

2. Organisation of the organism

2.1 Cell structure

Paper 3 and 4

Marking Scheme

Q1.

Question	Answer	Marks	Guidance																					
(a)	<table border="1"> <thead> <tr> <th>structure</th> <th>animal cell</th> <th>bacterial cell</th> </tr> </thead> <tbody> <tr> <td>cell membrane</td> <td>C</td> <td>G</td> </tr> <tr> <td>cell wall</td> <td></td> <td>F</td> </tr> <tr> <td>cytoplasm</td> <td>B</td> <td>H</td> </tr> <tr> <td>mitochondrion</td> <td>A</td> <td></td> </tr> <tr> <td>nucleus</td> <td>D</td> <td></td> </tr> <tr> <td>plasmid</td> <td></td> <td>E</td> </tr> </tbody> </table>	structure	animal cell	bacterial cell	cell membrane	C	G	cell wall		F	cytoplasm	B	H	mitochondrion	A		nucleus	D		plasmid		E	5	<i>one mark for each correct row</i>
structure	animal cell	bacterial cell																						
cell membrane	C	G																						
cell wall		F																						
cytoplasm	B	H																						
mitochondrion	A																							
nucleus	D																							
plasmid		E																						
(b)	<u>aerobic</u> respiration ;	1																						
(c)	<table border="1"> <thead> <tr> <th>adaptive feature</th> <th>egg cell</th> <th>sperm cell</th> </tr> </thead> <tbody> <tr> <td>energy store</td> <td>✓</td> <td></td> </tr> <tr> <td>enzymes in the acrosome</td> <td></td> <td>✓</td> </tr> <tr> <td>flagellum</td> <td></td> <td>✓</td> </tr> <tr> <td>jelly coat</td> <td>✓</td> <td></td> </tr> </tbody> </table>	adaptive feature	egg cell	sperm cell	energy store	✓		enzymes in the acrosome		✓	flagellum		✓	jelly coat	✓		4	<i>one mark for each correct row</i>						
adaptive feature	egg cell	sperm cell																						
energy store	✓																							
enzymes in the acrosome		✓																						
flagellum		✓																						
jelly coat	✓																							

Q2.

(c)	(a leaf is) a group of tissues ; performing / AW,(specific) function(s) ;	2	
-----	--	----------	--

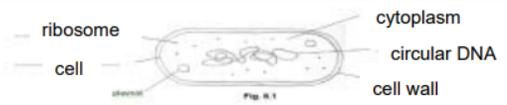
Q3.

(b)	guard (cell) ; palisade (mesophyll cell) ; red blood (cell) ; ciliated (cell) ;	4	MP1 and MP2 can be in either order
(c)	when (existing) cells divide ;	1	
(d)(i)	<i>any three features labelled correctly:</i> acrosome / enzymes ; nucleus ; cell membrane ; cytoplasm ; mitochondria ; flagellum ;	3	
(d)(ii)	sperm (cell) ;	1	

Q4.

(e)	any two from: cell wall ; cell membrane ; cytoplasm ; ribosomes ; DNA / genetic material ; AVP ;	2	e.g. temporary vacuole / vesicle
-----	--	---	----------------------------------

Q5.

(a)(i)		4	5 correct = 4 marks 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark
(a)(ii)	any two from: circular DNA ; plasmids ; cell wall ;	2	
(a)(iii)	any one from: store / source, of genetic material / genes / DNA ; used to transfer genetic material from one cell to another / conjugation ; code to make proteins ; AVP ;	1	e.g. resist, toxic substances / antibiotics

Q6.

(a)	name of structure	letter from Fig. 2.1	one function	5	
	chloroplast	M ;	site of photosynthesis		
	ribosome	N	(site of) protein synthesis / AW ;		
	cell wall	S ;	prevents the cell bursting		
	nucleus ;	L	controls the cell / contains DNA / stores genetic information / AW ;		
(b)(i)	any one from: chloroplast(s) ; cell wall ; (large / permanent) vacuole ; AVP ; e.g., starch, grain / granule	1			
(b)(ii)	any one from: nucleus ; mitochondria ; ribosome(s) ; cytoplasm ; (cell) membrane ;	1			
(c)	root hair (cell) ; large, surface area / SA ; (for) absorption of / AW, minerals / ions / water ;	3			

Q7.

