

Mark schemes

Q1.

(a) 20; 1

(b) Add (sexually active) female(s);
Ignore add males 1

(c) (Effect on breeding)

1. Less mating/breeding

OR

Fewer offspring;

(Explanation)

2. Fewer advertisement calls, so females not attracted

OR

Fewer advertisement calls, so males not located;

3. Fewer mating calls as males less (sexually) active;

4. More rasping calls as (more) males not (sexually) active;
Accept mature for active

5. Less time spent in courtship;
Maximum 3 marks for MP2 to MP5

4 max

[6]

Q2.

- (a) 1. Random samples;
Allow in context of fish or gills
2. Large sample size;
If a specified number is given, it must be 10 or more.
Accept 'many'/'multiple' for large sample but ignore 'several'

2

- (b) Correct answer of $18\,000/1.8 \times 10^4 = \mathbf{2\,marks};;$

1 mark for

Correct answers not given to 2sf (17 969.952)

OR

Evidence of 1701.7 (total length of filaments)

OR

27 227.2 – 27370 (total number of lamellae)

Accept 17970/17969.9

2

- (c) (*Trachurus trachurus*) – **no mark**

1. More oxygen uptake/diffusion

OR

More gas exchange;

2. More energy/ATP from respiration;
Incorrect fish name = zero
Accept just 'Trachurus' or 'trachurus'
'More' required once only

2

(d) **1 mark** for first column

1 mark for 2nd and 3rd column all correct

Kingdom	Animalia	Animalia
Phylum/Phyla	Chordata	Chordata
Class	Actinopterygii	Actinopterygii
Order	Batrachoidiformes	Carangiformes
Family	Batrachoididae	Carangidae
Genus	Opsanus	Trachurus
Species	<i>tau</i>	<i>trachurus</i>

2

[8]

Q3.

(a) (Genome)

1. Complete set of genes in a cell

OR

(All) the DNA in a cell

OR

(All) the genes/alleles/genetic material in a cell

OR

The total number of DNA bases in a cell;

Reject 'all the DNA/genes within a species/population'

(Proteome)

2. (Full) range of proteins that a cell **can produce**

OR(Full) range of proteins **coded for** by the cell's DNA/genome;

Accept organism for cell

For 'full range' accept 'complete set' OR all

Do not accept 'number of proteins' unqualified

Ignore 'range of proteins that a species/population can produce'

2

- (b) 1. Can not identify/distinguish species;

2. (Optical) microscope resolution is low;

Ignore magnification

3. Flagella (are fragile so) broken/damaged/missing

OR

Artefacts misinterpreted/mistaken for flagella;

4. (Flagella) difficult to stain **so** not visible;

Ignore difficult to stain unqualified

5. (Flagella) at an angle **so** not visible;

Accept 'out of plane' for 'at an angle'

6. Not all bacteria have flagella;

3 max

(c) DNA/mRNA/RNA base sequencing

OR

Amino acid sequencing

OR

Use of electron microscopes with greater resolution

OR

Use of electron microscopes **and** improved staining/preparation;

Accept genome sequencing

Ignore detail OR magnification for resolution

Accept abbreviations TEM OR SEM in this instance

1

(d) Correct answer of

19 565 (from measurement of 45mm)

OR

20 000 (from measurement of 46mm)

OR

20 435 (from measurement of 47mm) = **2 marks**;;

Accept for **1 mark**, evidence of

45 000 OR 46 000 OR 47 000 (correct image size in μm)

OR

$\div 2.3$ (correct use of equation);

Accept answers that round correctly to those shown

Accept division by 2.3×10^{-3} OR 0.0023

2

[8]

Q4.

- (a) 1. Hierarchy (of groups) with no overlaps

OR

(smaller) groups within (larger) groups with no overlaps;

2. (Grouped) according to evolutionary origins/relationships/history;
Accept 'common ancestry'

2

- (b) Perissodactyla;

Accept incorrect spellings provided the word looks close to Perissodactyla

Ignore upper/lowercase letters

Accept 'order'

1

- (c) Oval/shape drawn inside the *Rhinoceros* oval and not touching the *unicornus* oval or the *Rhinoceros* oval;

1

- (d) 1. (Genetic) variation/difference (exists) between Indian rhinos;

2. Indian rhinos most/more related to Javan rhinos;
Accept more recent common ancestor for 'most/more related'

3. Indian rhinos least/less related to White/Black rhinos;
Ignore 'Sumatran'

4. Comparisons only made to one Indian rhino

OR

Sample size (of other rhinos) not known;

Ignore 'sample size too small'

5. Cannot conclude anything about relationship between other species (with each other)

OR

(same) percentage differences may not refer to same base sequences;

4 max

- (e) 1. (Likely) either White or Black (rhinoceros) as identical/same/14 percentage
- OR**
- Not from Indian/Javan (rhinoceros) as (very) different percentages
- OR**
- Cannot be certain as White, Black and Sumatran have similar percentages;
2. Use a different reference (species of) rhinoceros
- OR**
- Use a different gene/protein
- OR**
- Use more than one gene
- OR**
- Compare (DNA) base sequence (not percentage differences)
- OR**
- Compare amino acid sequences
- OR**
- Compare mRNA sequences;
Accept black/white rhino, but reject Javan/Sumatran if named
Ignore amino acid sequence of cyt b