

1. (a) Genus; 1
- (b) (i) Prefer / more likely to mate with male of same species; 1
- (ii) Appropriate / species-specific courtship by male / courtship not recognised;
chemical attraction / pheromones;
compatible genitalia; max 2
- (iii) (Geographical) isolation;
mutations / genetic differences;
selection;
(isolation lead to) reproductive isolation /
populations no longer able to mate; 3
2. (i) Order; 1
- (ii) Correct sequence: 1
- | Sequence |
|----------|
| 1 |
| 6 |
| 2 |
| 3 |
| 4 |
| 5 |
3. (a) *Any two from:*
(Group of) organisms able to interbreed / reproduce / have offspring;
Giving fertile offspring / which are fertile; 2 max
- (b) *In sequence:*
1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
6. Genus; 1

[7]

[2]

- (c) No nucleus / no membrane-bound organelles / named e.g. / no mitochondria / don't divide by mitosis / divide by binary fission / 70S ribosomes / smaller ribosomes / circular DNA / only one 'chromosome' / have plasmids / has murein cell wall;
Accept have (slime) capsule / have fimbriae / pili
Ignore references to „no chloroplasts“ 1 [4]
4. (a) (i) 0.24 : 1, 1
(ii) Mammals more active / higher metabolic rate;
Respiration provides heat;
To maintain body temperature / for endotherms / warm-blooded; 2
- (b) $R = C - (F+P)$ / $R = C - F - P$; [*Accept: transposed F and P*] 1
- (c) Diet of primary consumer contains more cellulose / more indigestible material;
OR Diet of secondary consumers protein rich / more digestible material;
OR Primary consumers lose more (energy) in faeces; 1 [5]
5. (a) (Absorption of) light; 1
- (b) Inner membrane/cristae/stalked particles of mitochondria; 1
- (c) Plantae (plants) / Protoctista / prokaryotes;
Processes are photosynthesis and respiration / plants/algae/(some) protoctistans/prokaryotes photosynthesise/have chlorophyll; 2 [4]
6. (a) (i) there are no fertile hybrids found in the overlapping regions; 1
(ii) even if mating took place, there would be no fertile hybrids/
different chromosome number/gene pool/evolutionary history/many morphological/biochemical/serological differences; 1

(b) (i)

Kingdom	Animalia/Animals
Phylum	Chordata
Class	Mammalia
Order	Xenarthra
Family	Dasypodidae
Genus	<i>Dasypus</i>
Species	<i>(D.) novemcinctus</i>
1 mark per correct column	

2

(ii) Family, as all three belong to different genera;

1

[5]

7. (i) Population is the total number of organisms/individuals of a species/tigers in an area (at a given time);

1

(ii) (Deforestation involves) habitat destruction/ destruction of niches;
Some prey animals move out or die / fewer suitable prey for tiger/
less food for tiger; Reduces tiger population if prey biomass
falls below 600 (tonnes per km²);

3

[4]8. (i) Increase in biomass
time;

1

(ii) Approximately 10% of energy passed
(from phytoplankton to zooplankton) ;
Energy lost as heat/in respiration/in excretory products/
to decomposers;

2

*not urine/movement***[3]**

9. (a) group of organisms with similar features;
can (interbreed to) produce fertile offspring; 2
- (b) directional selection;
any TWO from
selection against one extreme / for one extreme;
against broadest beaks in B and narrowest beaks in A / for narrowest in B
and broadest in A;
whole distribution / range / mean / mode / median is shifted towards
favoured extreme; 3 max
- [5]
10. (i) Taxon A - there is more than one level/taxon below it / genus only
has species /only has one level / taxon above it;
- (ii) Taxon C - there is more than one level/taxon above it / phylum only
has kingdom / only has one level taxon above it; 2
- [2]
11. hierarchy / groups within groups / KPCOFGS;
no overlap;
common structures / similar characteristics;
reflecting evolutionary history;
binominal nomenclature / example;
definition of a species; 4
- [4]
12. evolutionary;
Panthera;
species;
fertile;
family;
kingdom; 6
- [6]

13. phylogenetic (classification);
 based on evolutionary links;
 hierarchy/ start with species grouped into Genus, Species
 with close common ancestry;
 then into larger groups/examples of representing more
 and more distant common ancestry;
 Genus, Family, Order, Class, Phylum;
 in same Kingdom, so must be related/from common
 ancestor; 3 [3]
14. (a) Phylum,
 Order,
 Genus;
Any 2 score 1, all three gain 2 marks 2
- (b) F. serratus and F. spiralis;
 Highest % value (for non-self);
 The more closely related they are, the more similar their DNA;
 Explanation of value / complementarity in terms of joining strands;
*(Special case: if spiralis / spiralis given, then max 1 possible if
 complementarity explained)* 3 max [5]
15. (a) *Oryctolagus, Helix, Trichonympha*; (reject if specific names included)
 (not insisting on generic capitals) *any two for 1 mark* 1
- (b) Animals, Protoctists, Prokaryotes;; (accept Latin equivalents)
any two for one mark, all three for both 2
- (c) that (they are) fertile; 1 [4]

