

OCR AS GCE Biology (14 pages)

F211 Cells, Transport and Exchange

Mark schemes from January 2009-June 2012

Topics:

1.1.3 Cell Division

State that mitosis occupies only a small percentage of the cell cycle and that the remaining percentage includes the copying and checking of genetic information;
Describe, with the aid of diagrams and photographs, the main stages of mitosis (behaviour of the chromosomes, nuclear envelope, cell membrane and centrioles);
Explain the meaning of the term <i>homologous pair of chromosomes</i> ;
Explain the significance of mitosis for growth, repair and asexual reproduction in plants and animals;
Outline, with the aid of diagrams and photographs, the process of cell division by budding in yeast;
State that cells produced as a result of meiosis are not genetically identical (details of meiosis are not required);
Define the term <i>stem cell</i> ;

Question	Expected Answers		Additional Guidance
3 (a)	(i) a cell that is, unspecialised / not differentiated ; capable of, division / mitosis ; able to, differentiate / specialise / become other cell types ;	2 max	DO NOT ACCEPT replication ACCEPT totipotent / pluripotent / omnipotent
3 (a)	(ii) cambium / meristem / early embryonic cells ;	1	ACCEPT plants have no stem cells
(b)	growth (of tissue / organism) ; replace (cells) / repair (tissues) ; asexual reproduction/cloning / producing genetically identical cells ; maintain chromosome number in all cells ;	3	initially mark first response on each line, if not all lines used, go back and credit further correct points DO NOT ACCEPT growth of cells DO NOT ACCEPT repair of cells ACCEPT ref to maintain, haploid / diploid, number
(c)	(i) higher percentage remain leukaemia free (for five years) / AW ; ORA use of figs ;	2	Need clear comparative statement DO NOT ACCEPT 'more people' e.g. 60% cf. 38% approx. one and a half times more 22% more e.g. ALLOW one mark for: '60% given cord blood cells survive, 38% given marrow cells survive for five years' ALLOW two marks for: '60% given cord blood cells survive but only 38% given marrow cells survive for five years' as this is a comparative statement

Question	Expected Answers	Marks	Additional Guidance
5 (a)	Q, T, P, R ; ; ; ;	4	Allocate marks for the following pairs: S - Q Q - T T - P P - R
5 (b) (i)	growth of cell / growth of organelles / increase number of organelles / synthesis of proteins ;	1	DO NOT ACCEPT 'growth' unqualified DO NOT ACCEPT refs to DNA replication IGNORE ref. to respiration ACCEPT named steps in protein synthesis
5 (b) (ii)	mutation / faulty DNA produced / error in copying ; daughter cells will not receive identical genetic information ; proteins / (daughter) cells, not made / do not function ;	2	ACCEPT 'daughter cells will not be clones' ACCEPT 'proteins / daughter cells function differently'
5 (c)	haploid / half genetic information / chromosome number is n ; genetic information not identical / produces genetically different cells ; 4 cells produced ;	2 max	ACCEPT use of comparative chromosome numbers as example DO NOT ACCEPT identical / not identical without 'genetic' DO NOT ACCEPT smaller cells
Total		9	

Question	Expected Answers		Additional Guidance
(c) (ii)	1 greater availability of cord cells / more likely to find donors; 2 easier to harvest / no pain for donor ; 3 cells at earlier stage of development ; 4 can be stored for future, use/repair / gene therapy, of donor ; 5 slightly mismatched cord cells work (almost) as well as marrow cells ;	2	ACCEPT ORA throughout ACCEPT easier to extract/obtain / less risky / less invasive ACCEPT can differentiate into wider range of cells DO NOT ACCEPT cells younger
		Total : 10]	



