## Unit 2: Development, Plants & the Environment

Question Number	Question			
1.(a)(i)	Which cell is undergoing mitosis? Put a cross in the correct box.			
	Correct Answer	Acceptable Answers	Reject	Mark
	<b>⊠</b> B;			1

Question	Question			
Number				
1.(a)(ii)	Give the name of the	structure labelled Z.		
	Correct Answer	Acceptable Answers	Reject	Mark
	Spindle fibre;	Spindle		1

Question Number	Question			
1.(a)(iii)	Name the stage of mi	tosis shown.		
	Correct Answer	Acceptable Answers	Reject	Mark
	Metaphase;	Metaphase I		1

Question Number	Question				
1.(b)	Describe how you would prepare cells in order to observe mitosis.				
	Answer	Mark			
	Award one mark for each of the following points in context to a maximum of four marks.4				
	1. Ref. to use of root tip;				
	<ol> <li>Add {acid / named acid / acetic alcohol};</li> </ol>				
	<ol> <li>Add appropriate named stain e.g. toluidine blue, acetic orcein, Schiff's reagent, Feulgen's reagent;</li> </ol>				
	4. Break open tip with {(mounted) needle/eq};				
	5. Mount in {stain / acid / water};				
	6. (Gently) squash under coverslip;				
	7. Warm (to intensify staining);				
1					

Question Number	Question	
2.(a)(i)	Explain how independent assortment leads to genetic variation	
	Answer	Mark
	Award one mark for each of the following points in context.	
	1. ref. to random aligning of chromosomes/eq;	2
	<ol> <li>idea of new combinations of {(parental) chromosomes / alleles};</li> </ol>	

Question Number	Question			
2.(a)(ii)	Describe how crossing over further increases genetic variation.			
	Answer	Mark		
	Award one mark for each of the following points in context to a maximum of two marks.	2		
	1. breaking and rejoining of {chromatids / DNA /eq};			
	2. on same chromosome pair;			
	<ol> <li>recombines {genes / alleles} / produces recombinants /eq;</li> </ol>			

Question Number	Question		
2.(b)	Describe the changes in height between 1950 and 1980.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of two marks.		
	1. Height increased (from 1950) until 1970;		
	2. Plateau /eq (after 1970);		
	3. Relevant correct manipulation of data from graph;		

Question Number	Question		
2.(C)	The evidence from both graphs suggests that a combination of genetic and environmental factors influence the height of men in Japan. Give an explanation for this.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of three marks for each section, and a maximum of four marks overall.	4	
	Environmental 1. Diet is an environmental factor;		
	2. Protein content increases;		
	3. Protein required for growth;		
	4. This leads to increase in height up to 1970;		
	Genetic 1. {Plateau / level off} in height (after 1970);		
	2. indicates a (potential) maximum height/eq;		
	3. this is a genetic factor;		
	<ol> <li>no change in height despite further protein increase (after 1970);</li> </ol>		

Question Number	Question						
3.(a)	The table below lists three organelles. Put a cross in the box to match each organelle with the correct letter shown on the diagram.						
	Correct Answer						Mark
	Organelle	Α	В	С	D	E	3
	Rough endoplasmic reticulum			$\square$			
	Mitochondrion	$\square$					
	Golgi apparatus		$\square$				

Question	Question			
Number				
3.(b)	For some time after the Golgi apparatus was identified, there was doubt as to whether it was a new and separate organelle. Explain how the Golgi apparatus could be confused with other organelles within a cell.			
	Answer	Mark		
	Award one mark for each of the following points in context to a			
	maximum of three marks	2		
		5		
	1. {layers / stacks} of {membrane / cisternae};			
	2. single membrane;			
	5			
	3 similar to endonlasmic reticulum.			
	A difficulty interpreting cleatron micrographs.			
	4. difficulty interpreting electron micrographs;			
	5. reference to {limited microscope techniques /			
	artefacts / resolution};			

Question Number	Question			
3.(c)(i)	The data provide evidence that the Golgi apparatus is a separate organelle. Suggest an explanation for this.			
	Answer	Mark		
	Award one mark for each of the following points in context.			
	<ol> <li>idea of different levels of radioactivity from other organelles;</li> </ol>	2		
	2. peak at different time;			

Question Number	Question		
3.(c)(ii)	Explain how the data provide evidence for the sequence of events in the process of protein transport in these cells.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of <b>four</b> marks.	4	
	1. radiactivity peaks first in RER;		
	2. protein synthesised (in RER);		
	3. vesicles containing protein formed by RER;		
	4. vesicles migrate and fuse to Golgi;		
	5. which is where the second peak;		
	6. protein modified in Golgi;		
	7. vesicles (containing protein) formed from Golgi;		
	8. third peak in secretoty vesicles;		
	9. (vesicles contain protein) for secretion;		

