COMPONENT 1 - Concepts in Biology

HIGHER TIER

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Larger lumen/diameter (1) Thinner walls (1) Less muscle (1)	3			3		
	(b)	(i)		Thin walls / pores or gaps between cells / one cell thick	1			1		
		(ii)		Always greater concentration in the blood (than tissue fluid) (1) To allow for diffusion to take place (1)	2			2		
	(c)	(i)		Any **two (×1)** from: • Oxygen • Named nutrient / glucose / amino acids • Hormone / named hormone	2			2		
		(ii)		Any **two (×1)** from: • Carbon dioxide • Urea • Hormone/ named hormone • Water	2			2		
				Question 1 total	**10**	**0**	**0**	**10**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		1	1			1		
		(ii)		Xylem correctly labelled (area above phloem)	1			1		
		(iii)		Arrow tail starting in xylem passes through spongy mesophyll space and out through a stoma Allow arrow to show symplastic as well as apoplastic transport		1		1		
	(b)			Water molecules move faster (have more energy) (1) more rapid loss of water/higher transpiration rate (1)	2			2		
				Question 2 total	**4**	**1**	**0**	**5**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Withdrawal	1			1		
	(b)			Sensory neuron from receptor in skin (1) To coordinator / spinal cord / relay neuron (1) To motor neuron to the effector in the arm (1)		3		3		
	(c)	(i)		$\frac{(0.22+0.27+0.23+0.23+0.27+0.22+0.25+0.24)}{8} = 0.241$ [s]		1		1	1	
		(ii)		She is correct (marks are awarded for reasoning) Measurements were to 2 decimal places therefore mean should be to 2 decimal places (1) The first three readings gave a mean of 0.24 (1) Additional readings did not improve this value (1)			3	3	2	
				Question 3 total	**1**	**4**	**3**	**8**	**3**	**0**

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>4</td><td>(a)</td><td>(i)</td><td></td><td>DD and dd – both required for mark</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>I</td><td>F1
<table><tr><td>Gametes</td><td>D</td><td>D</td></tr><tr><td>d</td><td>Dd</td><td>Dd</td></tr><tr><td>d</td><td>Dd</td><td>Dd</td></tr></table>All 4 gametes correct (1)
[allow ecf from (i)]
Mechanics of cross correct (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
</table>

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<tr><td></td><td></td><td></td><td>II</td><td>F2
<table><tr><td>Gametes</td><td>D</td><td>d</td></tr><tr><td>D</td><td>DD</td><td>Dd</td></tr><tr><td>d</td><td>Dd</td><td>dd</td></tr></table>All 4 gametes correct (1)
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Mechanics of cross correct (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>III</td><td>3 Purple flowered : 1 White flowered
(answer must include phenotype to gain mark)</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>3.147:1 / 3.15:1 / 3.2:1</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Any two (×1) from:
• Because when sown not all the seeds germinated/grew
• Not all the seeds grew after fertilisation
• Fertilisation is random
• Due to chance</td><td></td><td></td><td>2</td><td>2</td><td></td><td></td></tr>
</table>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			(i) homozygous dominant × homozygous dominant (ii) heterozygous × heterozygous (iii) homozygous dominant × recessive (iv) recessive × recessive (v) homozygous dominant × heterozygous All 3 correct = 2 marks 2 correct = 1 mark		2		2		
				Question 4 total	**0**	**9**	**2**	**11**	**1**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			A comparison is needed in each of the following 3 pairs of answers below before a mark is awarded - Mitosis produces 2 daughter cells **and** meiosis produces 4 daughter cells (1) Mitosis retains chromosome number of parent cell **and** meiosis halves chromosome number (1) In mitosis daughter cells are genetically identical **and** in meiosis daughter cells are genetically different (1)	3			3		
	(b)	(i)		Changes in cells lead to uncontrolled growth and division	1			1		
		(ii)		Cells that have not lost the ability to differentiate (into different types of cells)	1			1		
		(iii)		Own-donor stem cells have no ethical issues because the donor receives his/her own cells back (1) The major ethical issue surrounding the use of embryonic stem cells is the **destruction** of a potential life (1) Some people consider the use of cord stem cells to raise an ethical issue because of the introduction of DNA from another person/many people do not consider the use of cord stem cells to raise an ethical issue because it does not involve the destruction of life (1)			3	3		
				Question 5 total	**5**	**0**	**3**	**8**	**0**	**0**

Question				Marking details	Marks Available					
					AO	AO2	AO3	Total	Maths	Prac
6	(a)			During osmosis water moves from where it is high concentration to where it is lower concentration (1) The chips in the water have a higher concentration of water outside than in the cells therefore water moves into the potato increasing the length (1) The chips in the 10% sugar solution have a greater concentration of water in the cells than in the solution therefore water moves out of the potato decreasing their length (1) Osmosis can only take place through a selectively permeable membrane. The cell membrane and cytoplasm of the cell act as a SPM (1)	1 1	 1 1		4		
	(b)			The concentration of water inside the cell is the same as the concentration outside/ reference to isotonicity (1) Therefore there is no net movement of water / rate of movement into potato = rate of movement out so length does not change (1)	2			2		2
	(c)			Cell membrane broken down therefore osmosis does not occur		1		1		
	(d)			Absorption of water by roots/ turgidity/water transport	1			1		
	(e)	(i)		Ends: 4 + 4 **and** Sides:10 + 10 + 10 + 10 (1) 48 cm^2 (1)		2		2	2	
		(ii)		Smaller chip has the larger surface area : volume ratio and so more water can be absorbed in a given time			1	1		2
	(f)	(i)		Higher concentration inside the root hair cell than outside therefore ions have been absorbed against a concentration gradient			1	1		
		(ii)		active transport requires a supply of ATP		1		1		
				Question 6 total	**5**	**6**	**2**	**13**	**2**	**4**

