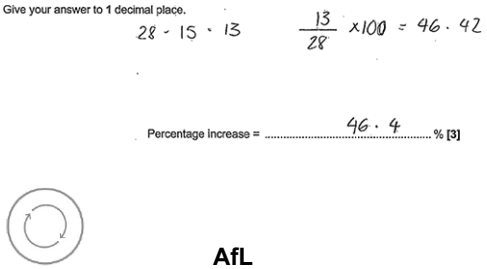
Mark scheme – Supplying the Cell (F)

Question			Answer/Indicative content	Marks	Guidance
1			A ✓	1 (AO1.1)	
			Total	**1**	
2			D ✓	1 (AO1.1)	
			Total	**1**	
3			C ✓	1 (AO1.1)	
			Total	**1**	
4			D	1 (AO 1.1)	
			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			A	1 (AO 1.1)	
			Total	**1**	
7			A	1 (AO 1.1)	**Examiner's Comments** **AfL** There were occasionally some candidates who had 'No Response' answers which could be easily overcome through developing examination technique. Candidates should also be discouraged from choosing numbers from the set of alternatives and entering this in their answer box, rather than the letter of the alternative they think is correct.

			Total	**1**	
8			B	1 (AO 1.1)	**Examiner's Comments** This is an AO1.1 question testing recall of transport in and out of cells. In general, candidates chose either A or B. Only candidates who performed well overall chose the correct answer B.
			Total	**1**	
9			C ✓	**1 (AO 1.1)**	
			Total	**1**	
10			C ✓	**1 (AO1.1)**	
			Total	**1**	
11			D ✓	**1** (**AO** 1.2)	**Examiner's Comments** Very few candidates were aware of the reasons for active transport on this recall question. Many opted for 'A'. Others that had more of an awareness that concentration was involved chose the high concentrations, clearly unsure about the reason why active transport is needed.
			Total	**1**	
12			B ✓	**1** (**AO** 2.1)	
			Total	**1**	
13			C ✓	**1** (**AO** 2.1)	
			Total	**1**	
14			mitosis ✓	1 (AO1.1)	
			Total	**1**	
15			plants receive less light (for photosynthesis) / salt water/concentration affects osmosis / water is drawn out of the plants ✓	1 (AO 2.1)	**Examiner's Comments** Candidates found this question one of the most challenging on the paper. Few candidates could apply their knowledge of salt water on osmosis in plant cells or light on photosynthesis. Exemplar 1 demonstrates a common response which did not score. **Exemplar 1**

					Suggest **one** reason why salt marshes are difficult places for plants to grow. When the ~~water~~ tide comes in, the plants would be submerged in water and may drown. [1]
			Total	**1**	
16			**Any three from:** mitosis ✓ DNA replicates ✓ chromosomes separate ✓ cells divide into two new cells ✓ cells grow ✓	3 (AO 1.1)	**ALLOW** chromosomes are copied **ALLOW** DNA duplicates/doubles **ALLOW** (identical) daughter cells produced each with own copy of chromosomes **ALLOW** cell splits into two **Examiner's Comments** A large number of candidates found this AO1.1 question about cell division challenging and did not identify it as asking about how new cells are made, so did not make the link to cell division. Many described how the menstrual cycle was controlled by hormones and how they affected the thickness of the lining. There were some very good responses from those candidates that recognised this was about cell division but some mentioned meiosis rather than mitosis.
			Total	**3**	
17	a	i	**Any one from:** provides a fine/clean cut ✓ for more accurate/precise cutting measurement ✓	1 (AO 2.2)	**ALLOW** scalpel is sharper **ALLOW** easier to cut with scalpel **IGNORE** more hygienic **Examiner's Comments** Most candidates scored this AO2.2 mark, many correctly referring to precision or sharpness. However, several responses identified a concern about contamination with a kitchen knife and this was not appropriate in the context of the stem of the question so did not gain credit.
		ii	cut in a direction away from yourself / where possible cut using a cutting board ✓	1 (AO 2.2)	**ALLOW** place cover over scalpel if not in use **ALLOW** idea of keep fingers away from cutting/sharp edge/blade **IGNORE** safety gloves **Examiner's Comments** Again, many candidates scored this AO2.2 mark, with many correctly referring cutting away from yourself or, in some cases, keeping fingers away from the blade. However, several responses identified wanting to wear gloves, goggles etc and these were not accepted for correct responses. Some also wrote about being sensible, careful or responsible with the scalpel but not how to do that, so did not gain credit.
		iii	No roots to take up minerals/water ✓ No shoots so no photosynthesis/sugars ✓	2 (AO 2 x 2.2)	**ALLOW** (cells absorb) sugars for respiration/energy **ALLOW** to provide water/sugar/minerals/nutrients scores 1 mark if no other

