

Question	Marking Guidelines	Mark	Comments
1(a)	Birth <u>rate</u> and death <u>rate</u> = 2 marks;; OR 1. Change in population / births and deaths / population at start and end; 2. In a given time;	2	Neutral: any reference to per or times by a number eg per 1000 / $\times 100$ Neutral: ignore any reference to immigration and emigration unless context is incorrect
1(b)	1. High birth rate / high proportion/percentage/number of young/children; 2. High death rate / low proportion/percentage/number of elderly/older people/low life expectancy;	2	1 and 2. Both points must be clearly stated. Do not award other mark by implication 1 and 2. Accept appropriate use of percentage/number as alternatives 1. Accept: 'wide base' or any equivalent description of high proportion/number of young children 2. Accept: 'narrow at top' or any equivalent description of low proportion of older people 2. Accept high death rate in context of any age group

Question	Marking Guidelines	Mark	Comments
2(a)	<i>Ulva lactuca</i> ;	1	Reject: <i>Ulva</i> on its own Accept: <i>lactuca</i> on its own Accept: Incorrect spelling
2(b)(i)	Difficult/too many/too many to count / individual organisms not identifiable / too small to identify / grows in clumps;	1	Neutral: easier/quicker/representative/more accurate, unless qualified
2(b)(ii)	Any described feature of concrete eg texture / flat / composition chemicals / nutrients etc;	1	Neutral: not natural / man made / are different, without further qualification
2(c)	<ol style="list-style-type: none"> 1. Pioneer species/<i>Ulva</i> increases then decreases; 2. Principle of a species changing the conditions / a species makes the conditions less hostile; 3. New/named species better competitor / previous/named/pioneer species outcompeted; 4. <i>G. coulteri</i>/<i>Gelidium</i> increases <u>and</u> other/named species decreases; 	4	<p>1 and 4. Growth/reproduces = increases. Dies = decrease</p> <p>2. Accept description of change in conditions eg soil/humus forms, nutrients increased</p> <p>Pioneer species grows, dies and forms humus = 2 marks</p> <p><i>G. coulteri</i>/<i>Gelidium</i> outcompetes other/named species = 2 marks</p>

Question	Marking Guidelines	Mark	Comments
3(a)	<ol style="list-style-type: none"> Expression / appearance / characteristic due to genetic constitution/genotype/allele(s); (Expression / appearance / characteristic) due to environment; 	2	<ol style="list-style-type: none"> Accept: named characteristic Accept: homozygous / heterozygous / genes / DNA Neutral: chromosomes
3(b)(i)	<ol style="list-style-type: none"> 3 <u>and</u> 4 <u>and</u> 9/11/affected offspring; Both 3 and 4 are carriers/heterozygous; <p>OR</p> <p>If dominant at least one of 3 and 4 would be affected;</p>	2	<ol style="list-style-type: none"> Accept: 9/11 and their parents Accept: unaffected parents have affected children Accept: if 3 and 4 are unaffected all their children will be unaffected
3(b)(ii)	<ol style="list-style-type: none"> 11 is affected, 3 is not; 3/father of 11 does not have a recessive allele on his X chromosome/ X^t; <p>OR</p> <p>(If on X) 11/affected female would not receive the recessive allele on X chromosome/X^t from 3/father;</p> <p>OR</p> <p>(If on X) 3/father (of 11) would pass on the dominant allele on his X chromosome/X^T;</p>	2	<ol style="list-style-type: none"> Accept: 3/unaffected father/parents produce an affected daughter Accept: 3 and 4 would only produce unaffected females Answers must be in context of alleles <p>Reject: recessive/dominant chromosomes</p>
3(c)(i)	<p>Answer in range of 5.8 - 6.2% = 3 marks;;;</p> <p>If incorrect answer, then 2 max of following points</p> <ol style="list-style-type: none"> $q^2/p^2/tt = 0.001$ or 1 divided by 1000; $p/q/T = 0.968 - 0.97$; Understanding that heterozygous = $2pq$; 	3 max	<p>Answers in range of 0.058 - 0.062 = 2 marks</p> <ol style="list-style-type: none"> This can be shown mathematically ie $2 \times$ two different numbers Accept: answer provided attempts to calculate $2pq$

3(c)(ii)	Affected individuals (usually) do not reproduce/die during childhood/do not pass on allele/genetic screening;	1	
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Question	Marking guidance	Mark	Comments
4 (a)	$F - E - R / F - (E + R)$;	1	Accept: $F - (R + E) / F - R - E$
4 (b) (i)	Increase because fed concentrates/food with high nutritive value/food with high digestibility/food with little waste/because less egested;	1	
4 (b) (ii)	Decrease because movement restricted/heat loss reduced;	1	Accept: less movement/less muscle contraction Ignore references to keeping warm
4 (c) (i)	0.98 : 1 / 98 : 100;	1	Answer must be this way round and expressed in its simplest terms Reject: 0.98
4 (c) (ii)	Mammals maintain (body) temperature/have high (body) temperature;	1	Accept: mammals are endotherms /warm-blooded Accept: converse for insects
4 (d)	(Results show) positive correlation/positive correlation described; Most/higher values close to line / curve shows good agreement; Lower values less close to line/less correlation; (Generally) predicted values are higher / actual values lower;	3 max	Reject: reference to line/curve of best fit Ignore reference to anomalies Reference to 'predicted' or 'actual' required

