Unit 2 - Mark scheme

Question number	Answer	Mark
1(a)	• {expressed / observable} characteristics	(1)

Question number	Answer	Mark
1(b)(i)	• genotype	(1)

Question number	Answer	Mark
1(b)(ii)	B 1, 4	(1)

Question number	Answer	Mark
1(c)(i)	B bar chart, histogram	(1)

Question number	Answer	Mark
1(c)(ii)	• calculation of one correct difference (1) or • mean height for male and female calculated Example of calculation: 3.2 ÷ 2.2 = 1.5 3.2 ÷ 2.6 = 1.2 4.0 ÷ 2.2 = 1.8 4.0 ÷ 2.6 = 1.5 3.6 and 2.4 • range of difference given 1.2 – 1.8 (1)	(2)

Question number	Answer	Mark
2(a)	B anatomical, physiological, behavioural	(1)

Question number	Answer	Mark
2(b)	An explanation that includes the following points: • mimics the *Canthigaster valenti* by having similar markings (1) • mimics the *Canthigaster valenti* by having similar {size / shape} (1) • therefore it still deters predators even though it does not produce poison (1)	(3)

Question number	Answer	Mark
2(c)	An explanation that includes the following points: • because they are different species (1) • therefore cannot produce fertile offspring (1)	(2)

Question number	Answer	Mark
3(a)	A J	(1)

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that includes the following points: • because this structure is very small (1) • and only an electron microscope has the ability to magnify this much (1)	Accept converse statement	(2)

Question number	Answer	Mark
3(c)	An explanation that includes the following points: • because the two membranes are very close together (1) • and the resolution of this microscope is not high enough (1)	(2)

Question number	Answer	Mark
3(d)(i)	An explanation that includes the following points: • mitosis results in two cells that each have a nucleus (1) • each bud contains a full set of chromosomes (1) • so the buds are genetically identical to the parent yeast cell (1)	(3)

Question number	Answer	Mark
3(d)(ii)	An answer that includes the following points: • because new cell structures need to be made in order for the bud to grow (1) • therefore oxygen is needed to produce the ATP (1) • therefore {glucose is needed to produce the ATP / amino acids are needed to make proteins} (1)	(3)

Question number	Answer	Mark
4(a)	• {restricted / native} to a particular area	(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	• subtraction (1) • percentage (1) Example of calculation: 5 500 − 3 000 / 2 500 (2 500 ÷ 5 500) × 100 = 45.45	Accept 45.5 and 45	(2)

Question number	Answer	Mark
4(b)(ii)	An explanation that includes three of the following points: • because of habitat destruction there is no food (1) • because of habitat destruction there is no shelter (1) • fragmentation of habitat makes it harder to find a mate (1) • therefore, there is a decrease in genetic diversity (1)	(3)

Question number	Answer	Mark
4(c)(i)	A description that includes the following points: • sperm observed under a microscope to assess {motility / ability to swim in a straight line} (1) • use of {stains / microscope} to observe the integrity of the acrosome (1) • comparisons need to be made to freshly collected sperm so that effects can be calculated (1)	(3)

Question number	Answer	Mark
4(c)(ii)	An explanation that includes any four of the following points: • because sperm can be frozen from different males to increase genetic diversity (1) • because frozen sperm will always be available if numbers of Baird's tapir decrease too far (1) • can freeze sperm so that they are available when females come in to season (1) • freezing could reduce the number of successful fertilisations because of poor viability (1) • more sperm would need to be used as viability is low, reducing stocks (1)	(4)

Question number	Answer	Mark
5(a)(i)	An answer that includes the following points: • growing many pumpkins so that a mean can be calculated (1) • dry mass of one batch taken at start of growth period and one batch used after growing for 792 hours (1) • give credit for details of how to obtain dry mass (1)	(3)

Question number	Answer	Mark
5(a)(ii)	An explanation that includes any two of the following points: • because water content is variable (1) • do not include the water content (1) • as this is due to transport by the xylem (1)	(2)

Question number	Answer	Mark
5(b)(i)	C R	(1)

Question number	Answer	Mark
5(b)(ii)	A description that includes the following points: • taking a photograph and overlaying with graph paper / using a computer package / measuring diameter with a graticule and calculating area (1) • calculate a mean for several {areas of phloem / vascular bundles} (1)	(2)

Question number	Answer	Mark
5(c)	• because {the contents of the phloem flow through the sieve tubes only / phloem includes companion cells}	(1)

