OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



MARK SCHEME

B1.1 CELL STRUCTURES

SCORE	PERCENTAGE
/95	%

STEMUP

These questions belong to OCR, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by OCR. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with OCR and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. OCR has not endorsed, approved or been involved in the production of it. OCR and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

OCR publishes its past papers, mark schemes and examiner reports. Always check the current specification at ocr.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Question			Answer/Indicative content	Marks	Guidance
1			D	1	
			Total	**1**	
2	a		4 1 2 5 3 all correct = 2 one out of sequence = 1	2	
	b		as a stain (1) so can see organelles (1)	1 1	 **allow** to increase contrast
	c	i	contains genes / genetic material / DNA (1)	1	
		i	controls cell (functions) (1)	1	**allow** protein synthesis
		ii	(onion cells) do not photosynthesize (1)	1	
		ii	(because) they are underground / in the dark (1)	1	
	d		0.25 (mm) (2)	2	**allow** 1.5 ÷ 6
	e		more difficult to focus (1) smaller field of view (1)	1 1	
			Total	**12**	
3		i	structure X is too big to be a virus	1	**allow** viruses cannot be seen with a light microscope
		ii	use an electron microscope (1)	1	
			Total	**2**	
4			A	1	
			Total	**1**	
5			A	1	
			Total	**1**	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
6	a		vacuole — contain chromosomes mitochondria — support nucleus — respiration	2	all three correct = 2 marks one or two correct = 1 mark

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
	b		[Level 3] Answer includes a correct description of how protein synthesis is controlled and is able to link this to the change in shape of the cap Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Answer includes a correct description of how protein synthesis is controlled or links change in shape of the cap to the movement of the nucleus Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Answer includes a correct statement about how protein synthesis is controlled. or Links change in shape of the cap to production of different proteins / presence of different genes. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted up to grade C Indicative scientific points about protein synthesis may include: • Proteins are coded for by genes / DNA • Genes / DNA are kept in the nucleus (on chromosomes) • The genes contain a sequence of bases that code for the protein Indicative scientific points about the experiment include: • The cap changes shape because the cell starts to make different proteins • The different proteins are made because the nucleus has come from the cell with the crinkled cap • Therefore the cell's DNA / genes are now coding for proteins that make the cap crinkle Use the L1, L2, L3 annotations in Scoris; do not use ticks.
			Total	8	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
7	a	i	**any two from:** has a nucleus ora (1) has mitochondria ora (1) has chloroplasts ora (1)	2	**not** cell wall **not** cytoplasm **not** cap
		ii	some genes can be lost from some cells: ✗ both aerobic and anaerobic respiration can occur: ✗ cells are able to differentiate and specialise: ✓ organisms are able to clone themselves: ✗	1	more than one answer = 0
		iii	nervous or hormone system to communicate between cells / transport or circulation or cardiovascular system to carry nutrients / oxygen / blood / CO_2 around the organism excretory or gas exchange system to exchange materials with the surroundings (1)	1	**ignore** named organs e.g. kidney / heart etc. for system **allow** explained alternative systems e.g. respiratory system / reproductive / digestive

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
	b		[Level 3] includes a correct description of protein synthesis AND describes where proteins are made AND correctly links this to the change in shape of the cap over a period of time. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] includes a correct description of protein synthesis AND describes where proteins are made OR correctly links this to the change in shape of the cap over a period of time. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] includes simple description of protein synthesis OR describes where proteins are made OR why it takes several weeks for the change in the cap. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted up to grade A* Indicative scientific points about protein synthesis at level 2/3 may include: • the order of bases codes for the order of amino acids • mRNA carries the code from the DNA • triplet base code read for amino acid Indicative scientific points about where proteins are made may include: • proteins are made on the ribosomes • in the cytoplasm Indicative scientific points about why it takes several weeks for the change in the cap: • time taken for the proteins in the cap to be replaced / make different proteins • mRNA from the old nucleus takes some time to be replaced by mRNA from new nucleus Indicative scientific points about protein synthesis at level 1 may include: • proteins are coded for by DNA / genes • sequence of bases that code for the protein Use the L1, L2, L3 annotations in Scoris; do not use ticks.
			Total	10	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
8			[Level 3] Explain the results in terms of direction of water movement **AND** differences in concentration between the liquid and the cells. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Explain the results in terms of direction of water movement without referring to differences in concentration. **Or** gives a complete explanation for one tube only Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] States that water is moving in or out of the cells without reference to the correct direction **OR** links the idea of osmosis to water movement. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	This question is targeted at grades up to C Indicative scientific points at Level 3 may include: • tube A - cells burst because water moves in (by osmosis) from an area of higher water concentration • tube B - cells shrink because water moves out (by osmosis) because the there is a higher water concentration inside the cells Indicative scientific points at Level 2 may include: • tube A - cells burst because water moves in (by osmosis) • tube B- cells shrink because water moves out (by osmosis) Indicative scientific points at Level 1 may include: • water moves into the cells • water moves out of the cells • water caused the cell to burst / shrink • osmosis is the movement of water (across a partially-permeable membrane) • when cells burst makes the liquid go clear If reference to salt solution moving out of red blood cells then answer is limited to level 1 Use the L1, L2, L3 annotations in Scoris; do not use ticks.
			Total	6	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
9			(A) has a flagellum (1) does not have a nucleus (1)	2	If answer B then no marks ignore tail allow has DNA in the cytoplasm / DNA in a loop
			Total	2	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
10			[Level 3] States the effects are due to osmosis AND Explain the results in terms of direction of movement AND uses the terms lysis and crenation correctly Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] States the effects are due to osmosis **and** attempts to explain the results in terms of direction of movement OR States the effects are due to osmosis **and** uses the terms lysis **and** crenation correctly Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] States the effects are due to osmosis. OR uses the terms lysis **or** crenation correctly Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	This question is targeted at grades up to A* Indicative scientific points at that may be include: • effects are due to osmosis • at low concentrations / cells burst / liquid goes clear due to **lysis / haemolysis** **not turgid** • high concentrations / cells shrivel / liquids remain cloudy due to **crenation** **not plasmolysis / flaccid** direction of movement • at low concentrations / cells burst / liquid goes clear because water moves into cells when **salt** concentration of solution is **lower** (than **salt** concentration inside cells) **or** at low concentrations / cells burst / liquid goes clear because water moves into cells when **water** concentration of solution is **higher** (than **water** concentration inside cells) **or** at low concentrations / cells burst / liquid goes clear because water moves into cells when solution is **hypotonic** • at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when **salt** concentration of solution is **higher** (than **salt** concentration inside cells) or at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when **water** concentration of solution is **lower** (than **water** concentration inside cells) or at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when solution is **hypertonic** **allow** reverse arguments for each direction of movement

