Mark scheme – Supplying the Cell (H)

Question			Answer/Indicative content	Marks	Guidance
1			A ✓	1 (AO2.1)	
			Total	**1**	
2			C ✓	1 (AO2.1)	
			Total	**1**	
3			B ✓	1 (AO1.1)	
			Total	**1**	
4			B ✓	1 (AO1.1)	
			Total	**1**	
5			C	1 (AO 2.2)	**Examiner's Comments** This is an AO2.2 question testing the ability to apply knowledge of osmosis to changes in volume, and was well answered by many candidates. Candidates clearly understood there would be no change in volume if put in the same sucrose concentration.
			Total	**1**	
6			D ✓	**1 (AO 1.2)**	
			Total	**1**	
7			B ✓	**1 (AO 1.1)**	
			Total	**1**	
8		i	no chloroplasts / no chlorophyll / no leaves ✓ they cannot photosynthesise ✓	2 (AO 2 x 2.1)	**DO NOT ALLOW** chlorophyll removed by alcohol no chlorophyll/chloroplasts/leaves to allow photosynthesis = 2 marks **Examiner's Comments** There were many good answers seen here, with candidates linking the inability to photosynthesise to the absence of leaves or chlorophyll.

		ii	**Any two from:** include a thermostat ✓ keep the temperature constant/at optimum ✓ control the humidity ✓ circulate air inside the cabinet / keep well ventilated / give a supply of carbon dioxide ✓	2 (AO 3.3a)	**IGNORE** include insulation **ALLOW** increase humidity/water vapour **IGNORE** water the plants **ALLOW** give a supply of oxygen **Examiner's Comments** A common improvement was suggesting the provision of extra carbon dioxide, but a number of candidates concentrated on the heating or lighting rather than exploring 'further improvements'.
			Total	**4**	
9	a	i	suitable best-fit curve ✓	1 (AO 2.2)	**DO NOT ALLOW** obvious double lines or lines drawn with ruler **Examiner's Comments** The ability of candidates to draw a best fit curve seems to be improving and less double lines or sketched lines were seen.
		ii	answer should match where curve of best fit crosses X axis on candidates own line of best fit	1 (AO 3.2a)	**ALLOW** +- half a small square ie +- 0.02 from intercept on candidates graph **Examiner's Comments** Some candidates had difficulties with the scale, but most could read off the intercept.
		iii	0.6 (mol/dm^3) ✓	1 (AO 2.2)	
	b		meristem ✓	2 (AO 1.1)	**ALLOW** cambium **Examiner's Comments** Although some of the spellings varied, a number of candidates correctly identified meristems.
			Total	**4**	
10			embryonic stem cells are able to differentiate into any cell / totipotent / adult stem cells are limited / pluripotent ✓ **therefore insulin producing cells** are	2 (AO 1.1) (AO 2.1)	**IGNORE** adult stem cells are already specialised **ALLOW** difficult to locate adult stem cells **IGNORE** embryonic stem cells can repair all parts

			easier to develop from embryonic stem cells/adult stem cells are not ✓		**Examiner's Comments** The majority of candidates correctly explained the totipotent nature of embryonic stem cells but few candidates went on to explain the consequences of this in replacing pancreatic cells. Exemplar 6 shows an example of a common answer that only scores the first marking point. **Exemplar 6** embryonic stem cells can specialise to become any type of cell whereas adult stem cells can only specialise to become a cell from their own tissue [2]
			Total	**2**	
11			iodine (molecules) moved into bag / through membrane ✓ starch (molecules) cannot move through membrane / out of the bag ✓ starch molecule are large / iodine molecule are small / starch molecules larger than iodine / ORA ✓	3 (AO 2 x 3.2a) (AO 2.1)	**ALLOW** iodine moved into starch solution **DO NOT ALLOW** iodine moved by osmosis through membrane **ALLOW** starch cannot diffuse through membrane **DO NOT ALLOW** starch cannot move by osmosis through membrane **ALLOW** iodine smaller than pores in membrane/ORA✓ **Examiner's Comments** Many of the candidates understood that the iodine molecules must have entered the bag. However, some of them put this down to osmosis rather than diffusion and therefore lost this mark. Few candidates commented on the fact that starch molecules could not leave the bag and did not explain this in terms of the size of the molecules.
			Total	**3**	
12		i	stem cells are not differentiated/can still specialise ✓ they could become rod cells ✓	**1 (AO 1.2)** **1 (AO 2.1)**	**ALLOW** stem cells are unspecialised / can grow into any type of cell / have ability to differentiate **Examiner's Comments** Most candidates were able to describe what a stem cell is assessing AO1.1, and many had the AO2.1 idea that they could become rod cells. Some missed the AO2.1 mark by referring to damaged or mutated cells, instead of the rod cells.
		ii	idea it would not be detected as foreign cells (by the immune system/WBC) ✓ **OR**	**1 (AO2.2)**	