(b)	allele chromosome nucleus ; ↓	1	
-----	-------------------------------------	---	--

Q8.

	<table border="1"> <thead> <tr> <th data-bbox="315 558 423 669" rowspan="2">example</th> <th colspan="5" data-bbox="423 558 902 596">level of organisation</th> </tr> <tr> <th data-bbox="423 596 521 669">cell</th> <th data-bbox="521 596 618 669">tissue</th> <th data-bbox="618 596 716 669">organ</th> <th data-bbox="716 596 813 669">organ system</th> <th data-bbox="813 596 902 669">organism</th> </tr> </thead> <tbody> <tr> <td data-bbox="315 669 423 722">circulatory</td> <td data-bbox="423 669 521 722"></td> <td data-bbox="521 669 618 722"></td> <td data-bbox="618 669 716 722"></td> <td data-bbox="716 669 813 722">✓</td> <td data-bbox="813 669 902 722"></td> </tr> <tr> <td data-bbox="315 722 423 774">epidermis</td> <td data-bbox="423 722 521 774"></td> <td data-bbox="521 722 618 774">✓</td> <td data-bbox="618 722 716 774"></td> <td data-bbox="716 722 813 774"></td> <td data-bbox="813 722 902 774"></td> </tr> <tr> <td data-bbox="315 774 423 827">pancreas</td> <td data-bbox="423 774 521 827"></td> <td data-bbox="521 774 618 827"></td> <td data-bbox="618 774 716 827">✓</td> <td data-bbox="716 774 813 827"></td> <td data-bbox="813 774 902 827"></td> </tr> <tr> <td data-bbox="315 827 423 879">tree</td> <td data-bbox="423 827 521 879"></td> <td data-bbox="521 827 618 879"></td> <td data-bbox="618 827 716 879"></td> <td data-bbox="716 827 813 879"></td> <td data-bbox="813 827 902 879">✓</td> </tr> <tr> <td data-bbox="315 879 423 932">sperm</td> <td data-bbox="423 879 521 932">✓</td> <td data-bbox="521 879 618 932"></td> <td data-bbox="618 879 716 932"></td> <td data-bbox="716 879 813 932"></td> <td data-bbox="813 879 902 932"></td> </tr> </tbody> </table>	example	level of organisation					cell	tissue	organ	organ system	organism	circulatory				✓		epidermis		✓				pancreas			✓			tree					✓	sperm	✓					5	one mark for each correct row R each additional tick
example	level of organisation																																											
	cell	tissue	organ	organ system	organism																																							
circulatory				✓																																								
epidermis		✓																																										
pancreas			✓																																									
tree					✓																																							
sperm	✓																																											

Q9.

(a)	<p>contains the genetic material</p> <p>controls which substances enter and leave the cell</p> <p>filled with sap to support the cell</p> <p>strengthens the cell</p> <p>transports nerve impulses</p> <p>where photosynthesis occurs</p> <p>.....</p>	5	R each additional line R any box with two lines
(b)	<p><i>any two from:</i> root hair ; palisade (mesophyll) ; spongy (mesophyll) ; xylem ; phloem ; guard ; (root), cortex / cortical ; epidermal / epidermis ; AVP ;;</p>	2	

Q10.

(a)	<p>nucleus labelled ; (cell) membrane labelled ; cytoplasm labelled ;</p>	3	
(b)	<p><i>any two from:</i> cell wall ; chloroplast ; (permanent) vacuole ;</p>	2	

Q11.

(a)	line ending on cell membrane ; line ending in the cytoplasm ; line ending on or in the vacuole ;	3	
(b)(i)	1 cell, is larger / has expanded / has changed shape / AW ; 2 cytoplasm has increased in volume ; 3 vacuole, is larger / AW ; 4 cell wall / cell membrane, is, stretched / AW ;	2	
(b)(ii)	1 water moves into the, cell / vacuole ; <i>max two from:</i> 2 ref. to osmosis ; 3 through partially permeable membrane ; 4 cell or vacuole contents / cytoplasm , more concentrated than (distilled) water / AW ;	3	

Q12.

