<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><th>Animal</th><th>Plant</th><th>Yeast</th><th>Bacterium</th></tr>
<tr><td></td><td></td><td>budding</td><td></td></tr>
<tr><td>yes</td><td>yes</td><td>yes</td><td>no</td></tr>
<tr><td></td><td>cellulose</td><td></td><td>peptidoglycan</td></tr>
<tr><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
</table>
;
;
;
;</td><td>4</td><td>Mark the first answer in each box. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks

Award 1 mark for each correct row

ACCEPT tick / present & cross / not present / absent / none

IGNORE ref to nucleoid

CREDIT murein as alternative to peptidoglycan
ACCEPT peptidoglycin
DO NOT ACCEPT peptoglycan

ACCEPT ‘on RER’ or ‘in cytoplasm’ for yes
ACCEPT ref to size of ribosomes (large / 80S / 22nm in Eukaryotes, small / 70S / 18nm in bacteria)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><u>meristem</u>(atic<u></u>) ;</td><td>1</td><td>IGNORE position in plant such as ‘root tip’, cambium</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(ii)</td><td>nucleus / nucleolus / chromatin ;

cytoplasm ;

cross / end, (cell) walls ;</td><td>2 max</td><td>Read through and award marks for correct features
IGNORE ref to other individual organelles / vacuole
IGNORE nucleous
DO NOT CREDIT ‘two nuclei in one cell’

CREDIT end plates
ACCEPT no end walls / no nucleus / no cytoplasm
IGNORE walls between cells</td></tr>
</table>

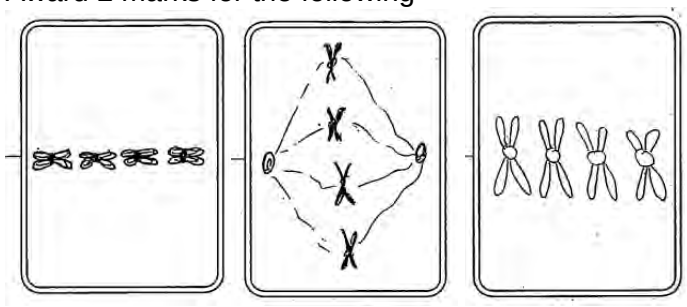
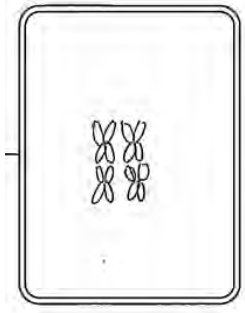
Question			Expected Answers	Marks	Additional Guidance
	(b)	(iii)	thicker ; lignified ; contain (bordered) pits ;	 2 max	**IGNORE** stronger **CREDIT** have lignin **/**contain lignin / reinforced with lignin / impregnated with lignin **DO NOT CREDIT** have lignin on the walls / lined by lignin / surrounded by lignin **IGNORE** ref to pattern of thickening **IGNORE** 'pore'
	(c)		sieve (tube) element ; companion (cell) ; parenchyma ;	 2 max	**IGNORE** 'sieve tube' 'sieve cell' **ACCEPT** fibres / sclereids / sclerenchyma
			Total	**11**	

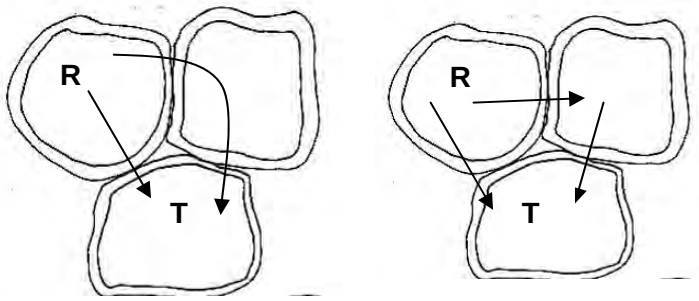
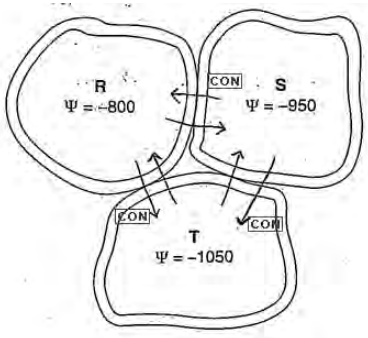
Question			Answer	Marks	Guidance
2	(a)	(i)	*division type 1* mitosis **and** *division type 2* meiosis **;**	1	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** correct spelling only **ACCEPT** correct spelling only **CREDIT** meiosis I **and** II **DO NOT CREDIT** meiosis I / meiosis II alone
2	(a)	(ii)	**A** (DNA) replication **;** **B** cytokinesis **;**	2	**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** **IGNORE** stages of cell division **IGNORE** cell division / stages of cell division