Question	Expected Answers	Marks	Additional Guidance
1 (a)	mitosis / mitotic division ;	1	DO NOT CREDIT meiosis, mitosis ACCEPT mytosis
(b)	N ; L ; K ; J ;	4	Mark the first answer for each stage . If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks .
(c)	1 checking, genetic material / DNA / chromatin / chromosome(s) / genes, (for errors) ; 2 protein synthesis ; 3 synthesis / replication / increase in number of, organelles / named organelle ; 4 ATP production / respiration ; 5 <u>cell</u> growth / increase in <u>cell</u> , volume / size ;	2 max	Mark the first two suggestions only . IGNORE DNA, replication / synthesis ACCEPT checking for mutations DO NOT CREDIT check for cell mutations ACCEPT named step e.g. transcription / translation / described CREDIT one named organelle only ACCEPT centriole as organelle IGNORE organelle growth IGNORE release energy DO NOT CREDIT produce / create, energy (in form of ATP) IGNORE cytoplasm replicates

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>in plant</i></p> <p>(cell), plate / wall, forms (between new cells) ;</p> <p><i>idea of :</i></p> <p>cytokinesis starts from middle of cell ;</p> <p>(only) occurs in meristem ;</p> <p>no centrioles ;</p> <p>AVP ;</p>	2 max	<p>Mark the <u>first two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</p> <p>Assume response refers to plants unless stated otherwise. Accept reverse argument for animals.</p> <p>CREDIT in animal no cell plate</p> <p>IGNORE plants have cell walls unqualified</p> <p>ACCEPT cytokinesis starts at outer edge in animals</p> <p>ACCEPT cambium / specialised tissues / cells</p> <p>IGNORE ref (root) cap, root tip / shoot tip</p> <p>CREDIT in animals most, cells / tissues, can divide</p> <p>ACCEPT centrioles not used to pull chromatids apart</p> <p>DO NOT CREDIT no spindle fibres in plants</p> <p>e.g. nuclear envelope does not reform in most plant cells in telophase I (fit does form in most animal cells)</p>
	Total	9	

Question	Expected Answer	Mark	Additional Guidance
4 (a)	(just behind) tip / apex, of root ; (just behind) tip / apex, of shoot ; cambium / pericycle / vascular bundle ; bud ;	max 2	Mark the first <u>two</u> suggestions. ACCEPT behind root cap IGNORE root unqualified IGNORE stem / root unqualified / shoot unqualified ACCEPT between xylem and phloem
4 (b) (i)	1 chromosomes / chromatin / nucleus, can be seen / are visible ; 2 determine / distinguish between, different stages (of mitosis / division / cell cycle) ; 3 (staining) provide contrast (between cell structures) / AVV ; 4 (because) different, structures / chemicals, take up different amounts of stain ;	max 2	IGNORE ref to organelles throughout 1 ACCEPT DNA for chromosomes / chromatin ACCEPT chromosomes / chromatin / DNA / nucleus, not normally visible 3 IGNORE different structures can be seen (this is visibly not contrast) 4 IGNORE different tissues or cells, take up different amounts of stain
4 (b) (ii)	mitosis / mitotic ;	1	spelling must be correct

Question	Expected Answer	Mark	Additional Guidance
4 (c)	Two marks for correct answer, even if no working shown 18.00 ; ;		CREDIT 18 / 18.0 If answer is incorrect or missing allow one mark for working 100 – 82 or 4.34. + 3.23 + 3.23 + 7.20 or 18 somewhere in working
4 (d)	<i>in meiosis</i> (cells produced are) not <u>genetically</u> identical ; one set of chromosomes / haploid ; (they are) gametes ; four cells produced ;	max 1 [8]	Mark the first answer. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE ref to cells produced by mitosis (as qu asks about meiosis) ACCEPT not clones Award in context of genetically different from parent or from each other ACCEPT half number of chromosomes / half genetic material
Total			

Question	Answer	Marks	Guidance
1 (a)	(i) <u>mitosis</u> ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
	(ii) <i>idea that:</i> cells, <u>genetically identical</u> / have same DNA ; so both (daughter) cells receive a full, copy / complement ;	2	ACCEPT in context of identical to each other or identical to parent ACCEPT 'same genetic information/material' ACCEPT same / correct amount of DNA ACCEPT same / correct number of chromosomes IGNORE ref to clones unqualified IGNORE 'new cells need genetic material' without ref to full amount daughter cells have all the identical genetic material = 2 marks (mp 1 and 2)
(b)	1 one maternal and one paternal / AW ; 2 carry same <u>genes</u> ; 3 carry, same / different, alleles ; 4 (usually) same / similar, length ; 5 centromere in same position ; 6 same banding pattern ; 7 pair up in meiosis / form bivalent ;	3 max	CREDIT 'same loci' IGNORE 'genetic material', 'genetically identical' 'genetic information' ACCEPT 'same shape' 'same size' IGNORE 'same pattern'
(c)	(i) a, group / collection, of cells ; (cells) specialised / AW ; to perform a function(s) / working together ;	2 max	IGNORE 'same' or 'different' cells ACCEPT same job