					mark **Examiner's Comments**  **AfL** In this AO2.2 question the most common response was about being able to see the explants clearly or preventing contamination and very few candidates referred to the words in the question explaining there were no roots or leaves. Candidates should be encouraged to highlight, key words or phrases that might be important to consider in their responses. Most candidates who scored got the 1 mark for the allow in the guidance column of the mark scheme. It was very rare that any candidate scored 2 marks.
	b	i	warmth needed for (chemical) reactions / respiration / photosynthesis / growth ✓ light for photosynthesis / chlorophyll produced ✓	2 (AO 2 x 2.1)	**ALLOW** warmth speeds up metabolism/enzymes/mitosis/reproduction **IGNORE** bacteria **ALLOW** light/sunlight so plant can make sugar **IGNORE** Sun **Examiner's Comments** This AO2.1 question mainly gained marks from candidates who referred to warm conditions speeding up growth. Few mentioned light, and even fewer were able to link the light to photosynthesis.
		ii	temperature can be controlled / kept at optimum temperature ✓ idea that light can be provided 24 hours / continuous light source ✓	2 (AO 3.3a)	**ALLOW** keeps constant temperature**IGNORE** keep heat constant **ALLOW** idea that air movement is constant **ALLOW** may go dark at night near window / avoids night-time conditions / avoids sunlight variability AW **Examiner's Comments** Candidates were able to identify that this AO3.3a question as developing an experiment by introducing an element of control. Where candidates only scored 1 mark it was usually for the idea of controlling the light by allowing continuous light. Some candidates did not score the first marking point as they were describing controlling heat rather than temperature, which was not given.
		iii	leaf cells / cells producing stems / chlorophyll being produced ✓	2 (AO 3.2a)	ALLOW explants are making chloroplasts / able to photosynthesise **Examiner's Comments** This AO3 question proved quite challenging but candidates who did gain credit usually gained the mark for recognition of photosynthesis, with fewer identifying that chlorophyll would be present. There were a significant number of candidates who wrote about growth of mould.
	c		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 86.7 (%)**	3	

			award 3 marks 13 ÷ 15 ✓ = 86.666666... (%) ✓ = 86.7 (%) (1 decimal place) ✓	(AO 2 x 2.2) (AO 1.2)	**ALLOW** 86.6 (recurring) **ALLOW** ECF for % calculation if incorrect substitution of values from question **ALLOW** ECF for answer given to 1 decimal place **Examiner's Comments** This question covering AO1.2 and AO2.2 was challenging. Some common errors included not using a calculator but rather using an estimation method leading to inaccurate responses and also not working out the change in mass. A significant number of those who correctly completed the calculation did not round it correctly, giving 86.6 as their answer or commonly 86.6 recurring. **Exemplar 1**  **AfL** In this exemplar, ECF was applied to the percentage calculation with incorrect value (though numbers are linked to the question), then correct rounding was done by the candidate. This highlights how important it is for candidates to show their working out as the candidate would not have scored any marks if all they had put was 46.4 on the answer line, as it would not have been possible to apply ECF.
	d		plant/cauliflower cells can differentiate into any cell/become specialised (and make a new individual) ✓ the type of cell adult stem cells can differentiate into is limited / adult stem cells are difficult to obtain ✓	2 (AO 2.1)	**If not specified assume answer refers to adult animals** **ALLOW** embryonic cells can differentiate into any cell and make a new individual **ALLOW** adult animals no longer have embryonic (stem) cells **ALLOW** animals cells cannot differentiate into any cell **ALLOW** higher level answers relating to cloning techniques e.g. animal cells with no cell wall so osmotic medium needs balancing precisely to avoid cells bursting **Examiner's Comments** This AO2.1 question found candidates having considerable difficulty in applying their knowledge and understanding of stem cells. Most concentrated on the idea of animals being larger or more developed or advanced than cauliflowers. Others discussed ethics and only higher ability candidates were writing about differences in ability to differentiate in their responses.
			Total	**14**	