Question	Marking guidance	Mark	Comments
5 (a)	(Increase in) dead organisms/humus/decomposition; Leading to (increase in) nitrification/ammonia to nitrate/activity of nitrifying bacteria; Nitrogen fixation;	2max	Accept: pioneer species for plants
5 (b) (i)	Bare soil temperatures fluctuate; More bare soil, early/at start of succession/when few plants;	2	Reject: environmental temperature Accept: converse
5 (b) (ii)	Plant will grow/survive in the shade/when overshadowed (by taller plants)/when receiving less light;	1	Effect on plant with reason for effect Ignore reference to competition
5 (c)	(Grassland consists of) small/annual plants; Will be replaced by/outcompeted by woody plants; So these (woody plants) must be removed/have growth checked/grazed;	2 max	Must be in the context of grassland Need idea of replaced not just an increase in percentage cover

Question	Marking guidelines	Mark	Comments
6(a)	<ol style="list-style-type: none"> 1. No interbreeding / gene pools are separate / <u>geographic(al)</u> isolation; 2. Mutation; 3. Different selection pressures / different foods/niches/habitats; 4. Adapted organisms survive and breed / differential reproductive success; 5. Change/increase in allele frequency/frequencies; 	5	<p>Accept: all marks if answer written in context of producing increased diversity of plants</p> <ol style="list-style-type: none"> 1 Do not award this mark in context of new species being formed and then not interbreeding 1 Accept reproductive isolation as an alternative to no interbreeding 2 Accept: genetic variation 3 Accept: different environment / biotic/abiotic conditions or <u>named</u> condition 3 Neutral: different climates
6(b)	<p>Similar/same environmental/abiotic/biotic factors / similar/same selection pressures / no isolation / gene flow can occur (within a species);</p>	1	<p>Accept: same environment</p>

Question	Marking guidance	Mark	Comments
7 (a)	Two marks for correct answer of 59/60;; One mark for incorrect answer clearly derived from figures of 18, 28 and 38;	2	Ignore: any figures after decimal point.
7 (b)(i)	Population changes; As young birds leave nest/join population;	2	Reject: population decreases Reject first point if (young) birds are leaving population/migrating
7 (b) (ii)	(Would be likely to) catch all birds (again) in second sample / sample sizes are the same; Birds (in territories and) not mixing with population; Only estimates number of birds in territories sampled / territory sample not representative (of population);	2 max	Neutral: references to breeding Accept: idea of the population is divided
7 (c)	(Recording) DNA / base sequence is like marking (animal)/wouldn't need to mark; (Finding identical/same base sequence) would show animal has been caught/recorded before;	2	

Question	Marking guidance	Mark	Comments
8 (a)	<p>The frequency/proportion of <u>alleles</u> (of a particular gene);</p> <p>Will stay constant from one generation to the next/over generations / no genetic change over time;</p> <p>Providing no mutation/no selection/population large/population genetically isolated/mating at random/no migration;</p>	3	<p>The three principles for marking are: What feature What happens to it Providing . . .</p> <p>Accept: genotype/explanation of genotype</p> <p>Accept: alternative wording, e.g. there is no gene flow/genetic drift for genetically isolated.</p>
8 (b)	<p>White/deaf cats unlikely to survive/selected against;</p> <p>Will not pass on allele (for deafness/white fur) (to next generation)/will reduce frequency of allele;</p>	2	<p>Accept: alternative wording, e.g. have a disadvantageous phenotype</p> <p>Neutral: will not breed</p>
8 (c)	<p>In Paris/London frequencies (of these alleles) add up to more than 1;</p>	1	<p>Can be shown by correct figures to be more than 1 e.g. $0.71 + 0.78 = 1.49$</p> <p>Accept: more than 100%</p>
8 (d)	<p>Two marks for correct answer of 44(.22);;</p> <p>One mark for incorrect answer in which p/frequency of H determined as 0.67 and q/frequency of h as 0.33</p> <p>OR</p> <p>Answer given as 0.44(22);</p>	2	

