  per thousand,  
so increase =  $18\ 000 \times 12.3/221\ 400$ ;  
size of population =  $18\ 000\ 000 + 221\ 400$  (increase)  
= 18 221 400; 2

- (b) herd immunity/effect;  
any individual has lower chance of meeting infected individual;  
lower chance of disease being passed on/prevents spread of disease; 2 max

- (c) males have XY, females XX/ males have Y chromosome females do not;  
so males have only one allele for some genes;  
these alleles are expressed;  
(harmful alleles) increase chance of early death/valid example;

OR

males have XY, females XX/ males have Y chromosome, females do not;  
males develop testes;  
which are responsible for testosterone production;  
which causes males to take more risks/valid example;

OR

males have XY, females XX/ males have Y chromosomes, females do not;  
females develop ovaries;  
which are responsible for oestrogen production;  
which protects individuals against diseases/valid example, e.g CHD;

3 max

**[9]**

- M13.** (a) (i) A – high proportion of young, decreasing proportion  
in successively older groups / low proportion of older people;  
B – approximately same proportion of all age groups;  
(*must have pattern i.e. refer to whole age range*) 2
- (ii) a large base to pyramid/high proportion of young /high birth rate; 1
- (b) birth rate and death rate;  
emigration and immigration; 2

[5]