Question number	Answer	Mark
5(d)	A g cm^{-2} hr^{-1}	(1)

Question number	Answer	Mark
6(a)(i)	• Archaea	(1)

Question number	Answer	Mark
6(a)(ii)	A diagram that includes any three of the following structures: • circular DNA (1) • plasmid (1) • (70S) ribosomes (1) • membrane (1) • flagellum (1) • pili (1) • capsule (1)	(3)

Question number	Answer	Mark
6(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. **Indicative content** • numbers of bacteria increase along the digestive system • *Veillonella* can tolerate only low pHs • *Streptococcus* found in pH 6 – 8 with reasonably high oxygen content • *Streptococcus* requires oxygen for aerobic respiration • *Enterobacterium* can tolerate low oxygen concentrations • *Enterobacterium* requires less ATP or can respire anaerobically • pH affects enzyme activity • pH affects the ionisation of R groups • small change in pH drastically affects enzyme activity	(6)

Level	Marks	Descriptor
	0	No awardable content.
1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.
2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.
3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.

Question number	Answer	Mark
7(a)	C they can produce some types of cell	(1)

Question number	Answer	Mark
7(b)	A description that includes the following points: • ribosomes involved in translation resulting in two different polypeptides (1) • endoplasmic reticulum involved in folding each polypeptide into tertiary structure (1) • endoplasmic reticulum involved in transporting each polypeptide (1)	(3)

Question number	Answer	Mark
7(c)(i)	A description that includes the following points: • α polypeptide increases to maximum by 6 months before birth and then stays constant (1) • β polypeptide rises slowly during pregnancy but then increases rapidly after birth (1) • γ polypeptide increases to maximum by 6 months before birth and then drops rapidly after birth (1)	(3)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that includes the following points: • gene for α polypeptide remains switched on as this polypeptide is present both before and after birth (1) • gene for γ polypeptide is switched off at birth so levels fall (1) • gene for ß polypeptide switched on during pregnancy so levels rise (1) • credit given for an epigenetic mechanism that switches {on / off} gene expression (1)	For example, {DNA / histone} methylation switches off {genes / gene for γ polypeptide} or transcription factors switch on {genes / gene for ß polypeptide}	**(4)**

Question number	Answer	Mark
8(a)	B species richness of all the species within a habitat	**(1)**

Question number	Answer	Mark
8(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. **Indicative content** • good diversity for birds in all sections except Section 4, which decreases to moderate • good diversity for birds is very similar in Sections 1, 2 and 3 • moderate diversity for fish in Section 1, which increases in Section 2 but then decreases again in Sections 3 and 4 • moderate diversity is very similar in the three sections • good diversity for aquatic plants in Sections 1 and 2, which has decreased by Section 4 • good biodiversity for mussels in stretch 1, decreasing to moderate biodiversity in stretch 2 and poor diversity in stretch 4 • no overall trends as you move down the river	**(6)**

Level	Marks	Descriptor
	0	No awardable content.
1	1-2	Demonstrates isolated elements of biological knowledge related to the given context with generalised comments made. The description will contain basic information with some attempt made to link knowledge and understanding to the given context.
2	3-4	Demonstrates adequate knowledge by selecting and applying some relevant biological facts/concepts to provide the description being presented. The description shows some linkages and lines of reasoning with some structure.
3	5-6	Demonstrates comprehensive knowledge by selecting and applying relevant knowledge of biological facts/concepts to provide the description being presented. The description is clear, coherent and logically structured.

Question number	Answer	Mark
8(c)	An answer that includes the following points: • there are more species of fish than birds (1) • therefore a value of 2.5 has a relatively lower biodiversity than a value of 1.6 (1)	(2)

Question number	Answer	Mark
8(d)(i)		(1)

Species of aquatic plant	Number of aquatic plants counted	(n-1)	n(n-1)
Coontail	8	7	56
Tape grass	6	5	30
Common waterweed	3	2	6
Northern water milfoil	2	1	2
Star duckweed	9	8	72
White water lily	2	1	2
Water star-grass	2	1	2
Eurasian water milfoil	6	5	30
Curly pondweed	5	4	20
European frogbit	2	1	2
Flowering rush	3	2	6

Question number	Answer	Mark
8(d)(ii)	• $\Sigma n(n-1)$ is 228 (1) • value for N(N-1) is (11 × 10) = 110 (1) • diversity index is 0.48 (1)	(3)