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
					Use the L1, L2, L3 annotations in Scoris; do not use ticks.
			Total	6	
11			C ✓	1 (AO 2.2)	Examiner's Comments The question assessed AO2.2 practical skills needed for using a microscope. Candidates did not demonstrate an awareness of skills in using a microscope. Few candidates identified the correct response. All distractors were seen in significant numbers. This is clearly an area where candidates could develop application of skills in a practical situation.
			Total	1	
12			B ✓	1 (AO 2.2)	Examiner's Comments The question assessed AO2.2 mathematical and practical skills needed for using a microscope. Most candidates were able to calculate the correct magnification for the objective lens. The most common distractor chosen by candidates was 200x. This indicates these candidates seemed unaware of the combined magnification power of the eyepiece and objective lenses to the overall magnification which the question was assessing.
			Total	1	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

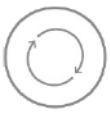
STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
13		i	First check answer on answer line If answer = 1000 (x) award 2 marks $\frac{10}{0.01}$ ✓ 1000 (x) ✓	2 (AO 1.2) (AO 2.2)	Examiner's Comments This question assessed their AO1.2 mathematical and AO2.2 practical skills. Some candidates correctly gave 1000 and scored 2 marks. However, the working out of nearly all candidates indicated that there was little understanding of the calculation required, as single marks were very rare. The most common incorrect response was 100.
		ii	5(μm)	1 (AO 2.2)	ALLOW +/– 1 μm tolerance Examiner's Comments The question assesses AO2.2. A significant number of candidates were able to get the correct answer within tolerance. The most common error was to just measure the length of the chloroplast to 7.5 and fail to use the scale measurement to adjust the estimate.
			Total	3	
14			C ✓	1 (AO 1.1)	
			Total	1	
15			A ✓	1 (AO 1.1)	
			Total	1	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
16			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	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
17	a		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.04 (mm) award 2 marks 20 ÷ 500 ✓ = 0.04 (mm) ✓	2 (AO 2.2)	**ALLOW** 0.038 – 0.042 **ALLOW** 19 ÷ 500 **OR** 21 ÷ 500 **ALLOW** 40 **µm/micrometres** **ALLOW** 0.004 for 1 mark due to incorrect units for measurement Examiner's Comments This AO2.2 question often resulted in candidates only scoring 1 mark, with relatively few candidates answering this correctly. Common mistakes were inaccurate measurement of the line, not converting the measurement into mm and not applying the formula correctly. Quite a few candidates wrote 2/500 = 250.
	b		(yes) smallest (size of cell) 8 µm/0.8 thousands of a millimetre ✓ (size is) greater than 0.02 thousands of a millimetre / 0.2 µm ✓	2 (AO 2.2)	If answer is no award zero marks Examiner's Comments This AO2.2 question was testing candidates' ability to work scientifically and interconvert units. It proved challenging. The vast majority of candidates concluded that the cells could not be seen so did not gain credit. Those that thought the cells could be seen often did not explain why adequately e.g. 'it has a better magnification', and did not use the measurements in the stem. Some did attempt to convert but were unsuccessful.
	c		(sub-cellular) structures were not clearly visible until electron microscopy ✓	1 (AO 1.1)	**ALLOW** idea that smaller organelles/structures can now be seen by electron microscope **ALLOW** electron microscopes have a higher resolution / magnification **ALLOW** (sub-cellular) structures/organelles shown in more detail/easier to see Examiner's Comments The question was testing AO1 recall of the use of EM. Many candidates simply said 'it allows us to see cells in more detail' or similar without linking this to subcellular structures.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
			Total	5	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