Question			Answer	Marks	Guidance
2	(b)		**A1** independent assortment / random segregation **,** of (homologous) chromosomes / bivalents; **A2** in **,** metaphase I / meiosis I **;** **A3** *of* chromatids in **,** metaphase I I / meiosis I I **;** **A4** (so) homologous chromosomes , have different alleles / come from different parents **;** **A5** produces large number of allele combinations **;** **C1** crossing over / (formation of) chiasma(ta) **;** **C2** in **,** prophase I / meiosis I **;** **C3** (so) chromatids will have new combination of alleles **;** **C4** amount of variation depends on distance between crossover points **;** **M1** mutation **;** **M2** changes the (DNA) nucleotide/ base, sequence **;** **M3** DNA checks (during duplication) did not recognise damage **;** **M4** *idea of* differences in (named) protein(s) **;** **N1** non-disjunction **;** **N2** homologous chromosomes do not separate (in metaphase I) **;** **N3** one **,** more / less **,** chromosome present **;** **F1** random, mating / fusion of gametes/ fertilisation **;** **F2** gametes are not genetically identical; **F3** produces large number of (allele) combinations **;**	**8 max**	**A1 ACCEPT** Random assortment / independent segregation **A2 /A3 DO NOT CREDIT** metaphase /meiosis, I **and** II **A2 /A3 ACCEPT** correct anaphase stage linked to segregation **A2** must be in context of independent assortment / random segregation **A4/ A5 DO NOT CREDIT** genes **A4 ACCEPT** pairs of chromosomes / maternal **and** paternal chromosomes, have different alleles/ come from different parents **A5 ACCEPT** different combinations of, chromatids /chromosomes, in gametes **CREDIT** figures e.g. for humans 2^{23} possible combinations **C1 DO NOT CREDIT** between sister chromatids **C2 DO NOT CREDIT** prophase / meiosis, I **and** II **C2** must be in context of crossing over **C3 ACCEPT** shuffles / swaps/exchanges, alleles on chromatids **C4** e.g. more variation the further apart the crossovers occur **M2 IGNORE** **'**pairs' **M2 CREDIT** deletion,/substitution/ addition, of, base / nucleotide **M3 ACCEPT** proof reading did not recognise damage **M4** e.g. change in, amino acid sequence/primary structure **N1 CREDIT** inversion / translocation (chromosome mutation) **N2 CREDIT** description of inversion / translocation **N3 CREDIT** examples of chromosome changes e.g. Trisomy 21 **F2 ACCEPT** gametes are genetically different **F3 DO NOT CREDIT** produce large number of gene combinations

Question			Answer	Marks	Guidance
			QWC ;	1	**Awarded for one change and consequence of that change** **Award if ONE of the following has been awarded** mp **A1 or A2 or A3** **and** mp **A4 or A5** **OR** mp **C1 or C2** **and** mp **C3 or C4** **OR** mp **M1 or M2** **and** mp **M3 or M4** **OR** mp **N1 or N2** **and** mp **N3** **OR** mp **F1 or F2** **and** mp **F3**
			Total	**12**	