16. (i) (populations) isolated/in different areas;
no interbreeding (between populations)/gene exchange/flow;
variation in each (population); (*accept example of variation*)
due to mutation/meiosis; (*accept reference to types of mutation*)
each population adapting to its own/different environment;
through natural selection;
producing differential survival;
producing changes in allele/phenotype frequencies;
producing reproductive isolation; 4 max
- (ii) breed together salamanders from different areas;
if fertile offspring, then still same species; 2
- (iii) phenotype depends on genotype and environment;
different local environments can produce variation;
different selection pressures;
mutations producing new alleles;
meiosis produces new combinations of alleles/example;
random fusion of gametes / sexual reproduction 4 max
17. (a) phylum, class, family, genus; 1
- (b) (i) presence of a nucleus / membrane bound organelles /
named organelles only 80S ribosomes / lacks a cell wall; 1
- (ii) lacks a cell wall / no chitin / is motile / has one nucleus / no hyphae; 1
(*do not credit it has a nucleus*)
- (*credit only one answer relating to a lack of cell wall; if more than one answer is given in (i) and / or (ii), incorrect answers negate*)
- (c) (i) more recent common ancestor / DNA in common; 1
- (ii) mutation;
there is variation;
genes (coding) for protein / cytochrome c with different structures;
EITHER
individuals with a modified cytochrome c have a selective
advantage / are selected for;
these individuals are more likely to survive to have offspring /
have more offspring;
(*must link a comparison of survival to reproduction*)
gene / allele frequency changes over generations / time;
OR
changed structure does not affect protein function;
these structural differences accumulate over time; 4 max

[10]

[8]
QWC 1

18. (a) (i) Order, Family, Genus.
(all correct = 2 marks; 2 correct = 1 mark) 2
- (ii) 3 concentric circles in Carnivora, labelled Felidae, Panthera and L; 1
- (b) (i) large groups split into smaller groups (which do not overlap); 1
- (ii) (phylogenetic) based on evolutionary history;
shows ancestry of groups / points of divergence;
example, e.g. reptiles and birds separated after mammals / reptiles
and birds more closely related than mammals;
(hierarchical) based on shared characteristics (seen today); 3 max
19. (a) large groups are divided into smaller groups; (*not just „hierarchical“*)
members of a group have features in common;
based on anatomy/fossils/embryology/DNA/specific aspect of cell biology
/homologous structures;;
(*any two for 2 marks*)
reflects evolutionary history; 3 max
- (b) fungi and animals; 1
- (c) (insects and fungi) have common ancestor;
they diverged a long time ago / before others referred to in phylogenetic tree; 2
- (d) those with similar sequences put in same groups/ are more closely related;
the greater difference in amino acid sequence the longer ago the groups
diverged; 2
- (e) A - present in all (eukaryotic) species or organisms / quantifiable;
D - extinct species not considered/no timing of events available /only limited
number of amino acid sequences /can't include prokaryotic species 2
20. (a) phylum, class, order;
species, *Acinonyx jubatus*; 2
- (b) larger groups containing smaller groups; 1

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[10]

- (c) (i) do not interbreed to produce fertile offspring / different DNA / different niches; 1
- (ii) fossil record;
evolutionary history/phylogeny;
biochemical differences e.g. DNA/proteins/cytochromes;
homologous features / named feature;
karyotype / number and form of chromosomes;
(discount any example credited in (i)) 2
- [6]**
21. (a) Kingdom, class, family, genus; 1
- (b) (i) (Human)
Fish
Rhesus monkey
Horse; 1
- (ii) As animals closely related, more amino acids in sequence; 1
- (c) The more similar the DNA, the more similar the base sequences;
The greater the number of hydrogen bonds/bonds between base pairs;
More energy/heat needed to separate strands; 3
- Q** Correct terminology of base, base pair and hydrogen bond must be used as specified in scheme.*
- [6]**
22. (a) (Similar) individuals/organisms that reproduce/ interbreed;
To produce fertile offspring; 2
- Q** Do not credit "viable" offspring. The context required here is fertile.*
- (b) (i) Species A has extra element/missing from species B/scissor wings; 1
- (ii) Similar sequence/(most of the) same elements in the courtship; 1
- (c) Female recognises own species sound;
Responds to that sound only/courtship sequence continues; 2
- [6]**

23. (a) Kingdom/phylum/class; 1
- (b) (i) 6; 1
- (ii) Family; 1
- (iii) The two species of *Mirounga* shared a common ancestor more recently than they did with *Monarchus tropicalis*; 1
- (c) Difference in DNA/base sequence/alleles/genes; 1
- (d) (i) Genetic bottleneck linked to low genetic diversity/smaller gene pool;
Reference to very low seal population/population in 1910/under 100 seals/caused by hunting; 2
Must refer to data provided for second mark
- (ii) New colonies formed by small number (of seals)/ small number of founders;
Founders have different/fewer alleles/genes / have smaller gene pool; 2
24. (a) 1 Large surface area provided by lamellae/filaments;
Q Candidates are required to refer to lamellae or filaments. Do not penalise for confusion between two
- 2 Increases diffusion/makes diffusion efficient;
- 3 Thin epithelium/distance between water and blood;
- 4 Water and blood flow in opposite directions/countercurrent;
- 5 (Point 4) maintains concentration gradient (along gill)/equilibrium not reached;
5 Not enough to say gives steep concentration gradient
- 6 As water always next to blood with lower concentration of oxygen;
- 7 Circulation replaces blood saturated with oxygen;
- 8 Ventilation replaces water (as oxygen removed); 6 max
6-8 Accept answers relating to carbon dioxide
- (b) Mixing of air and water (at surface);
Air has higher concentration of oxygen than water;
Diffusion into water;
Plants/seaweeds near surface/in light;
Produce oxygen by photosynthesis; 2 max

[9]

- (c) Not much oxygen near sea bed;
Toadfish haemoglobin (nearly) saturated/loads readily at /has higher affinity for oxygen at low partial pressure (of oxygen); 2
- (d) (i) The chimpanzee and the bonobo are more closely related (than to the gorilla);
They have identical amino acids/one of the amino acids is different in the gorilla; 2
- (ii) (Chimpanzee) orang-utan;
Amino acids different so bases different;
Few hydrogen bonds; 3

[15]