(a)	(A) red blood cell ; (B) neurone / nerve cell ;	2
(b)	structure ; function ;	2
(c)	nervous system ; reproductive system ; reproductive system ;	3

Q13.

(c)	<i>any two from:</i> cell wall ; chloroplast ; (large) permanent vacuole ; AVP ; e.g. starch grains	2
-----	---	----------

Q14.

	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>controls cell activities</p> <p>controls movement of chemicals into and out of cells</p> <p>makes glucose</p> <p>prevents cell from bursting</p> <p>.....</p> </div> <div style="width: 45%;"> <p>cell membrane</p> <p>cell wall</p> <p>chloroplast</p> <p>nucleus</p> <p>vacuole</p> </div> </div>	4	
--	---	----------	--

Q15.

(a)	line ending on and labelled nucleus ; line ending on one of the chloroplasts and labelled ;	2	
-----	--	----------	--

Q16.

(b)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">tissue</td> <td style="width: 33%;">organ</td> <td style="width: 33%;">organ system</td> </tr> <tr> <td>fat (under the skin) ;</td> <td>kidney ; heart ; lung ;</td> <td>(nervous system)</td> </tr> </table>	tissue	organ	organ system	fat (under the skin) ;	kidney ; heart ; lung ;	(nervous system)	4	
tissue	organ	organ system							
fat (under the skin) ;	kidney ; heart ; lung ;	(nervous system)							

(c)	(smallest) chloroplast ; palisade cell (then) phloem tissue (then) root ; (largest) whole plant ;	3	
-----	---	----------	--

Q17.

(b)	nerve (cell) ; ciliated (cell) ; root hair (cell) ; red blood (cell) ; xylem (cell) ; phloem (cell) ; palisade (mesophyll cell) ; spongy (mesophyll cell) ; white blood (cell) ; AVP ;	2	
-----	---	----------	--

Q18.

(b)	cell membrane ; cytoplasm ; nucleus ; AVP ;	3	
-----	--	---	--

Q19.

(d)	use selective breeding ; breed / cross / mate, two white goats ; select offspring with white coats and breed again / do not breed the offspring with black coats or remove black goats ; <i>idea of</i> (breeding) over many generations ; correct ref. to homozygous dominant ;	3	
-----	--	---	--

Q20.

(a)		6	one mark for each correct line deduct one mark for each extra line drawn
-----	--	---	---

Q21.

(a)	<p><i>total of five from:</i></p> <p><i>mitochondria to max 4:</i></p> <ol style="list-style-type: none"> 1 more in root hair cell / ORA ; 2 (site of) <u>aerobic respiration</u> ; 3 to, release / provide, energy ; 4 for active, transport / uptake, of, minerals / ions / named ion(s) ; 5 up/against, a concentration gradient ; <p><i>chloroplasts to max 4:</i></p> <ol style="list-style-type: none"> 6 in palisade only / none in root hair cell ; 7 no light reaches root hair cells / cells are underground <i>or</i> in soil ; <i>ora</i> 8 (site of) photosynthesis ; 9 contain chlorophyll ; 10 transfers / changes, energy from light to, energy in chemicals / ATP ; 11 to synthesise, glucose / carbohydrate ; 	5	MP5 A low to high concentration
-----	--	---	---------------------------------

Q22.

(a)(i)	<u>aerobic</u> respiration ;	1	
(a)(ii)	<i>any one from:</i> (composition of) cell wall OR cell walls (in plants) are made of cellulose / cell walls in fungi are made of chitin ; (presence of) chloroplasts OR chlorophyll (in plants) ; ora AVP ;	1	

Q23.