<table>
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<tr><td>7</td><td>(a)</td><td></td><td></td><td>carbon dioxide + water ⟶ glucose + oxygen
reactants (1)
products (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>Contain chlorophyll (1)
which absorbs light needed to provide energy for photosynthesis (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td>
<table>
<tr><th>Bell jar</th><th>Expected final colour of indicator</th><th>Reason for final colour of indicator</th></tr>
<tr><td>A</td><td>yellow</td><td>No photosynthesis taking place but plant is carrying out respiration releasing carbon dioxide</td></tr>
<tr><td>B</td><td>red/ slightly yellow</td><td>Some photosynthesis taking place in shaded conditions and plant is producing carbon dioxide by respiration. Carbon dioxide taken in = carbon dioxide produced</td></tr>
<tr><td>C</td><td>purple</td><td>Rate of photosynthesis is greater than rate of respiration. Therefore more carbon dioxide taken in for photosynthesis than released by respiration</td></tr>
</table>
Each row = 2 marks
[NB Expected colour change correct but explanation incorrect = 1 mark
Colour change incorrect but explanation correct = 0 marks]
Colour change = AO3, Explanation = AO2</td><td></td><td>3</td><td>3</td><td>6</td><td></td><td>6</td></tr>
</table>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(c)	(ii)		(III) light intensity	1			1		1
		(iii)		To prevent the respiratory activity of soil organisms from interfering with the experiment		1		1		1
				Question 7 total	**5**	**4**	**3**	**12**	**0**	**8**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		A **species** whose number/ population density in a given area (1) indicates certain environmental or ecological conditions (1)	2			2		
		(ii)	I	Percentage increase = $(48-18) \times \frac{100}{48}$ (1) = 62.5% which is **greater** than 60% (1)		2		2	2	
			II	Biodiversity decreased (1) Even though number of species has stayed the same (1) Numbers of all, except mussels, have decreased (1)			3	3		
	(b)			The large number of recreational divers produce huge amounts of data (1) More data available for statistical analysis leads to greater accuracy / confidence (1)			2	2		
				Question 8 total	**2**	**2**	**5**	**9**	**2**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		All plots correct and joined (1) Axes labelled (1) Suitable scales on both x and y axes (1)		3		3	3	
		(ii)	I	As the volume of fertility drug increases so does the number of eggs released		1		1		
			II	18.5 [a.u.]		1		1	1	
	(b)			Follicle stimulating hormone (FSH) (1) Cut out gene for human FSH from human cells and insert into CHO cells (1) Using enzymes (1)	1	1 1		3		
	(c)			**Indicative content:** **AO1 allocation** - Oestrogen (produced by the ovary) causes LH to surge (from the pituitary gland). LH stimulates enzymes in the dominant follicle and along with the increased pressure causes the follicle to rupture and release the egg (ovulation). The egg travels into the fallopian tube, ready for fertilisation. The egg can survive for 12 to 24 hours after ovulation. following ovulation fertilisation can occur **AO2 allocation** -This woman has irregular LH release on the 14th and 24th days of successive months. This leads to irregular ovulation therefore fertilisation is unpredictable.	3	3		6		

				5-6 marks Detailed explanation of changes in terms of production of oestrogen causing LH release stimulating release of egg. Interprets data from successive months clearly explaining LH release is irregular leading to irregular ovulation making fertilisation unpredictable. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The information included in the response is relevant to the argument.* **3-4 marks** Explanation in terms of oestrogen causing LH to surge, LH release stimulating release of egg. Recognises LH release is irregular for this woman leading to irregular ovulation which makes fertilisation unpredictable. *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.* **1-2 marks** Recognises that LH peaks each month and this is connected to ovulation. LH release is irregular in this woman. *There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure*. *There may be significant errors or the inclusion of information not relevant to the argument.* **0 marks**: *No attempt made or no response worthy of credit.*						
				Question 8 total	**4**	**10**	**0**	**14**	**4**	**0**

COMPONENT 1 - Concepts in Biology

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	**10**	**0**	**0**	**10**	**0**	**0**
2	**4**	**1**	**0**	**5**	**0**	**0**
3	**1**	**4**	**3**	**8**	**3**	**0**
4	**0**	**9**	**2**	**11**	**1**	**0**
5	**5**	**0**	**3**	**8**	**0**	**0**
6	**5**	**6**	**2**	**13**	**2**	**4**
7	**5**	**4**	**3**	**12**	**0**	**8**
8	**2**	**2**	**5**	**9**	**2**	**0**
9	**4**	**10**	**0**	**14**	**4**	**0**
TOTAL	**36**	**36**	**18**	**90**	**12**	**12**