Question	Marking Guidance	Mark	Comments
9(a)	<ol style="list-style-type: none"> 21 or 21.4; One mark for the principle of difference/initial; 	2	<p>Correct answer = 2 marks outright</p> <p>Ignore number of decimal places</p>
9(b)(i)	Water intake linked to sweating / panting;	1	<p>Neutral: ref. to urine</p> <p>Neutral: dehydration</p>
9(b)(ii)	<ol style="list-style-type: none"> Food intake linked to (increased) <u>respiration</u>; Food intake linked to heat/energy release / maintaining body temperature; 	2	<ol style="list-style-type: none"> Not 'increased metabolism' Reject: decreases respiration <p>Neutral: references to environmental temperature increasing</p> <ol style="list-style-type: none"> This mark is independent of 1
9(c)	<ol style="list-style-type: none"> Increased sweating so less water available (for milk production); Less food so less energy/nutrients available (for milk production); Enzymes not working at optimum temperature; 	1 max	<ol style="list-style-type: none"> Not just 'less energy available (for milk production)' Reject: references to enzyme denaturation
9(d)	<p>(Skin temperature)</p> <ol style="list-style-type: none"> Varies/fluctuates more / more heat lost/gained / (can be) further from core; (As) more affected by environment / sweating / conduction / convection / radiation; 	2	<p>Accept: converse arguments for rectal temperature</p> <ol style="list-style-type: none"> Accept: 'not affected by' in relation to rectal temperature <p>Accept: named environmental factors</p> <p>Accept: idea that skin is more exposed to the environment</p> <p>Accept refs. to vasoconstriction / vasodilation</p>
9(e)	Select a bull whose mother/offspring produced a high milk yield;	1	

9(f)	<ol style="list-style-type: none"> 1. Allows comparison; 2. (As) different countries have different population/ sample sizes; 	2	
9(g)	<ol style="list-style-type: none"> 1. (Selective) advantage producing lactase/ being lactose tolerant/able to digest milk/able to eat dairy foods; 2. People (producing lactase) reproduce; 3. (And) pass on gene/allele; 4. <u>Allele</u> frequency increases; 	4	<p>Accept: converse arguments for people who are lactose intolerant</p> <p>If mark point 2 has not already been given, then mark point 3 automatically gains 2 marks as reproduction must have occurred</p> <p>4. Neutral: gene frequency increases / allele frequency changes</p> <p>Must be clearly stated and not implied</p>

Additional notes on marking Question 10

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. In fact, extra credit is given for those who show evidence of a greater breadth of study. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

Question	Marking Guidance	Mark	Comments
10(a)	<p>1.M Membrane function as selectively permeable barrier</p> <p>1.T Transport mechanisms across membranes</p> <p>1.CT Absorption and co-transport of sodium ions and glucose</p> <p>2.P Photosynthesis, chloroplast, thylakoids</p> <p>2.R Respiration, mitochondrion and cristae</p> <p>2.Ps Protein secretion, RER, SER and Golgi</p> <p>3.A Surface receptors/antigen and immune response</p> <p>3.CD Cell division</p> <p>3.B Vertical and horizontal transmission – membranes and bacteria</p> <p>3.Pc Pacinian corpuscle</p> <p>4.Tr Tropisms – movement of IAA</p> <p>4.N Nerve impulses/action potentials</p> <p>4.S Synaptic transmission</p> <p>4.Mc Muscle contraction, calcium ion movement/storage</p> <p>4.H Hormones - eg Blood glucose regulation – insulin and glucagon</p> <p>4.O Osmosis, including water movement in plants</p>	25	<p>Examiners are free to select other letters if they wish</p> <p>The emphasis in answers should be on the <u>involvement of membranes</u> in processes, not just the processes themselves</p> <p>Breadth, one mark for use of an example from each of the following approaches:</p> <ol style="list-style-type: none"> 1. Membranes – basic functions 2. Organelle membranes 3. Cell surface membranes 4. Processes – eg protein secretion, synaptic transmission, cell division

Question	Marking Guidance	Mark	Comments
10(b)	<p>1.P Pathogens and effects on host</p> <p>1.CH Cholera</p> <p>1.TB TB</p> <p>2.T Taxonomy</p> <p>2.C Classification and evolution</p> <p>2.I Inheritance and evolution</p> <p>2.Gc Genetic code, universal</p> <p>2.B Behaviour</p> <p>2.Ev Populations and evolution, variation between individuals within a species</p> <p>3.BP Relationships within ecosystems – eg predator/prey</p> <p>3.E Energy transfer in ecosystems</p> <p>3.N Nutrient cycles, the organisms involved</p> <p>3.S Succession, biodiversity, species and individuals in a community</p> <p>4.H Human impacts on the environment and its effect on relationships between organisms – including farming</p> <p>4.Gt Gene technology and GMO and selective breeding</p> <p>4.Ar Antibiotic resistance</p>	25	<p>Examiners are free to select other letters if they wish</p> <p>The emphasis in answers should be on the <u>relationships and interactions between organisms</u> not just the topics themselves</p> <p>Breadth, one mark for use of an example from each of the following approaches – <u>3 max</u>:</p> <ol style="list-style-type: none"> 1. Pathogen and host 2. Evolution (related topics) 3. Ecological 4. Human intervention in relationships