Question Number	Question	
3.(c)(iii)	Suggest one reason for the presence of some radioactivity in the mitochondria.	
	Answer	Mark
	Award one mark for one of the following points only.	
	1. Background/eq;	1
	2. Amino acids diffuse in mitochondria;	
	3. Radioactive protein {used by / found in} mitochondria;	

Question Number	Question			
4.(a)	Three structures found in mammalian sperm cells are described in the table below. Give the name of each structure being described.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Acrosome Flagellum Mitochondria	Tail	Midpiece	1 1 1

Question Number	Question			
4.(b)	Give the term that describes the ability of a stem cell from an embryo to produce all cell types.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Totipotent	Totipotency	Pluripotent	1

Question Number	Question	
4.(c)	Describe how a cell loses the ability to produce other cell types and becomes specialised.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three marks.	3
	1. some genes active / some genes inactivated;	
	2. only get mRNA from active genes;	
	3. active mRNA translated to specific protein;	
	4. proteins modify cell;	
	5. changes permanent/difficult to reverse;	
	6. ref. to differentiation;	

Question Number	Question		
4.(d)	It has been suggested that there will be less opposition to the medical use of stem cells from these embryos than from normal embryos. Suggest reasons for this.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of three marks.	3	
	<ol> <li>{these / unfertilised} embryos not viable;</li> <li>objections to discarding viable embryos / no objection to discarding non-viable embryos;</li> </ol>		
	<ol> <li>rights from moment of fertilization; as they are genetically unique/eq;</li> </ol>		

Question Number	Question	
5.(a)	State one advantage of the binomial system developed by Linnae	eus.
	Answer	Mark
	Award one mark for one of the following points only.	
	1. binomial name is unique;	1
	2. more precise / less confusion than simple names;	

Question Number	Question		
5.(b)	Complete the table by suggesting and family of the fin whale.	g appropriate names for the clas	s, order
	Correct Answers	Reject	Mark
	Class = Mammalia	Any mis-spelt answers	
	Order = Cetacea		1
	Family = Balaenopteridae		
	All three correct = 1 mark		

Question Number	Question	
5.(c)	Below are four features, A, B, C and D, used in the class organisms. Put a cross in the box or boxes next to the feature shared by both blue whales and fin whales.	ification of s which are
	Correct Answer	Mark
	<ul> <li>⋈ A;</li> <li>⋈ B;</li> </ul>	2
	in A, B and C / D = 1 mark in A / B and C and D = 0 marks in A, B, C and D = 0 marks	

Question Number	Question	
5.(d)	Suggest reasons for the classification of the blue whale and the f within the same genus, <i>Balaenoptera</i> , but as different species.	in whale
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three marks.	3
	1. idea that they are very similar / share many {features/eq};	
	2. reference to homologous features;	
	3. in structure / behaviour/eq;	
	4. idea that they cannot breed together;	
	5. to produce {fertile / sexually viable} offspring;	

Question Number	Question	
6.(a)	State what is meant by the term species richness.	
	Answer	Mark
	The number of (different) <u>species</u> in a {habitat / environment / ecosystem/eq};	1

Question Number	Question		
6.(b)	Compare the species richness shown by the survey for the vegetation in the roadside verges with that of the hedgerows over this study period.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of three marks.	3	
	1. both have decreased;		
	2. decrease in roadside verges greater than in hedgrows;		
	<ol> <li>{percentage / proportional} decrease greater in roadside verges greater than in hedgerows;</li> </ol>		
	<ol> <li>roadside verges greater species richness in 1990 and in 1998;</li> </ol>		
	5. correct manipulation of figures to quantify any comparison;		

Question Number	Question		
6.(C)	Other information would be needed, in addition to species richness, to show changes in the biodiversity of the vegetation in the two types of habitat. Give an explanation for this.		
	Answer	Mark	
	Award one mark for each of the following points in context to a maximum of three marks.	3	
	<ol> <li>idea that species richness gives no indication of abundance of each species;</li> </ol>		
	<ol> <li>idea that biodiversity refers to {variety/eq} of organisms;</li> </ol>		
	<ol> <li>ref to use of a calculated biodiversity index eg Simpson's;</li> </ol>		
	<ol> <li>using species richness value / number of different species;</li> </ol>		
	5. number of individuals in each species recorded;		
	6. ref to genetic diversity;		