			idea it would not be rejected (by the body) ✓		**ALLOW** accepted (by the body) / (body) more likely to accept **Examiner's Comments** This AO2 question was generally answered well. Lower ability candidates stated that stem cells from another person "wouldn't work". Marks are scored more frequently when candidates avoid general terms, and responses are specific to the question asked.
			Total	**3**	
13		i	(skin stem cell) differentiates into (motor) neurone ✓	**1 (AO 2.2)**	**ALLOW** differentiates into MN (taken from abbreviation of motor neurone disease to MND in stem of question) **Examiner's Comments** This question was referring to the ability of stem cells to be able to produce nerve cells that could be used to measure the speed of impulses. Most candidates did not refer to nerve cells in their answers. This is shown in exemplar 6, which gained 1 mark. **Exemplar 6** Stem cells are undifferentiated [1]
		ii	cerebru ✓ idea that area of brain controlling motor function / movement / conscious activities ✓	**2 (AO 1.1) (AO 2.1)**	**ALLOW** cerebral cortex / motor cortex **IGNORE** it is the area that coordinates reactions. **DO NOT ALLOW** a list of correct functions of the cerebrum without the importance of movement being highlighted **Examiner's Comments** The region labelled Y was correctly identified by many candidates, although there was some confusion with the cerebellum. The explanation did not always gain marks, as many candidates simply listed all the functions of the cerebrum.
		iii	**Any two from:** difficult to access brain (due to skull) ✓ large number of neurones / large number of nerve impulses in the brain/ difficult to follow a single neurone ✓	**1 (AO 2 × 2.2)**	**IGNORE** difficult to take measurements in brain unless qualified **Examiner's Comments** There were many correct references to the difficulty of

			ethical issues of researching on brain / risk of damage ✓		access to the brain and the risk of damage. Some candidates incorrectly referred to differences in conduction velocities in the two types of cell.
			Total	**5**	
14		i	photosynthesis makes sugars in guard cells ✓ epidermal cells (dont photosynthesise so) lower in sugar than guard cell ✓ **and any two from:** epidermal cells higher osmotic / water potential than guard cells ✓ ORA water enters guard cells (by osmosis) ✓ ORA increasing turgidity of guard cell opens stomata ✓ ORA due to thicker inner cell wall ✓ opening / size of stoma affects transpiration rate ✓	**4 (AO 2 × 1.1) (AO 2 × 2.1)**	**ALLOW** correct description of transpiration linked to the size of stoma **<u>Examiner's Comments</u>** Candidates found this question one of the most challenging on the paper. Few candidates demonstrated a good knowledge of the mechanism of stomatal opening. Many candidates seemed to reverse the question and tried to explain how the rate of transpiration controlled photosynthesis in guard cells.
		ii	they have differentiated ✓ have a **specific** job to do (in the leaf/plant) ✓	**2 (AO 2 × 1.1)**	**ALLOW** they have adapted (to their function) **ALLOW** no other cells do the same job **ALLOW** they can open / close stomata they have adapted to a **specific** job / they are adapted to open and close stomata = 2 marks **<u>Examiner's Comments</u>** There were some good answers focussing on the structural differentiation of guard cells and the fact that they have a specific role.
			Total	**6**	