Question			Answer	Mark	Guidance
1	(a)	(i)	fins **;** streamlining / streamlined shape **;**	1 max	**Mark the first answer.** If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = **0 marks** **ACCEPT** reasonable attempt to describe streamlined shape **ACCEPT** aerodynamic **ACCEPT** articulated / flexible , spine
1	(a)	(ii)	eyes on top of head **;**	1	**Mark the first answer.** If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **ACCEPT** the position of the eyes / eyes that can see above **IGNORE** eyes facing forward **IGNORE** fin **IGNORE** eyes close together **IGNORE** refs to shape
1	(b)		**1** (cellulose) cell wall **;** **2** chloroplast(s) **;** **3** (large / permanent) vacuole **;** **4** starch granules **;**	2	**Mark the first answer on each prompt line.** If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = **0 marks** **2 CREDIT** plastids / dictysomes / many small Golgi **3 IGNORE** chlorophyll **3 CREDIT** tonoplast **4 CREDIT** druses / raphides / crystalline inclusions / Ca oxalate

Question			Answer	Mark	Guidance
1	(c)		**1** (similarities / differences in) genes / genetics / DNA / RNA / molecules / biochemistry ; **2** (similarities / differences in) nucleotide / base , sequence / order ; **3** (similarities / differences in) cytochrome c / haemoglobin / ATP synthase / RNA polymerase; **4** (similarities / differences in) sequence / order , of amino acids (in proteins) ; **5** *idea that* similarities between any of the above implies (close) relationship ; **ora**	5 max	**1 ACCEPT** molecular / biochemical evidence **5 CREDIT** if their genes are similar they must share a recent common ancestor **5 AWARD** as a general statement or with an example, e.g. 'chimps and humans share large proportion of DNA and this means that they are related gets mp **1** and **5.** 'Chimps and humans are closely related' = 0 marks unless linked to a marking point from 1 – 4.
			6 *idea of* evolution within human history ; **7** similarities in / differences in / comparison of , embryology / morphology / anatomy / physiology / behaviour ;		**6 CREDIT** in the context of an example of evolution in action, e.g. MRSA resistance to antibiotics **or** as a general statement **6 CREDIT** selective breeding (artificial selection) example **7 CREDIT e.g.** similar finches occupying different niches on neighbouring Galapagos islands **7 CREDIT** e.g. vertebrate pentadactyl limb etc. **7 ACCEPT** idea of vestigial organs ; **7 IGNORE** appearance / features / adaptations
			QWC **;** One mark from 1-4 and 1 mark from 6-7	1	Marking point **5** is not part of QWC
				6	
			Total	**10**	

Question			Answer	Mark	Guidance
2	(a)		characteristics / features / AW , are passed on to / inherited (by the next generation) **;**	1	**IGNORE** genes / alleles / DNA as question asks about Darwin's conclusion **ACCEPT** 'appearance' for features **DO NOT CREDIT** answers that only refer to beneficial characteristics (as Darwin's other observations would need to be considered to arrive at this conclusion)
2	(b)		**1** B **and** C **and** D are more closely related (to each other than to A) **; ora** **2** *idea that* A is in different (taxonomic) group (from other 3) **; ora** **3** B **and** C **and** D , share more , recent common ancestor **;** **4** phylogeny / evolution , of B **and** C **and** D diverged at same point **; ora**	2 max	**IGNORE** references to relationship with organism (1) **1 IGNORE** 'B, C and D are more similar' as this could refer to appearance rather than relationship **2 CREDIT** named taxonomic group **3 IGNORE** genes etc.
2	(c)		fits evidence **;** *idea of* more **,** evidence / research (since nineteenth century) **;**	1 max	**CREDIT** examples, e.g. DNA revolution / more fossils **ACCEPT** improved technology / molecular evidence **IGNORE** 'the theory has been proved' **IGNORE** Darwin provided more evidence **ACCEPT** changes in religious belief
2	(d)	(i)	code for (one or more) polypeptide(s) **;**	1	**ACCEPT** protein **IGNORE** amino acid sequence

Question			Answer	Mark	Guidance
2	(d)	(ii)		5 max	**AWARD** marks from clearly annotated diagram
			1 double stranded **;**		**1 ACCEPT** double helix **or** two , polynucleotides / strands / chains **or** antiparallel strands **1 IGNORE** one old and one new strand
			2 each / both (strands) act as template **;**		**2 IGNORE** either **NOTE** 'there are 2 strands which act as templates' = 2 marks (mp 1 and 2)
			3 hydrogen bonds , easily , break / form , between bases ;		**3 ACCEPT** weak H bonds between bases break **3 IGNORE** refs to H bonds , breaking / forming , without qualification that the bonds are weak or , form / break , easily
			4 complementary (specified) base , pairing / AW **;**		**4 IGNORE** complementary nucleotides unless qualified with examples of base-pairing
			5 purine (only able to) bind to pyrimidine **;** **6** (due to) different sizes of purines and pyrimidines **;**		
			7 hydrogen bonding different between A & T **and** C & G **or** 3 H bonds between C & G **and** 2 H bonds between A & T **;**		**7 ACCEPT** names of bases with phonetic spellings **7 DO NOT CREDIT** thyamine **7ACCEPT** A=T **and** C≡G without reference to hydrogen bonds

