OXFORD**AQA**
INTERNATIONAL QUALIFICATIONS

INTERNATIONAL A-LEVEL
BIOLOGY (9610)
BL05
Unit 5 Synoptic paper

Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.
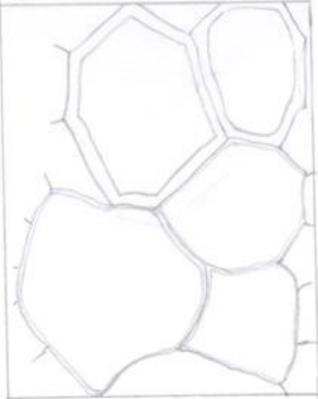
It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from oxfordaqa.com

Question	Marking guidance	Mark	Comments
01.1	1. 5 cells drawn with correct shapes and wall thicknesses + connections to adjacent cells; 2. Smooth lines; 3. To fit **Figure 2** as those in **Figure 1** fit;	3	2. Not sketchy

Question	Marking guidance	Mark	Comments
01.2	1. $$\dfrac{\text{Length on drawing} \times 500}{\text{Corresponding length on } \textbf{Figure 1}};$$ 2. Correct answer from 1. – eg 1062.5; 3. To 3 sig. figs. – eg 1060;	3	eg $$\dfrac{68 \times 500}{32} \quad \textbf{OR} \quad \dfrac{53 \times 500}{25}$$ Allow $\pm$ 1 mm of each measurement 2. Allow **2 marks** for ecf from incorrect measurements in 1 Allow **2 marks** for correct numbers but wrong order of magnitude – eg 106 / 10.6

Question	Marking guidance	Mark	Comments
01.3	1. Evaporation of water (at leaves) via stomata; 2. Lowers <u>water potential</u> in leaf (cells); 3. Reduces pressure / Ψ_p / Ψ in xylem vessels which 'pulls' water up; 4. Reference to hydrogen bonds / cohesion(-tension);	4	1. Allow loss of water vapour via stomata 3. Allow water moves from high to low Ψ or water moves from high to low pressure Ignore root pressure / capillary action

Question	Marking guidance	Mark	Comments
01.4	1. Use of (tap and) syringe to move air bubble to (near) lower end of scale; 2. Measure time for bubble to move a set distance **OR** measure distance moved in a set time; 3. Repetitions (at least 2 more) and calculation of mean; 4. Control variable(s) – eg light / temperature / humidity / (no) wind; 5. (Measure diameter of capillary and) use $\pi r^2 h$ and time to calculate rate;	5	

Question	Marking guidance	Mark	Comments
01.5	1. Not all the water entering is lost in transpiration / evaporation; 2. **Named** process that uses/produces water in the plant eg photosynthesis / hydrolysis / turgor / respiration;	2	1. Allow measures uptake, not loss, of water

Question	Marking guidance	Mark	Comments
02.1	1. (Starch kept at room temperature / step 2 and) incubate starch at stated temperature / 10 °C; 2. (A few drops amylase added / step 3 and) add measured volume of amylase; 3. (Small volume of mixture removed / step 5 and) measure volume of mixture; 4. (Tested every 2 minutes / step 6 and) test at more frequent intervals – eg every ½-minute; 5.(pH not controlled and) add buffer solution; 6. (Temperature intervals too large and) test at intermediate temperature intervals; 7. Mix / stir / shake amylase and starch solutions at step 3;	2 max	Allow correction described (as this implies the error) for each mark

Question	Marking guidance	Mark	Comments
02.2	1. Need larger scale on y–axis / scale needs to cover smaller range of values / plotted results should cover > ½ of y–axis; 2. Add units (to each axis); 3. Plot points as 'x'; 4. Not extrapolate to (0,0);	2 max	Allow use 'smaller scale' if suitably qualified – eg 1 cm to represent 0.1 unit (on y-axis) 2. Allow units are missing 3. Allow plot points as small(er) dots Allow plot line as smooth curve of best fit

Question	Marking guidance	Mark	Comments
02.3	1. Use intermediate temperatures / temperatures at smaller intervals; 2. Around 40 °C / between 20 and 60 °C / between 30 and 50 °C;	2	 2. Allow around the (apparent) optimum temperature

Question	Marking guidance	Mark	Comments
03.1	HH **and** Hh;	1	Ignore homozygous dominant and heterozygous

