

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 / dictyosomes / many small Golgi 3 IGNORE chlorophyll 3 CREDIT tonoplast 4 CREDIT druses / raphides / crystalline inclusions / Ca oxalate

Question		Answer	Mark	Guidance
1	(c)	<p>1 (similarities / differences in) genes / genetics / DNA / RNA / molecules / biochemistry ;</p> <p>2 (similarities / differences in) nucleotide / base , sequence / order ;</p> <p>3 (similarities / differences in) cytochrome c / haemoglobin / ATP synthase / RNA polymerase;</p> <p>4 (similarities / differences in) sequence / order , of amino acids (in proteins) ;</p> <p>5 <i>idea that</i> similarities between any of the above implies (close) relationship ; ora</p>	5 max	<p>1 ACCEPT molecular / biochemical evidence</p> <p>5 CREDIT if their genes are similar they must share a <u>recent common ancestor</u></p> <p>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.</p>
		<p>6 <i>idea of evolution</i> within human history ;</p> <p>7 similarities in / differences in / comparison of , embryology / morphology / anatomy / physiology / behaviour ;</p>		<p>6 CREDIT in the context of an example of evolution in action, e.g. MRSA resistance to antibiotics or as a general statement</p> <p>6 CREDIT selective breeding (artificial selection) example</p> <p>7 CREDIT e.g. similar finches occupying different niches on neighbouring Galapagos islands</p> <p>7 CREDIT e.g. vertebrate pentadactyl limb etc.</p> <p>7 ACCEPT idea of vestigial organs ;</p> <p>7 IGNORE appearance / features / adaptations</p>
		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)		<p>1 B and C and D are <u>more</u> closely related (to each other than to A) ; ora</p> <p>2 <i>idea that</i> A is in different (taxonomic) group (from other 3) ; ora</p> <p>3 B and C and D , share more , <u>recent</u> common ancestor ;</p> <p>4 phylogeny / evolution , of B and C and D diverged at same point ; ora</p>	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 ; <i>idea of</i> 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 <u>changes in</u> 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)	<p>1 double stranded ;</p> <p>2 each / both (strands) act as <u>template</u> ;</p> <p>3 hydrogen bonds , <u>easily</u> , break / form , between bases ;</p> <p>4 <u>complementary</u> (specified) base , pairing / AW ;</p> <p>5 purine (only able to) bind to pyrimidine ;</p> <p>6 (due to) different sizes of purines and pyrimidines ;</p> <p>7 hydrogen bonding different between A & T and C & G or 3 H bonds between C & G and 2 H bonds between A & T ;</p>	5 max	<p>AWARD marks from clearly annotated diagram</p> <p>1 ACCEPT double helix or two , polynucleotides / strands / chains or antiparallel strands</p> <p>1 IGNORE one old and one new strand</p> <p>2 IGNORE either</p> <p>NOTE 'there are 2 strands which act as templates' = 2 marks (mp 1 and 2)</p> <p>3 ACCEPT <u>weak</u> H bonds between bases break</p> <p>3 IGNORE refs to H bonds , breaking / forming , without qualification that the bonds are weak or , form / break , easily</p> <p>4 IGNORE complementary nucleotides unless qualified with examples of base-pairing</p> <p>7 ACCEPT names of bases with phonetic spellings</p> <p>7 DO NOT CREDIT thymine</p> <p>7ACCEPT A=T and C≡G without reference to hydrogen bonds</p>

Question			Answer	Mark	Guidance
2	(e)	(i)	<u>speciation</u> ;	1	
2	(e)	(ii)	<i>idea that</i> different islands have different , selection pressures / habitats / environments / vacant niches ; ora <i>idea of isolation</i> ; 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)	<p><i>discontinuous</i> gender / male and female / eye colour ;</p> <p><i>continuous</i> size / length / mass ;</p>	2	<p>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</p> <p>Note: Suggestions must relate to visible characteristics of the frogs,</p> <p>ACCEPT sex IGNORE skin colour (as stated in Q)</p> <p>CREDIT example of a measurable characteristic (e.g. leg length, surface area, height, weight)</p>
3	(a)	(ii)	<p><i>idea of</i></p> <p>1 no / little , environmental effect for , (named example of) discontinuous variation / example given for discontinuous variation in (i) as ecf ;</p> <p>2 some / large , environmental effect for , (named example of) continuous variation / example given for continuous variation in (i) as ecf ;</p> <p>3 gender may be affected by , temperature / atrazine exposure ;</p>	2	<p>IGNORE examples of environmental factors</p> <p>ACCEPT discontinuous variation is only , genetic / due to alleles present</p> <p>Note: A comparative statement (e.g. ' environment has a <u>greater</u> 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)</p>