Question Number	Question	
6.(d)	Seed banks, such as the Millennium Seed Bank Project (MSBP), are an effective means of conserving plant species. Write a short briefing, intended for a government committee, describing how seed banks work and why their funding should be continued.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of five marks.	5
	1. reference to seeds stored in cool, dry conditions;	
	2. seeds can be stored for {long time/eq};	
	3. {viability tests/eq} carried out at regular intervals;	
	<ol> <li>{more economic / less costly / less labour involved} than conserving {living plants/eq};</li> </ol>	
	5. less space needed/eq;	
	6. {large numbers/eq} of plants can be stored;	
	7. seeds do not need be stored in original {habitat/eq};	
	<ol> <li>less likely to be damaged by {vandalism / natural disaster/eq};</li> </ol>	
	9. less likely to be damaged by {disease / herbivores/eq};	
	10. ref to any other valid comment about the value of conserving plant species;	

Question Number	Question	
7.(a)(i)	Complete the table to show the total annual production of sisal	
	Answer	Mark
	287;	1

Question Number	Question	
7.(a)(ii)	Calculate the percentage of sisal produced from freshly-cut lo your working.	eaves. Show
	Answer	Mark
	287 / 1432 or relevant working; 20 / 20.0;	2
	[Allow consequential error from part (i)]	

Question Number	Question	
7.(b)	Nylon is a synthetic (man-made) fibre which can be used to make ropes. Nylon ropes are lighter and stronger than those made using sisal. Suggest two advantages of using sisal rather than nylon to make ropes.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks.	2
	1. biodegradable;	
	2. use renewable material;	
	<ol> <li>sisal {obtainable / grown} {easily / locally / similar idea};</li> </ol>	
	<ol> <li>fibres extraction more suited to {developing countries / small scale};</li> </ol>	
	5. cheaper;	
	6. less use of fossil fuel/eq;	
	Assume idea relates to sisal unless stated otherwise, but accept converse arguments for nylon.	

Question Number	Question	
7.(c)(i)	Explain what is meant by the term tensile strength of a fibre.	
	Answer	Mark
	Ability to resist {stretching / being broken when pulled} / maximum {load / force} which can be applied before	1
	breaking;	

Question Number	Question	
7.(c)(ii)	Suggest how you would carry out a practical investigation to compare the tensile strength of sisal and nylon fibres.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of <b>four</b> marks.	4
	<ol> <li>idea of suspending {fibres / bundles of fibres} with weights on / pulling them with a forcemeter/eq;</li> </ol>	
	<ol> <li>{ fibres / bundles of fibres} of same diameter used / different diameters accounted for;</li> </ol>	
	3. { fibres / bundles of fibres} of same initial length used;	
	4. detail of how {weights added / forcemeter pulled};	
	<ol> <li>description of measurable endpoint eg {breaking point / stretched to standard length};</li> </ol>	
	<ol> <li>repeated readings taken at each {weight / forcemeter reading} (using different fibre NOT just checking the reading with same fibre);</li> </ol>	
	<ol> <li>reference to a safety procedure eg {goggles in case fibre snaps / precaution against falling weights};</li> </ol>	
	8. ref to control of {temperature / humidity / other relevant factor};	

Question Number	Question	
7.(d)	Describe two ways in which the structure of xylem vessels is similar to that of sclerenchyma fibres.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks.	2
	1. lignin in wall / lignified walls;	
	2. reference to {thick / thickened} walls;	
	3. dead / no living contents / hollow lumen;	
	4. elongated / much longer than they are wide;	

Question Number	Question	
8.(a)	Below are four cell structures A, B, C and D. Put a cross in the box next to each structure found only in plant cells.	
	Correct Answer	Mark
	A;	2
	in A, B and C / D = 1 mark in A / B and C and D = 0 marks in A, B, C and D = 0 marks	

Question	Question		
Number			
8.(b)	The list below shows some of the organelles that could be found in		
	eukaryotic cells.		
	5		
		and a final second sector	
	amyiopiast ce	entriole chloroplast	
	lysosome mitochondr	ion nucleus ribosome	
		the convert would form the list t	
	Complete the table by choosing the correct name from the list to match		
	each description.		
	Accentable Answers	Reject	Mark
			Mark
	I = millochondrion;	Any other answers	
			3
	2 = amyloplast		
	3 = Iysosome;		
	1	1	

Question Number	Question	
8.(c)	Describe the structure of a cellulose microfibril.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of <b>four</b> marks.	4
	1. cellulose molecule is an unbranched {polymer/chain};	
	2. of B-glucose;	
	3. joined by glycosidic bonds;	
	4. microfibril formed from 50 to 80 cellulose molecules;	
	<ol> <li>reference to hydrogen bonds (between adjacent cellulose molecules);</li> </ol>	
	6. between adjacent -OH groups;	
	7. large number of hydrogen bonds;	