Question	Marking guidance	Mark	Comments
03.2	q = √0.52 = 0.7211; 2pq = 2 × 0.2789 × 0.7211 = 0.4022; 40 (%);	3	Allow symbols other than p and q Allow **1 mark** for heterozygotes = 2pq Allow **2 marks** for answer derived from q = 0.48 / 0.52 **or** from q^2 = 0.48 **or** from p = 0.48 Allow **2 marks** for 0.40 / 0.4022 Allow **1 mark** for e.g. 0.5 / 0.43 Ignore extra decimal places

Question	Marking guidance	Mark	Comments
03.3	1. Isolated population **so** high probability of marrying / mating with someone with the **H** allele; 2. Late onset so reproduce / have children before the disease is diagnosed / before selection can occur; 3. New mutations could occur;	2 max	1. Allow converse – low probability of mating with **hh** (from outsiders) 4. Allow idea of heterozygotes / presence of **H** allele may have another effect that is beneficial eg resistance to a disease; 4. Allow may be linked to another beneficial gene / allele

Question	Marking guidance	Mark	Comments
03.4	1. Fewer protons/electrons passed to ETC **OR** fewer protons enter inter-membrane space **or** fewer protons pass through ATP-synthase **OR** reduced proton gradient established **OR** less energy released from the transfer of electrons; 2. Less ATP made (for metabolic reactions);	2	1. Allow no protons/electrons passed to ETC Allow no protons enter inter-membrane space Allow no protons pass through ATP-synthase Allow no proton gradient established Allow no energy released from the transfer of electrons 2. Allow no ATP made (for metabolic reactions)

Question	Marking guidance	Mark	Comments
04.1	**W** = rod <u>and</u> **Z** = cone;	1	Both required for **one mark**

Question	Marking guidance	Mark	Comments

04.2	1. Several **W** connected to same ganglion cell / same bipolar neurone / same neurone;
	
	2. Stimulation of each individual cell is sub-threshold / is insufficient
	
	  or cells together cause above-threshold stimulation of bipolar cell / of ganglion cell / of neurone
	
	  or summation / described;
	
	3. Each cell **W** cannot produce depolarisation / an action potential / impulse on its own
	
	  or need several cells **W** to produce depolarisation / an action potential / impulse
		3	1. Allow 'show retinal convergence'
			    Ignore rhodopsin sensitivity
			
			2. Reject temporal summation

Question	Marking guidance	Mark	Comments
04.3	1. (Each receptor cell has) separate neurone to brain / separate bipolar neurone / separate ganglion cell; 2. Impulses from each receptor kept separate / no retinal convergence;	2	

Question	Marking guidance	Mark	Comments
04.4	1. <u>Three</u> types of **Z** / cones (each with a different type of pigment);	3	1. Allow three types of iodopsin
	2. Each type (of cell/pigment) sensitive to a different (range of) wavelength of light;		2. Allow detect / absorb / respond to for sensitive 2. Allow different colours of light Ignore incorrect name of colour
	3. Variable degree of stimulation of each type by different wavelengths / colours of light (produces colour vision);		3. Allow different percentage stimulation of each type by different wavelengths / colours of light (produces colour vision);

Question	Marking guidance	Mark	Comments
05.1	1. (Provide enough energy) to break H-bonds; 2. To produce two separate strands of DNA;	2	 2. Allow to denature the DNA Allow so probes can bind

Question	Marking guidance	Mark	Comments
05.2	1. Allows the probe to bind to / form H-bonds with the fetal DNA; 2. To reduce / prevent fetal DNA strands annealing together;	2	

Question	Marking guidance	Mark	Comments
05.3	1. Different alleles / normal and CF alleles / different probes have different base <u>sequences</u>/specific base <u>sequences</u>; 2. Probe binds by complementary base pairing / described – eg A to T / G to C;	2	 2. Allow probe is complementary

Question	Marking guidance	Mark	Comments
05.4	To enable detection of the (different) allele(s) / described;	1	Allow to detect if **N** / CFTR or **n** / CF Ignore reference to 'gene'

Question	Marking guidance	Mark	Comments
05.5	**P** = nn **and R** = NN; **Q** = Nn;	2	No marks if same genotype given more than once

Question	Marking guidance	Mark	Comments
05.6	1. To give valid results / to show 'real' effect of treatment; 2. So patients not treated preferentially / so patients do not behave differently / not just psychological effect / to avoid bias;	2	1. Allow to give reliable results / to make the investigation valid 1. Ignore repeatable / reproducible / control / fair test / representative 1. Reject accurate 2. Ignore 'so not just placebo effect'

Question	Marking guidance	Mark	Comments

05.7	**Pro:**
	
	1. Improvement shown by patients given CFTR allele but not by those given placebo / speed of breathing (always) higher in those given CFTR allele than by those given placebo;
	