Question			Expected Answer	Mark	Additional Guidance								
3	(a)	(iii)	<p>1 <i>idea that</i> offspring visibly different from , A / egg donor ;</p> <p>2 to show that the offspring produced were clones ;</p> <p>3 to show / identify , (genetic) parents (of clone) / B and C ;</p>	2 max	<p>ACCEPT brown frog for A</p> <p>2 'to show that cloning is successful' is not enough</p> <p>Note: 'To show that the offspring were clones as they are not the same as A.' = 2 marks (mps 1 & 2)</p>								
3	(b)	(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Genetic fingerprint number</th> <th>Letter of frog</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">D</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">A</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">B</td> </tr> </tbody> </table>	Genetic fingerprint number	Letter of frog	1	D	2	A	3	B	3	<p>Mark the first answer in each box. If an additional answer is given that is incorrect or contradicts the correct answer, then = 0 marks</p> <p>If no letters in the table <u>at all</u>, look at the diagram and award marks if the profiles are identified correctly.</p>
Genetic fingerprint number	Letter of frog												
1	D												
2	A												
3	B												
3	(b)	(ii)	<p>cytoplasm / mitochondria , came from A</p> <p>or</p> <p>mitochondria / (mitochondrial) DNA , in cytoplasm of A ;</p>	1	<p>If frog not identified correctly = 0 marks</p> <p>Must refer specifically to frog A</p> <p>Must refer specifically to frog A</p>								

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

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

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

Question		Answer	Marks	Guidance
4	(b)	<p>1 cross / breed, with disease resistant variety ;</p> <p>2 method to test offspring for disease resistance ;</p> <p>3 select , best offspring / offspring with resistance ;</p> <p>4 (inter)breed, offspring with resistance / best offspring ;</p> <p>5 (continue process) for (many) generations ;</p> <p>6 <i>idea of avoid breeding, closely related / AW , individuals to preserve genetic diversity ; ora</i></p> <p>7 (regularly back) cross with, wild variety ;</p> <p>8 <i>idea of preserving rare varieties in case they are needed in the future ;</i></p> <p>9 AVP ;</p>	6	<p>If a candidate describes resistance as immunity DO NOT CREDIT the first time it is seen but apply ECF thereafter</p> <p>1 ACCEPT make two disease resistant individuals reproduce 1 IGNORE crossbreed two best individuals</p> <p>2 ACCEPT general statement or example e.g: ‘germinate seeds, expose to disease, see if die’</p> <p>3 ACCEPT seeds / tubers / potatoes 3 IGNORE children / babies</p> <p>5 IGNORE many years</p> <p>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</p> <p>8 ACCEPT use of seed bank to preserve range of alleles</p> <p>9 e.g, ref. to marker assisted selection / detail of pollination method / prevention of self-pollination / asexual reproduction of desired variety</p>
		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)	<p>1 <u>Echiniscus</u> ;</p> <p>2 order ;</p> <p>3 phylum ;</p> <p>4 <u>Animalia</u> ;</p> <p>5 Eukaryota ;</p>	5	<p>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</p> <p>ACCEPT phonetic spellings</p> <p>1 Initial letter must be upper case</p> <p>2 ACCEPT super family / epifamily</p> <p>4 ACCEPT animals</p> <p>4 IGNORE case of initial letter</p> <p>5 ACCEPT eukaryotes / Eukarya / eukaryotic</p> <p>5 IGNORE case of initial letter</p>
5	(b)	<p>1 (phylogeny is) <u>evolutionary</u> relationships (between organisms) ;</p> <p>2 (phylogeny is study of) closeness of (evolutionary) relationships ;</p> <p>3 phylogeny is basis of / used in , natural / scientific / modern, classification ;</p> <p>4 <i>idea that</i> the closer the (evolutionary or genetic) relationship the closer the (taxonomic) grouping ;</p> <p>5 correct use of example ;</p>	3	<p>1 IGNORE 'evolution' without further qualification</p> <p>1&2 phylogeny is the closeness of evolutionary relationships = 2 marks</p> <p>1 ACCEPT phylogeny is evolutionary history</p> <p>3 ACCEPT new</p> <p>3 IGNORE related to classification</p> <p>4 ACCEPT ref to recent common ancestors as AW for close relationship</p> <p>4 ACCEPT named taxonomic group for 'grouping'</p> <p>4 ACCEPT 'if the DNA is very different then the group is not the same'</p> <p>5 e.g. gorillas and chimpanzees (closely grouped)</p>

Question		Answer	Marks	Guidance
5	(c)	<p>too small to see ;</p> <p>(unable to see them) until invention of microscope / development of suitable <u>viewing</u> apparatus / AW ;</p> <p>only 0.3mm in length ;</p>	2	<p>'can only be seen under microscope' = 1 mark (mp1)</p> <p>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</p> <p>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)</p> <p>IGNORE type of microscope if stated ACCEPT 'magnifying glass'</p> <p>ACCEPT ± 0.1 mm</p>
		Total	10	