Mark schemes

Q1.

(a) 1. Use a grid

OR

Divide area into squares/sections/plots;

Accept use tape measures for 'use a grid'

2. Method of obtaining random coordinates/numbers;

Accept calculator/computer/ random numbers table/generator for method

3. Use same method of measurement (of the plants each time);

Accept descriptions of measurements eg from soil/ground to highest leaf or to top of plant or to (shoot) tip or to highest part/bit

4. Repeat a large number of times

OR

Measure a large number of plants;

Accept ≥ 10 for large number

Accept many/multiple but ignore several

5. (Find the) sum of heights and divide by number of plants;

Accept total for sum

Accept measurements for heights or plants

Accept a word equation eg

$$\frac{\text{Height total}}{\text{Number of plants}}$$

6. Calculate a running mean until number becomes (fairly) constant;

5 max

(b) 1. Plant height **and** /cm in first column **and** Frequency (density), in second column;

Accept M. sylvestris for plant

Accept length for height

Accept mm or m for cm

Accept number for frequency

2. Non-overlapping class intervals between 60 and 120;

eg

60 ≤ × < 70

OR

60 – 69, 70 – 79 etc

OR

60 – 69.9, 70 – 79.9 etc

OR

59.5 – 69.0, 69.5 – 79 etc

Accept unequal class widths if frequency density used in heading

Accept correct figures in either column

Figures given must match units in heading, eg 600 if heading shows / mm or 0.6 if heading shows /m

*Accept fewer or more than 6 rows of data **if** data covers a range between 60 and 120*

Ignore any numbers in the frequency column

2

(c) Correct answer of 2.11 = **2 marks;;**

Incorrect answer that shows correct total in numerator 1561250 = **1 mark**

OR

Correct total in denominator 741250 = **1 mark;**

For 2 marks, accept 2.1(0623946) or any correct rounding eg 2.1 or 2.106 etc

2

(d) (In relation to wild flower fields)

1. More **plant** species

OR

Larger **plant** (index of bio)diversity;

Accept the converse in the context of wheat fields

Accept more types/variety of plants

Accept greater species richness of plants

2. (So) more variety of food/nectar/pollen

OR

(So) more (types of) habitat/niche

OR

(So) more/better protection from predators;

Ignore more/better food but accept more food sources

Ignore more shelter

Ignore more homes

Accept 'types of' for 'variety of'

Accept 'fewer predators' for 'more protection'

2

[11]

Q2.

(a) 1. A group (of organisms) of the same species in a (particular) space at a (particular) time;

Accept descriptions of 'space' eg area, part of the world, habitat, ecosystem

2. That can (potentially) interbreed;

Accept that can produce fertile offspring

2

(b) The number of all species present in the woodland

1

(c) **Max 3 for mark points 3 to 10**

Reason for

1. The number of (bird) species increased (over 30 years);

2. Long-term study;

Reasons against

3. (Bird) species did not increase every year;

Accept some years the (bird) species decreased

Accept (bird) species fluctuated

4. Don't know if the protection was for birds

OR

Don't know if the aim of the protection was to increase biodiversity

OR

Don't know when the protection started;

5. No data from/comparison with a woodland without protection;

Accept no control (woodland)

6. Only breeding birds recorded

OR

Non-breeding birds may be present, but not recorded

OR

Not all bird species were recorded;

7. Only one woodland

OR

Protection might not be the same in other/all woodlands;
Ignore unqualified references to sample size

8. Only one day each year

OR

Birds breed at different times

OR

Birds migrate

OR

Birds might not be present/seen on the day (of recording);

9. Number of each species not known;
Accept did not calculate index of diversity

10. The data is old/out of date;

4 max

(d) Not a linear relationship;
Accept descriptions of a linear relationship
Accept not a proportional relationship
Accept no correlation
Accept data fluctuates

1

(e) 1. (The bird community) becomes less similar (to the first year)

OR

(The bird community) becomes more dissimilar (to the first year);
Accept the index (of similarity) decreases
Accept there is a negative correlation

2. (Suggesting) biodiversity has changed/ increased;

3. Due to changes/increases in the species/birds (present)

OR

Due to changes in the woodland/abiotic/biotic factors;
*Accept **named** examples that would cause change*
eg change in environment/ habitat/ competition/ predation/food sources

2 max

(f) 1. Climax community;

2. (Even in a climax community,) number of birds/species will change;

Accept suitable suggestions that describe the species/bird composition changing, eg migration of birds

2

(g) 1. No significant decrease/difference as shown by SD;

2. No idea if due to human activity

OR

No data/measurement/evidence of human activity

OR

Changes could be due to natural variation;

*Accept **named** examples of factors that could cause change, eg disease, natural disasters*

3. LPI/index above 1970/1.0/baseline

OR

LPI/index increased (overall)

4. (Vertical) scale has been altered to make (changes in) LPI/index look worse;

Accept 'biodiversity' for LPI

3 max

[15]

Q3.

