Question Number	Answer	Additional guidance	Mark
1(a)	Any two linked pairs from: • a single/thin layer (of cells) needs to be used (1) • so light passes through (the cells) (1) OR • use a stain/named stain(1) • to stain structures/see parts of the cell (1) OR • adjust focus of microscope (1) • to see cells/structures clearly (1) OR • select a higher power lens (1) • to increase magnification (1) OR • change light intensity/adjust mirror (1) • to see cells/structures clearly (1)	accept dye (1) accept to make cells/structures more visible (1) ignore zoom in/out accept clearer image/greater resolution accept increase magnification(1) accept to see cells/ structures clearly (1)	**(4)** AO 3 3b

Question Number	Answer	Mark
1(b) (i)	C meristem **1. The only correct answer is C** ***A*** *is not correct because a chloroplast does not have rapidly dividing cells* ***B*** *is not correct because epithelium does not have rapidly dividing cells* ***D*** *is not correct because a vacuole does not have rapidly dividing cells*	**(1)** AO 1 1

Question Number	Answer	Mark
1(b) (ii)	B metaphase **1. The only correct answer is B** ***A*** *is not correct because the stage of mitosis shown in cell R is not prophase* ***C*** *is not correct because the stage of mitosis shown in cell R is not anaphase* ***D*** *is not correct because the stage of mitosis shown in cell R is not telophase*	**(1)** AO 3 2a

Question Number	Answer	Additional guidance	Mark
1(b) (iii)	• same genes/ DNA/ chromosomes/ alleles (1) • diploid (1)	accept they are (genetically) identical accept 2n/ same number of chromosomes	**(2)** AO 1 1

Question Number	Answer	Acceptable answers	Mark
2(a)	**A** differentiate into any type of cell		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	Any **two** structures from the list with at least **one** matched adaptation: Structures (maximum of 2) • biconcave shape (1) • no nucleus (1) • thin membrane (1) • flexible / small (1) • contains haemoglobin (1) (matched) adaptation (maximum of 2) • large surface area / increase oxygen uptake (1) • to increase amount of haemoglobin / oxygen-carrying capacity (1) • so short distance for diffusion (1) • to get through capillaries (1) • to bind oxygen (1)		**(3)**

Question Number	Answer	Acceptable answers	Mark
2(c)	A description including **two** of the following points • clotting / to seal a wound / scab formed (1) • stop bleeding (1) • prevent infection / entry of microbes (1) • fibrin (1)		**(2)**

Question Number		Indicative Content	Mark
QWC	**1(d)**	A comparison between mitosis and meiosis including **Mitosis** • (genetically) identical cells produced • two daughter cells • one division • diploid daughter cells • identical set of chromosomes • occurs in the formation of body cells • for growth and repair (of body tissues) **Meiosis** • (genetically) non-identical cells • four daughter cells • 2 divisions • haploid daughter cells • half the number of chromosomes • occurs in the formation of gametes • for sexual reproduction • results in genetic variation	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description including two points on either meiosis or mitosis there maybe confusion between the two but this does not negate the level • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description including one comparison of meiosis and mitosis or a detailed description of either mitosis or meiosis • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed comparison of both meiosis and mitosis – at least two correct comparisons made • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	0.5 / 0.5 picogram	Accept: 0.5 picograms accept: the same (mass) as the sperm cell	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	**C** haploid		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	thymine with adenine, cytosine with guanine		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iv)	weak hydrogen bonds / hydrogen bonds / hydrogen (1)	H (bond)	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	A description including **three** of the following points: • cell divides / cell division / cell splits(1) • two cells produced (1) • (both) diploid (1) • (both) cells are genetically identical (1)	credit correct reference to stages of mitosis: DNA replication / chromosomes duplicate (1) Chromosomes line up along the equator / middle of the cell (1) chromosomes pulled to either end of cell (1) cytokinesis / cytoplasm splits (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A description including **three** of the following points: • ref (to many) cell divisions / eq (1) • growth (1) • ref to differentiation / specialisation (1) • ref to stem cells (1)	 accept: gets bigger / larger accept: become specific cells	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	Correct substitution i.e. (-0.5 ÷ 10.3) x 100 (1) - 4.85 / - 4.9	Accept data correctly put into other acceptable methods. Accept answer with more decimal places eg: - 4.8543 / - 4.854368932 Full marks for correct bald answer award max of one mark if negative is not written eg 4.85 / 4.9	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	better / easier / more valid comparison can be made between values /can make more valid conclusion / because the original / starting masses of potato were not the same / Idea of easier to visualise the size of the change	Ignore makes the results / test reliable / accurate	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)	A description including the following: • Produce two (daughter) cells • which are **genetically** identical • and diploid	Accept DNA for chromosomes throughout Also credit details of the process of mitosis chromosomes replicates (1) spindle fibres form / chromosomes attached to spindle (1) Chromosomes arranged on equator / middle of cell / chromosomes pulled apart /pulled to poles /separation of sets of chromosomes (1) Idea of nucleus reforming / New cell wall formed (to divide cell) / cytokinesis / description of cytokinesis (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	***3(c)**	A explanation to include some of the following points • active transport requires energy • (active transport moves mineral ions) from the soil • into root (hair cells) • reference to pumps (in the cell membranes) • from a low concentration to a high concentration/against their concentration gradient • reference to mineral ions / mineral salts accept named minerals eg nitrates • diffusion is a passive process • gases diffuse from high to low concentration/down their concentration gradient • gas exchange in the leaf occurs by diffusion • carbon dioxide diffuses in • to air spaces in leaves / into cells • for photosynthesis / produces glucose • oxygen diffuses in • for respiration	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation that gives information about active transport **OR** diffusion in the correct context e.g. minerals ions are transported into root (hair cells) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation that gives details of active transport or diffusion transporting materials e.g. carbon dioxide diffuses into leaves down their concentration gradient OR a limited explanation of both active transport and diffusion • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation that describes **both** processes e.g. active transport requires energy to transport mineral ions into the root hair cell AND carbon dioxide diffuses into the leaf for photosynthesis • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 3 = 12 marks)