M1. (a) (i) Continuous variation – range of values/not discrete categories/
many categories/no gaps;

1

(ii) Crossing over / chiasmata;
Random segregation / independent assortment;
In meiosis I and meiosis II;

max 2

(b) Range influenced by single 'outlier' (*accept anomaly*) /
converse for S.D.;
S.D. shows dispersion/spread about mean;
Range only shows highest and lowest values/extremes;
S.D. allows statistical use;
Tests whether or not differences are significant;

max 2

[5]

M2. (a) greater environmental influence than genetic;

1

(b) identical twins have same genotype / converse for non-identical;
compare identical and non-identical twins / identical twins who
have been separated /
non-identical twins in same environment;
if genetic - similarity between identical twins / converse;
large sample required / use a statistical test;

4

[5]

M3. (a) Difference in DNA/base sequence / difference in alleles/genes/gene pool;
Neutral: 'fewer alleles' unless qualified e.g. fewer different alleles.

1

(b) Environmental;
Accept: Environment

1

(c) Reduced (genetic diversity);

As fewer different/varied alleles/genes / reduced gene pool;

(Genetic) bottleneck;
Neutral: 'fewer alleles' unless qualified e.g. fewer different alleles.

2 max

[4]

M4. (a) (So results) can be compared/so measurement is the same each time/because eye is not perfectly round/uniform;

Accept eye opens to different amounts

1

(b) (i) 1. Eye (diameter) is smaller and antennae longer;

2. Antennae detecting touch;

3. Data only refers to shrimps/data may not apply to all animals/only in one area;

The principle here is that candidate has recognised that both features confirm suggestion. Exact wording does not matter.

2 max

(ii) 1. Standard deviation gives a measure of spread/variation;

2. More standard deviations overlap, the less likely it is that differences are real/significant/the more likely they are caused by chance;

Do not accept range

Accept converse.

Although we are looking for the idea of significance, we cannot require this term.

2

(c) (i) Qualitative statement about

difference in size/

difference in variation/

overlap in size;

Quantitative statement about

difference in size/

difference in variation/

overlap in size;

Supported by relevant two sets of figures from graph;;

Note simplistic answer involving a quantitative statement gains 1 mark.

More specific answer involving quantitative information gains 2 marks.

2

(ii) (No) for same body length, antenna are longer/antenna are shorter/some with longer body have short antennae/some with shorter body length have longer antennae;

OR

(Yes) positive correlation in open/in cave;
Habitat not critical as a term.
Must refer to idea of same habitat
Accept description

1

(d) More alleles of each gene/shrimps in open have all the alleles;
Candidates are required to use the information from the table. Must therefore refer to alleles.

1

(e) 1. A small number of shrimps were/went into the cave;

2. All/high proportion of shrimps had allele L;

3. Cave population descended from these/these reproduce;

3

(f) (i) 1. Cross shrimps from two sites/watch courtship;

2. Breed young together/observe mating;

3. Allow 1 mark for any method of improving quality of results e.g. carry out reciprocal crosses/large number of crosses/isolate beforehand;
Other valid equivalent suggestions should be accepted.

(ii) If same species the shrimps would breed, producing fertile young/courtship species specific;
Accept any form of evidence – mating/laying eggs/giving birth to young.

3

[15]

M5. (a) (i) 22;

1

(ii) 1. Odd number of chromosomes/33 chromosomes (in leaf cell);

2. Chromosomes cannot pair/cannot undergo meiosis/would result in half chromosomes/cannot form haploid cells;

2

(b) (i)   Fast growth/produces crop fast/produces large crop;

Do not insist on relative statement.
Accept similar terms for fast. E.g. "better" growth
Do not accept unqualified references to profit.

1

    (ii)   Leaves less likely to break/higher breaking strength;

1

(c)   Low genetic diversity because they are produced by mitosis;

Will all have the same DNA/genes/alleles/will be <u>genetically</u>
identical/will be clones;

OR

Low genetic diversity because they are not produced by meiosis;

No crossing over/independent segregation/will not be <u>genetically</u> different;

Independent segregation is the specification term. Accept other
such as random assortment.

2

[7]