(a)(i)	prokaryote ;	1																			
(a)(ii)	<table border="1"> <thead> <tr> <th>name</th> <th>function or use</th> <th>letter from Fig. 3.1</th> </tr> </thead> <tbody> <tr> <td>flagellum</td> <td>movement / AW</td> <td>B</td> </tr> <tr> <td>cell membrane</td> <td>controls what goes in and out (of the cell)</td> <td>G</td> </tr> <tr> <td>ribosome</td> <td>protein synthesis</td> <td>D</td> </tr> <tr> <td>cell wall</td> <td>prevents (cell) bursting / provides support</td> <td>A</td> </tr> <tr> <td>plasmid</td> <td>used in genetic modification</td> <td>C</td> </tr> </tbody> </table>	name	function or use	letter from Fig. 3.1	flagellum	movement / AW	B	cell membrane	controls what goes in and out (of the cell)	G	ribosome	protein synthesis	D	cell wall	prevents (cell) bursting / provides support	A	plasmid	used in genetic modification	C	5	one mark for each correct row
name	function or use	letter from Fig. 3.1																			
flagellum	movement / AW	B																			
cell membrane	controls what goes in and out (of the cell)	G																			
ribosome	protein synthesis	D																			
cell wall	prevents (cell) bursting / provides support	A																			
plasmid	used in genetic modification	C																			

Q24.

(b)(i)	nucleus ; chloroplast ;	2	A in either order
(b)(ii)	<i>any two from:</i> cytoplasm ; cell wall ; cell membrane ; nucleus ;	2	
(b)(iii)	animal and plant ;	1	A in either order

Q25.

(d)	<i>any five from:</i> 1 mitochondria are site of <u>aerobic</u> respiration ; 2 release energy ; 3 heart / intestine (cells), respire more ; 4 heart (cells) (continuously) contract ; 5 epithelial cells need more energy ; 6 active transport in the small intestine ; 7 red blood cells need space, for haemoglobin / oxygen ; 8 red blood cells, are moved in the blood / do not (actively) move ; 9 red blood cells, take up/ release, oxygen by diffusion ; 10 so no energy needed for active transport ; 11 <i>idea that</i> it is good if RBCs do not use up the oxygen they transport ; 12 AVP ;	5	
-----	---	---	--

Q26.

(b)(i)	K (cell) membrane ; L cytoplasm ; M nucleus ;	3	
(b)(ii)	brain and spinal cord ;	1	either order

Q27.

(b)			5	<i>one mark per correct row</i>
	function	structure	letter in Fig. 1.1	
	storage of DNA / controls (named) activity of cell / produces RNA / makes ribosomes	nucleus	C	;
	photosynthesis / absorb light / AW	chloroplast	E	;
	aerobic respiration	mitochondrion / mitochondria	D	;
	contains cell sap and stores water	vacuole	B	;
supports (the cell) / resists turgor pressure / prevents bursting / AW	cell wall	A	;	

Q28.