	2. Non-overlap of SDs at 30 days indicates there could be a significant <u>difference</u> from placebo **or** difference is not due to chance;
	
	Con:
	
	3. Improvement decreases after 30 days / at day(s) 60 (and 90);
	
	   OR
	
	   At 90 days no improvement on start value / on placebo;
	
	4. Small sample size / not repeated – **so** may not be representative / reduces validity;
	
	5. Speed of breathing out is not the only measure of lung function;
	
	6. Severity of CF may vary between volunteers **so** different degree of improvement
		4 max	For full marks, must have at least one Pro point
			
			1. Must compare treated with placebo
			
			2. **OR** (Con) No significant <u>difference</u> / <u>difference</u> due to chance at 60 / 90 days because SDs overlap at 60 / 90 days
			2. Ignore 'results' are significant / not due to chance **or** 'results' are not significant / are due to chance
			
			3. Allow improvement is short-lived / decreases with time
			
			4. Allow differences in e.g. age / sex / race – **so** not representative / reduces validity
			
			Ignore references too short time of investigation
			Ignore ethical considerations
			Ignore reference to correlation does not indicate causation
			Ignore reference to side effects

Question	Marking guidance	Mark	Comments
06.1	**Turgor / described** – 1. for support; 2. opening and closure of stomata; **Solvent** – 3. transport of ions **or** organic molecules; 4. medium for chemical reactions; **Hydrolysis** – 5. eg for breaking down (stored) organic substance / named example; 6. eg of ATP for active transport / synthesis/metabolism; **Photosynthesis** – 7. light-dependent reaction / photolysis of water; 8. production of reduced NADP / ATP; **Cooling** – 9. by evaporation / transpiration;	6 max	Allow other relevant points 3. Allow named example – eg nitrate / other named ion / glucose / sucrose / amino acids 9. Allow temperature control

Question	Marking guidance	Mark	Comments
06.2	**EITHER**: 1. Cut plant tissue (eg potato tuber) into cylinders of same length / same surface area (with a cork borer); 2. (Rinse and) blot dry; 3. Weigh **or** measure length of each cylinder; 4. Range of concentrations of sucrose / NaCl solution (at least 5) – eg 0 to 1.0 mol dm^{-3}; 5. Leave cylinders in solutions for **same** suitable time – eg 20 min to 2 days; 6. Remove cylinders, re-measure length of each **or** blot dry and re-weigh; 7. Repetitions for each concentration – at least twice more; 8. Calculate % change for each cylinder & calculate mean % change at each concentration; 9. Plot (line) graph & determine concentration giving zero change in mass/length; 10. Convert concentration of solution to water potential (use tables);	6 max	**OR**: 1. Peel epidermis layer (eg onion bulb scale leaf) 4. Range of concentrations of sucrose / NaCl solution (at least 5) – eg 0 to 1.0 mol dm^{-3} 5. Leave epidermis in solutions for **same** suitable time – eg 20 to 60 min Mount in given solution on microscope slide 6. Count turgid and plasmolysed cells in a given area 7. Repetitions for each concentration – at least twice more 8. Calculate mean % plasmolysed (or turgid) cells at each concentration 9. Plot line graph of mean % plasmolysed vs. concentration & determine concentration giving 50% plasmolysed 10. Convert concentration of solution to water potential (use tables)

Question	Marking guidance	Mark	Comments
06.3	1. Small leaves – eg spines to reduce surface area **OR** Rolled leaves – less exposure to air / lower Ψ gradient / retains humid air around stomata; ; 2. Sunken stomata – less exposure to (moving) air / retains humid air around stomata; 3. Thick waxy cuticle – waterproofing **or** prevent/reduce water loss; 4. Ridged stems – for casting shade; 5. Water storage tissue – eg swollen stems in succulent plants; 6. Extensive root systems – deep to reach water table **OR** near surface – opportunistic re: brief rainfall; 7. Reduced aerial part of plant – less surface for evaporation eg Lithops; 8. Surface hairs – protects the stomata from moving air or keeps layer of humid air next to the surface;	6 max	2. Allow fewer stomata – less surface area for evaporation **or** stomata opening at night – cooler so less evaporation 6. Allow long roots to reach water

Question	Marking guidance	Mark	Comments
06	<u>Quality of written communication</u> These are awarded for correct use of scientific terms and the ability to present a clear, logical account. They are not awarded for spelling, punctuation and grammar. <u>2 marks</u> for an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically. <u>1 mark</u> for an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically. <u>0 marks</u> for an answer in which few technical terms are used correctly or the accounts are seldom presented clearly and logically.	2	Award mark for overall performance in 06.1, 06.2 and 06.3