Question			Answer	Mark	Guidance
2	(e)	(i)	<u>speciation</u> ;	1	
2	(e)	(ii)	*idea that* different islands have different , selection pressures / habitats / environments / vacant niches **; ora** *idea of* isolation **; ora**	1 max	**CREDIT** ‘ the Galapagos have a wider range of habitats’ **IGNORE** islands have different habitat(s) from the mainland e.g. the islands are separated from the mainland / no gene flow / geographic barrier / reproductive barrier **ACCEPT** allopatric (speciation) **IGNORE** sympatric **IGNORE** refs to succession or human habitat destruction on the mainland as the question is about evolution
			Total	**12**	

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	*discontinuous* gender / male and female / eye colour **;** *continuous* size / length / mass **;**	**2**	**Mark the first answer on each prompt line.** If an additional answer is given that is incorrect or contradicts the correct answer, then **= 0 marks** **Note:** Suggestions must relate to **visible** characteristics of the **frogs**, **ACCEPT** sex **IGNORE** skin colour (as stated in Q) **CREDIT** example of a ***measurable*** characteristic (e.g. leg length, surface area, height, weight)
3	(a)	(ii)	*idea of* **1** no / little **,** environmental effect for **,** (named example of) discontinuous variation / example given for discontinuous variation in **(i)** as ecf **;** **2** some / large **,** environmental effect for **,** (named example of) continuous variation / example given for continuous variation in **(i)** as ecf **;** **3** gender may be affected by **,** temperature / atrazine exposure **;**	**2**	**IGNORE** examples of environmental factors **ACCEPT** discontinuous variation is ***only*** **,** genetic / due to alleles present **Note:** A comparative statement (e.g. ' environment has a greater effect on continuous variation') **= 2 marks** (mps 1 & 2) e.g ‘ no environment effect for discontinuous variation but it does affect continuous variation’ **= 2 marks** (mps1 &2)

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td>(iii)</td><td>1 idea that offspring visibly different from , A / egg donor ;

2 to show that the offspring produced were clones ;

3 to show / identify , (genetic) parents (of clone) / B and C ;</td><td>2 max</td><td>ACCEPT brown frog for A

2 ‘to show that cloning is successful’ is not enough

Note:
‘To show that the offspring were clones as they are not the same as A.’ = 2 marks (mps 1 & 2)</td></tr>
<tr><td>3</td><td>(b)</td><td>(i)</td><td><table><tr><th>Genetic fingerprint number</th><th>Letter of frog</th></tr><tr><td>1</td><td>D</td></tr><tr><td>2</td><td>A</td></tr><tr><td>3</td><td>B</td></tr></table>;
;
;</td><td>3</td><td>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks

If no letters in the table <u>at all</u>, look at the diagram and award marks if the profiles are identified correctly.</td></tr>
<tr><td>3</td><td>(b)</td><td>(ii)</td><td>cytoplasm / mitochondria , came from A

or

mitochondria / (mitochondrial) DNA , in cytoplasm of A ;</td><td>1</td><td>If frog not identified correctly = 0 marks

Must refer specifically to frog A

Must refer specifically to frog A</td></tr>
</table>

Question			Expected Answer	Mark	Additional Guidance
3	(c)	(i)	*advantage* (genetically identical so) all react the same **or** genetic variable controlled **;** *disadvantage* expensive (to produce) **or** don't see varied response to drug like in real populations (of mice) **or** *idea that* clones (of mice) may have unknown health issue (which would affect responses) **;**	**2**	**Note that the question refers to the use of cloned or uncloned mice in testing – and NOT to humans.** **ACCEPT ora** throughout **IGNORE** large numbers of clones produced **IGNORE** ref to animal welfare / religious objections **IGNORE** ref to validity **ACCEPT** 'no genetic diversity to affect results' **ACCEPT** 'rare allergies / adverse reactions **,** won't be seen'

<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(c)</td><td>(ii)</td><td>1 idea to produce , elite / best , animals ;
2 idea to save / preserve , endangered animals ;
3 grow / produce (spare) , stem cells / tissues / organs ;
4 AVP ;</td><td>2</td><td>IGNORE ref research into disease (as given in Q)
IGNORE ref to cost
1 ACCEPT example / desirable characteristics
2 ACCEPT recreating extinct animals
3 ACCEPT ref to named example of , tissue / organ
4 e.g. pet cloning / cloning GM animals / animals for xenotransplantation</td></tr>
<tr><td>3</td><td>(d)</td><td></td><td><table><tr><th>Individuals</th><th>% of alleles shared</th></tr><tr><td>David and John</td><td>100</td></tr><tr><td>Anne and Lisa</td><td>50</td></tr><tr><td>Sarah and Lisa</td><td>50</td></tr></table>;
;
;</td><td>3</td><td>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>17</td><td></td></tr>
</table>