Question			Answer	Mark	Guidance
3	(a)	(i)	mitosis ;	1	**CREDIT** correct spelling only **ACCEPT** binary fission
		(ii)	in the grex / 3 ;	1	
	(b)	(i)	cell signalling ;	1	
		(ii)	1 attraction of cell(s) to folic acid from bacteria ; 2 attraction of cells to each other by cAMP ; 3 coordinated movement in grex ; 4 differentiation / described, of (grex / slime mould) cells in response to DIF ;	2 max	**NOTE** must name the chemical involved for description (except mp 3 coordinated movement) **ACCEPT** attraction of cells to bacteria by folic acid **IGNORE** makes cells stick together
		(iii)	contains , receptors / glycoproteins / glycolipids / glycocalyx ; for , folic acid / cAMP / DIF ;	2	**DO NOT CREDIT** *consists* of receptors
	(c)		17 (hours) ;	1	
			Total	**8**	

4	**(a)**	**(i)**	mitosis / mitotic **;**	**1**	Correct spelling only
		(ii)	four chromosomes on equator **;** (each chromosome as) two sister chromatids **;**	**2**	If the image is unclear then pencil or a different colour may have been used - RAISE AN EXCEPTION Award 2 marks for the following  **DO NOT CREDIT** mp 1 if nuclear membrane shown **DO NOT CREDIT** mp 1 if homologous chromosomes paired e.  **DO NOT CREDIT** mp 2 if sister chromatids are not joined (at centromere)

		(iii)	arrow from R to T **;** arrow from R to S **AND** arrow from S to T OR arrow from R to S to T **;**	**2**	e.  If contradictory arrows to the above are drawn, apply CON for each arrow going from low Ψ to high Ψ. e.  gets 0
	(b)		this is where cambium / meristem / xylem / phloem / vascular bundle, is found **;** mitosis/cell division, occurs in cambium (to produce new cells for growth) **;** new cells, differentiate / specialise, (into xylem and phloem) **;** xylem supplies water for, (cell) elongation / (cell) growth ; phloem supplies, sugars / assimilates, for, energy / growth /respiration **;**	**max 2**	**CREDIT** from a labelled diagram **CREDIT** description of position being close to the edge of trunk **DO NOT CREDIT** responses that suggest that cambium etc. are in or outside bark OR under cut surface **ACCEPT** cambium differentiates **IGNORE** nutrients

	(c)		tip / apex, of, shoot / root **;** meristem **;** bud **;**	**max 1**	**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** **IGNORE** root or shoot unqualified **ACCEPT** behind root tip
	(d)		allow <u>oxygen</u> to reach, cells / tissues (under bark) **;** for (aerobic) respiration **;** animals transport oxygen in, blood / circulation / transport system **;** plants do not transport (much) oxygen in transport system **;** *idea that* (oxygen not supplied from leaves as) stomata only open in day / no leaves in winter **;**	**max 2**	**IGNORE** refs to need for CO_2 / photosynthesis throughout **ACCEPT** correct formula O_2 **DO NOT CREDIT** oxygen for photosynthesis **ACCEPT** gas(es) for oxygen **ACCEPT** gas(es) for oxygen
			Total	**10**	

Question			Answer	Marks	Guidance
5	(a)		metaphase **I and** metaphase **II ;** prophase **I ;** anaphase **II ;** telophase **II ;** anaphase **I ;**	5	**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**
	(b)		to, **halve** chromosome number / **reduce from** 2n **to** n **;** to separate homologous pairs (of chromosomes) **and** sister chromatids **;** because, DNA (previously) replicated / chromosomes are two chromatids at start **;**	2	**IGNORE** all references to mitosis **CREDIT ‘from** diploid **to** haploid’ **ACCEPT ‘from** 46 **to** 23 chromosomes’ **IGNORE** halve, genetic material / DNA **ACCEPT** genetic, material / information
	(c)	**(i)**	sequence / order, of bases / nucleotides **;**	1	**CREDIT** base pairs **DO NOT CREDIT** amino acid sequence
		(ii)	different, primary / secondary / tertiary, structure **;** (protein) shorter due to, deletion / stop codon **OR** longer due to, insertion / duplication **;** (protein) unchanged due to, silent mutation / non-coding DNA altered **;** (function is) lost / worse / better **;**	3	**ACCEPT** different <u>sequence</u> or <u>order</u> of amino acids **ACCEPT** different 3D folding or 3D shape for ‘silent’ **CREDIT** ‘neutral’ or a description of more than one triplet coding for one amino acid **IGNORE** different / altered function **ACCEPT** idea that change is harmful
			Total	**11**	