4	(b)	(ii)	<p>three chromosomes, one from each pair ;</p> <p>chromosomes drawn as one bar ;</p>	<p>Chromosomes should be of different lengths however if two are of similar length, look for different centromere position to award mark</p> <p>ACCEPT</p>  <p>DO NOT CREDIT two joined together at centromere</p> 
		Total	2	7

Question	Expected Answers	Marks	Additional Guidance
3 (a) (i)	<p>1 at low temperatures, all stain is in cells OR no stain in surrounding solution ;</p> <p>2 (taken up / held) against, diffusion / concentration, gradient ;</p> <p>3 at high temperature stain not held in cells ;</p> <p>4 at high temperature enzymes denatured so no ATP for active transport (of stain) ;</p> <p>5 use of correct comparative figs to illustrate a point ; AVP ; ;</p>	max 2	<p><i>MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.</i></p> <p>ACCEPT the stain is not evenly distributed between cells and solution</p> <p>ACCEPT stain doesn't move out of cells</p> <p>ACCEPT up the diffusion gradient</p> <p>ACCEPT solution now contains stain</p> <p>ACCEPT 0% = none / no cells (stained)</p> <p><i>MP 1 and 3 - must be stated rather than inferred from quoted figs</i></p> <p>IGNORE 'enzymes denatured' alone</p> <p>CREDIT active transport / carrier, proteins denatured</p> <p>ACCEPT mitochondria stopped working so no ATP produced</p> <p>e.g. 97% at 30°C but 0% at 80°C</p> <p>IGNORE figs without units</p>

Question		Expected Answers	Marks	Additional Guidance
3	(a) (ii)	cells, dead / not respiring ; no, (metabolic) energy / ATP, to take up stain ; AVP ;	max 1	DO NOT CREDIT 'burst' as these cannot be seen ACCEPT inhibitor present / membrane impermeable ACCEPT no functioning mitochondria
3	(b) (i)	(membrane) structure disrupted ; (phospho)lipid bilayer, melts / more fluid ; (membrane) proteins / carrier molecules, denatured / unable to function ; (membrane) becomes more permeable ;	max 1	<i>Mark first suggestion and if correct award mark – if further answers contradict first answer do not award mark.</i> ACCEPT damaged, destroyed, break down IGNORE membrane, denatured / more fluid IGNORE lipid molecules melt ACCEPT lose shape for denatured ACCEPT leaky IGNORE refs to bonds breaking

Question	Expected Answers	Marks	Additional Guidance
3 (b) (ii)	membrane <u>permeable</u> (to stain) ; methylene blue, leaked out of cells / released to solution ; by diffusion / down concentration gradient ;	max 2	IGNORE leaky ACCEPT stain / blue / pigment, moved out IGNORE lost colour / colour moved out (it is in stem of question) ACCEPT by active transport (assuming thermostable enzymes) blue / stain, diffuses out = 2 marks
3 (c)	accuracy take readings at intermediate temperatures (between 50 °C – 70 °C) ; reliability take more, readings at each temperature / repetitions ;	2	Mark first suggestion only DO NOT CREDIT wider temperature range OR more temperatures unqualified OR more regular intervals ACCEPT take readings every 5 degrees / °C ACCEPT ref. to haemocytometer ACCEPT colorimeter used to measure colour intensity of blue solution DO NOT CREDIT ref to use of calorimeter ACCEPT repeat experiment (ideally 3 readings for each temperature) , increase the number of cells observed ACCEPT replica / replicate for repeat

