Mark schemes

Q1.

(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]

Q2.

(a) 1. Wash hands with soap

OR

Disinfect surfaces;

Ignore sterilise hands OR surfaces

Accept sanitise for disinfect

Accept antiseptic /antimicrobial/alcohol (wipes)

Accept a named type of disinfectant

2. Use sterile pipette/syringe (to transfer bacteria);

Reject loop

Accept use unopened pipette/ syringe for sterile

3. (Remove bottle lid and) flame neck of bottle;

4. Lift lid of (agar) plate at an angle;

Accept lift lid slightly OR keep lid over plate

Ignore 'work quickly with lid off'

5. Work close to upward air movement;

Reject 'air movements sterilise air'

Accept 'convection current' for 'upward air movement'

6. Use sterile spreader;

Accept loop for spreader

Examples of sterilising technique eg, flame OR 'dip in alcohol and flame' OR 'dip in disinfectant and rinse (in sterile water)'

7. Place pipette/spreader into disinfectant (immediately after use);

Accept a named type of disinfectant

3 max

(b) Correct answer in range of 1.768 to 1.8

A common correct answer for 2 marks is 1.77

OR

2 = **2 marks**

Accept for **1 mark**, evidence of

28/28.26/28.3 (correct calculation, $\pi \times 3^2$)

OR

28.27433 (correct calculation using π value on calculator)

OR

0.4423 (correct calculation using diameter rather than radius)

OR

1.76 (correct calculation but incorrectly rounded);

Accept correct rounding of figures

2

(c) (Positive control)

1. Antimicrobial/ antibacterial (solution)

OR

Antibiotic

OR

Antiseptic/disinfectant;

(Negative control)

Accept named antimicrobial/antibacterial/antibiotic/antiseptic/disinfectant

2. (Sterile) water

OR

Oil (without cinnamon);

If not specified, accept the first answer as being for the positive control

2

(d)

Median for all cultures	16	12
Mean for all cultures	17	13

All four numbers correct;

*Accept 16.6 **and** 13.4 as the mean values (in this order)*

1

(e) 1. (Mean ± 2SD) 12.2 to 21.8 **and** 8.6 to

OR

(Mean ± 2SD) 11.8 to 21.4 **and** 9(.0) to 17.8

OR

(Mean ± 1.96 SD) 12.3 to 21.7 **and** 8.7 to 17.3

OR

(Mean ± 1.96 SD) 11.9 to 21.3 **and** 9.1 to 17.7;

Accept ECF for 1 mark, correct SDs calculated using incorrect means in (d)

2. (SD) overlap so difference (likely to be) due to chance

OR

(SD) overlap so (likely) no significant difference (in means);

Accept ECF for 1 mark, correct explanation based on correct SDs calculated from incorrect means in (d)

Reject results are due to chance OR results are significant

2

[10]