(a)(i)	prokaryote / plant ;	1																	
(a)(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">cell function</th> <th style="width: 33%;">cell structure</th> <th style="width: 33%;">letter from Fig. 1.1</th> </tr> </thead> <tbody> <tr> <td>storage of genes</td> <td>nucleus</td> <td>G</td> </tr> <tr> <td>aerobic respiration</td> <td>mitochondria</td> <td>E</td> </tr> <tr> <td rowspan="2">amino acids are assembled to make protein</td> <td>ribosome(s)</td> <td>H / F</td> </tr> <tr> <td>OR (rough) endoplasmic reticulum / (R)ER</td> <td>F</td> </tr> </tbody> </table>	cell function	cell structure	letter from Fig. 1.1	storage of genes	nucleus	G	aerobic respiration	mitochondria	E	amino acids are assembled to make protein	ribosome(s)	H / F	OR (rough) endoplasmic reticulum / (R)ER	F	3	one mark per row		
cell function	cell structure	letter from Fig. 1.1																	
storage of genes	nucleus	G																	
aerobic respiration	mitochondria	E																	
amino acids are assembled to make protein	ribosome(s)	H / F																	
	OR (rough) endoplasmic reticulum / (R)ER	F																	
(c)	<p>total of six from:</p> <p><i>similarities, max four from:</i> single cell / unicellular / AW ; (cell) wall / A ; cytoplasm / D ; ribosomes / H ; cell membrane / B ; DNA / genetic material ;</p> <p><i>differences, max four from: ;;;;</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">(bacteria have)</th> <th style="width: 50%;">(yeast have)</th> </tr> </thead> <tbody> <tr> <td>no nucleus / no G / has nucleoid</td> <td>nucleus / G</td> </tr> <tr> <td>loop / coil / AW, of DNA</td> <td>linear DNA / chromosome</td> </tr> <tr> <td>no, (rough) endoplasmic reticulum / ER</td> <td>(rough) endoplasmic reticulum</td> </tr> <tr> <td>no mitochondria / no E</td> <td>mitochondria / E</td> </tr> <tr> <td>no (large / permanent) vacuole / no C</td> <td>(large / permanent) vacuole / C</td> </tr> <tr> <td>plasmid(s)</td> <td>no plasmids</td> </tr> <tr> <td>no membrane-bound, cell structures / organelles</td> <td>membrane-bound, cell structures / organelles</td> </tr> </tbody> </table>	(bacteria have)	(yeast have)	no nucleus / no G / has nucleoid	nucleus / G	loop / coil / AW, of DNA	linear DNA / chromosome	no, (rough) endoplasmic reticulum / ER	(rough) endoplasmic reticulum	no mitochondria / no E	mitochondria / E	no (large / permanent) vacuole / no C	(large / permanent) vacuole / C	plasmid(s)	no plasmids	no membrane-bound, cell structures / organelles	membrane-bound, cell structures / organelles	6	
(bacteria have)	(yeast have)																		
no nucleus / no G / has nucleoid	nucleus / G																		
loop / coil / AW, of DNA	linear DNA / chromosome																		
no, (rough) endoplasmic reticulum / ER	(rough) endoplasmic reticulum																		
no mitochondria / no E	mitochondria / E																		
no (large / permanent) vacuole / no C	(large / permanent) vacuole / C																		
plasmid(s)	no plasmids																		
no membrane-bound, cell structures / organelles	membrane-bound, cell structures / organelles																		

Q29.

(e)	organ ; cell structure ; tissue ; organ ;	4	
-----	--	---	--

Q30.

(b)	<p>A are microvilli ; <i>function:</i> allow movement of substances into the cell / increase surface area for absorption by diffusion OR active transport / have proteins in the membrane for active transport ;</p> <p>B is the (rough) endoplasmic reticulum / (R)ER ; <i>function:</i> site of protein synthesis / modify proteins / assemble amino acids in a specific sequence to make (named) protein ;</p> <p>C is a mitochondrion ; <i>function:</i> <u>aerobic respiration</u> / provides energy for (named) cell process(es) ;</p>	6
-----	--	----------

Q31.

(a)(i)	<p>A (rough) endoplasmic reticulum ; D (sap) vacuole ;</p>	2	A ribosomes
(a)(ii)	<p>B / <i>nucleus</i> – one from: store of, DNA / chromosomes / genetic information / genetic material / genes ; controls / regulates, (reactions / protein synthesis in) the cell ;</p> <p>C / <i>mitochondrion</i> – one from: (aerobic) respiration ; releases / provides, energy ;</p>	2	
(a)(iii)	chloroplast ;	1	A starch grain

Q32.

(a)	tissue ; cell structure ; cell ; organ ;	4	
-----	---	----------	--

Q33.

(a)	<p><i>carbohydrates</i> cellulose ; for cell walls ; starch ; for energy/respiration ; to attract insects to flowers / nectar / fruits ;</p> <p><i>amino acids</i> to make (named) proteins ; for enzymes ; for growth ;</p> <p>AVP ;</p>	4	
-----	---	----------	--

Q34.

(c)	(stem cells) divide by <u>mitosis</u> ; form (named) specialised cells (in stomach) ; to replace cells (in the lining of stomach) ; <i>idea that cells are worn away from the surface of the stomach ;</i> for repair of any damage to tissues ;	2	
-----	--	----------	--

Q35.

(a)	(asexual) reproduction ;	1	R sexual reproduction
-----	--------------------------	----------	------------------------------