(a) 1. Species richness – number of species (in a community/habitat/ecosystem/area);

Reject number of species in a population.

2. Index of diversity – the relationship between the number of species (in a community) and the number of individuals in each species;

Accept equation with N and n correctly explained

3. No SD overlap for species richness **so** significant difference shown

OR

No SD overlap for species richness **so** difference not due to chance;

4. SD overlap **so** no significant difference in index of diversity

OR

SD overlap **so** any difference shown due to chance;

4

(b) 1. DNA/genome sequencing now used;

Accept RNA/amino acid sequencing

2. (Now) can analyse every/more prokaryote species (in the community);

Accept 'identify' for analyse

3. Rather than just recording measurable/observable characteristics;

2 max

(c) (For farming method 2 has)

1. Better conservation as higher species richness, higher (prokaryotic) biomass and more carbon stored (than farming method 1);

2. More microbial mass – more organisms for food web;

3. Higher species richness – more organisms for food web;

4. More stored carbon, less CO_2 in the atmosphere;

5. Lower yield so less food/less profit;

Accept converse for farming method 1

2 max

[8]

Q4.

(a) 1982 and 2003;

Reject if any other years are given

1

(b) 1. There were many/48 (different) species

OR

(1997 had) the high**est** number of (different) species;

Accept a lot/lots of (different) species for many

2. (However,) one/a few species were present in (very) large numbers

OR

Most species were present in (very) small numbers;

Accept dominated by one/a few species

Ignore each/all species were present in (very) small numbers

2

(c) 1. The species richness/*d* are lower after 29 years;

2. The data is only for one (fish/local) community/site

OR

The data might not be representative of all fish communities

OR

Other communities might have different (fish) species;

3. (The measurements) only done in October

OR

The community might be different at other times of year (other than October);

4. The volume/temperature of the heated water (released each year) might have varied

OR

Timing/frequency of heated water release (each year) not known;

5. Fluctuations suggest other **named** factor had an effect (on biodiversity/species richness/*d*);

Named factors could include weather/oxygen concentration/food availability/plants/ predators/prey/ insects/ invertebrates/ fishing

6. Species richness/*d* are not the only measures of 'effect';

7. Don't know when the power station opened

OR

There is no data before 1980

OR

There is no data before heated water was released

OR

No control (river) **to** compare with;

4 max

[7]

Q5.

(a) **Structure**

1. Nuclear envelope **and** pores
OR
Double membrane **and** pores;
Ignore porous for pores

2. Chromosomes/chromatin
OR
DNA with <u>histones</u>;
Ignore genetic material/information
Accept nucleoplasm
Ignore promoter regions OR genes OR alleles
Accept regulation of gene expression

3. Nucleolus/nucleoli

Function

4. (Holds/stores) genetic information/material for polypeptides (production)
OR
(Is) code for polypeptides;
Accept protein OR amino acid sequences OR primary structure for polypeptides

5. DNA replication (occurs);

6. Production of mRNA/tRNA
OR
Transcription (occurs);
Ignore mRNA leaves nucleus

7. Production of rRNA/ribosomes;

4 max

Max 2 for structure or function

(b) Cellulose (plant) **and**

Chitin (fungi);
For fungi accept N-acetylglucosamine

1

(c) Individual organisms could not be identified/separated

OR

Too small/numerous to count individuals

OR

Too time consuming;

Ignore too difficult to identify/distinguish different species

Ignore too difficult to count unless qualified

Accept reference to fungi for plants

1

(d) Correct answer for 2 marks, 0.7– 0.71;;

Accept for 1 mark,

0.29 − 0.3 (correct calculation not subtracted from 1)

OR

120 (correct total shoot biomass)

A common correct answer is 0.707

Accept numbers rounding down to 0.71

2

[8]