18		i	idea that stem cells are not differentiated / can still specialised✓ they can replace damaged cells / develop into/change/divide/become retina cells ✓	**2 (AO 1.2)**	ALLOW stem cells are unspecialised / can differentiate/grow into any (type of) cell **ALLOW** can differentiate/specialise into retina cells = 2 marks **IGNORE** can repair retina **Examiner's Comments** There were some good examples demonstrating their knowledge and understanding of stem cells in this answer. Most common non-credited answers were just repeating the question that they can repair the retina but not describing how. Exemplar 6 gained full marks. **Exemplar 6** Why might stem cells be able to repair the retina? stem cells are undifferentiated cells, meaning they can be modified to do anything. So scientists are able to modify stem cells to replace the faulty cells in the retina. [2]
		ii	any two from: to see if it works ✓ make sure it is safe / identify side effects✓ to find the correct dosage✓	**2 (AO 1.2)**	**ALLOW** see results **ALLOW** could go wrong / unknown effect **IGNORE** can't test on humans **Examiner's Comments** The vast majority of candidates scored at least 1 mark here for side effects / make sure it is safe. The least scored marking point was to find the correct dosage.
			Total	**4**	
19		i	any higher and the bacteria might be killed / bacterial enzymes denatured (1)	1	**allow** optimum temperature for the bacteria / bacterial enzymes
		i	any lower and the erythromycin would diffuse slower / bacteria would reproduce more slowly so takes longer to get the results (1)	1	**allow** spread out slower
		ii	prevent contamination by other microbes (1)	1	**not** germs / bugs
			Total	**3**	

20	a		absorbed water (1)	1	**allow** (movement) from higher to lower water potential / from higher to low water concentration
			higher water potential / water concentration outside ora (1)	1	
	b		(potato has) same water potential / water concentration (as solution) (1)	1	
			no (net) water loss or gain (1)	1	
	c	i	–10 (%) (2) but 10 (%) (1)	2	
		ii	can still compare even if original sizes are different (1)	1	
	d	i	ignores changes to width (1)	1	
		ii	measure (changes to) volume / mass (1)	1	
			Total	**9**	
21			B	1	
			Total	**1**	
22			all genetically identical / all have the same genes (1)	1	all clones (1)
			Total	**1**	
23		i	6:1	1	
		ii	7.6×10^{-3} 3.0×10^{-3} 1.5×10^{-3} correct calculation of 1 / time (1)	1	
		ii	answer in standard form (1)	1	
		iii	Comment on the rate of colour change / smaller block changed faster (1)	1	**ORA**
		iii	Diffusion alone is sufficient in smaller organisms / smaller organisms have a larger	1	

			surface area to volume ratio / diffusion alone may not be effective in multi cellular organisms (may require circulatory system) (1)		
			Total	**5**	
24	a		osmosis (1)	1	
	b		absorbed water (1)	1	**allow** (movement) from higher to lower water potential / from higher to low water concentration
			Higher water potential / water concentration outside ORA (1)	1	
	c		(potato has) same water potential / water concentration (as solution) (1)	1	
			no (net) water loss or gain (1)	1	
			Total	**5**	