Question			Answer		Marks	Guidance
4	(a)	(i)	*idea of* if one susceptible to, this / the disease, all likely to be **;**		1	**DO NOT CREDIT** if the response is referring to diseases in general
4	(a)	(ii)	**1**	environment / environmental factor **;**	2	
			2	(variation in) weather conditions / temperature **;**		**2 ACCEPT** climate
			3	rainfall / soil water content **;**		**3 IGNORE** 'availability of water' unqualified
			4	soil , (named) mineral / nitrate , content / AW **;**		**4 IGNORE** nutrient **4 ACCEPT** mineral availability / amount of fertiliser added
			5	(named) biotic factor (might vary) **;**		**5** e.g. number of pests / competition from other plants / disease
	(a)	(iii)	mutation **;**		1	**ACCEPT** deletion etc. **IGNORE** (named) mutagenic agent

Question			Answer		Marks	Guidance
4	(b)				6	If a candidate describes resistance as immunity **DO NOT CREDIT** the first time it is seen but apply **ECF** thereafter
			1	cross / breed, with disease resistant variety ;		**1 ACCEPT** make two disease resistant individuals reproduce **1 IGNORE** crossbreed two best individuals
			2	method to test offspring for disease resistance ;		**2 ACCEPT** general statement **or** example e.g: 'germinate seeds, expose to disease, see if die'
			3	select , best offspring / offspring with resistance ;		**3 ACCEPT** seeds / tubers / potatoes **3 IGNORE** children / babies
			4	(inter)breed, offspring with resistance / best offspring ;		
			5	(continue process) for (many) generations ;		**5 IGNORE** many years
			6	*idea of* avoid breeding, closely related / AW , individuals to preserve genetic diversity ; **ora**		**6 ACCEPT** avoid , inbreeding / inline breeding **6 ACCEPT** 'maintain genetic diversity by breeding with plants from different field / area' **6 ACCEPT** breed with different varieties to widen the gene pool
			7	(regularly back) cross with, wild variety ;		
			8	*idea of* preserving rare varieties in case they are needed in the future ;		**8 ACCEPT** use of seed bank to preserve range of alleles
			9	AVP ;		**9** e.g, ref. to marker assisted selection / detail of pollination method / prevention of self-pollination / asexual reproduction of desired variety
			QWC ;		1	**Award** if the answer has been given **one** mark from marking points **1–5 and one** mark from marking points **6–8**
				Total	**11**	

Question			Answer		Marks	Guidance
5	(a)				5	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** phonetic spellings
			1	*Echiniscus* ;		**1** Initial letter must be upper case
			2	order ;		**2 ACCEPT** super family / epifamily
			3	phylum ;		
			4	Animalia ;		**4 ACCEPT** animals **4 IGNORE** case of initial letter
			5	Eukaryota ;		**5 ACCEPT** eukaryotes / Eukarya / eukaryotic **5 IGNORE** case of initial letter
5	(b)		**1**	(phylogeny is) evolutionary relationships (between organisms) ;	3	**1 IGNORE** 'evolution' without further qualification **1&2** phylogeny is the closeness of evolutionary relationships = 2 **marks** **1 ACCEPT** phylogeny is evolutionary history
			2	(phylogeny is study of) closeness of (evolutionary) relationships ;		
			3	phylogeny is basis of / used in , natural / scientific / modern, classification ;		**3 ACCEPT** new **3 IGNORE** related to classification
			4	*idea that* the closer the (evolutionary or genetic) relationship the closer the (taxonomic) grouping ;		**4 ACCEPT** ref to **recent** common ancestors as AW for close relationship **4 ACCEPT** named taxonomic group for 'grouping' **4 ACCEPT** 'if the DNA is very different then the group is not the same'
			5	correct use of example ;		**5** e.g. gorillas and chimpanzees (closely grouped)

Question			Answer	Marks	Guidance
5	(c)		too small to see **;** (unable to see them) until invention of microscope / development of suitable viewing apparatus / AW **;** only 0.3mm in length **;**	2	'can only be seen under microscope' **= 1 mark (mp1)** **IGNORE** 'can't see it' without the idea of size, e.g. can't see it clearly = **0 marks**, can't see its features = **0 marks** **ACCEPT** implication of being too small to see, e.g. 'you need a microscope to see them' **= mp1** 'people couldn't see them in the past because we didn't have microscopes' **= 2marks (mp1 and mp2)** **IGNORE** type of microscope if stated **ACCEPT '**magnifying glass' **ACCEPT** ± 0.1 mm
			Total	**10**	