18		i	**Any two from:** idea of being more exposed to the wind OR plant in glasshouse is protected from wind/sheltered ✓ moving air increases transpiration/water loss ✓ wind blows the water (vapour) away from the leaf ✓	2 (AO 2.1)	**ALLOW** greater humidity in glasshouse **ALLOW** leaves moved by wind/air movement **ALLOW** more evaporation/diffusion of water (need comparative statement) **ALLOW** higher level response e.g. the cells losing water and become plasmolysed **if no other marks awarded ALLOW** link between wind and water loss for 1 mark <u>Examiner's Comments</u> Most marks gained on this AO2.1 question were often for the idea of wind causing water loss or drying out the plant. However, some candidates incorrectly thought it may be colder/less sunny in the wind and therefore there would be less photosynthesis.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
		ii	**Any three from:** control the temperature ✓ control light intensity ✓ cover the pot/prevent water loss from pot ✓ (balance) to measure plant mass before and after ✓ repeats ✓ set up using a potometer ✓	3 (AO 3.3a)	**IGNORE** control the heat **IGNORE** references to time unless linked to potometer **ALLOW** control amount of light **ALLOW** control amount of wind e.g. use of fan **ALLOW** control amount of water given to plants **ALLOW** measure fresh weight of leaves at regular intervals **ALLOW** measure water loss **ALLOW** remove leaves from plant and keep one set of leaves sealed in bag another set in air from fan <u>Examiner's Comments</u> This question targeted AO3.3a on developing experimental procedures. The most common correct responses were for measuring water loss, repeats and controlling the wind by using a fan. Quite a few candidates wrote 'make sure you only change one variable' without identifying which one.
			Total	5	
19			B	1 (AO 2.2)	
			Total	1	
20			B	1 (AO 2.2)	
			Total	1	
21			B	1 (AO 1.2)	
			Total	1	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

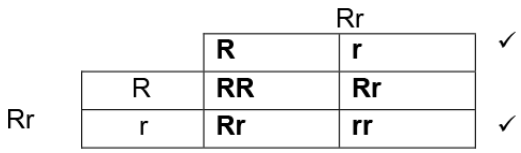
STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
22			B	1 (AO 2.2)	Examiner's Comments The majority of candidates did not understand the concept of orders of magnitude and choose distractor D as their answer.
			Total	1	
23	a		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 4 x 10^{-2} (mm) award 2 marks 0.04 ✓ = 4 x 10^{-2} (mm) ✓	2 (AO 2.2)	ALLOW correct variations of standard form Examiner's Comments Many candidates could correctly convert the answer of 0.04mm to standard form and so gained 2 marks. There were a number who simply answered 0.04 and so scored one of the available marks.
	b		increased resolution / high magnification / sub-cellular structures visible ✓ (can only be done on) dead material / thin sections only / gives 2-D / expensive (equipment) / possible distortion of material in preparation / less mobile / preparation takes longer/is more complex / (only) black and white images ✓	2 (AO 2.2)	IGNORE clearer/sharper/more detailed images / can see small cells Examiner's Comments Candidates displayed a good knowledge of the advantages and disadvantages of the TEM and full marks were common here.
			Total	4	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
24	a		clots the blood ✓ prevents bleeding / allows wounds to heal / forms a scab ✓	2 (AO 1.1)	IGNORE clump blood ALLOW prevents pathogens getting into the body <u>Examiner's Comments</u> There was some confusion in the responses describing the role of platelets whereby candidates thought platelets had a role in the specific immune response. Only higher ability candidates gained a mark here.
	b		 ✓ ✓ ratio 3 : 1 ✓	3 (AO 2.1) (AO 3.2b)	correct gametes = one mark correct genotypes of offspring = 1 mark ALLOW ECF for ratio ALLOW 3 in 4 <u>Examiner's Comments</u> The majority of candidates achieved two or three marks correctly identifying the gametes and genotypes. Most went onto correctly identifying the ratio if they achieved the gametes mark. Very few candidates achieved the error carried forward mark.

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

Question			Answer/Indicative content	Marks	Guidance
	c		**Any three from:** variation with some rats resistant and some who are not ✓ (resistant rats) more likely to survive/less likely to be killed ORA ✓ (resistant rats more likely) reproduce ORA ✓ pass on the allele / gene for resistance ORA ✓	3 (AO 2.1)	**IGNORE** selective breeding **ALLOW** mutation for resistance **ALLOW** offspring produced / breed together **ALLOW** pass on advantageous gene **IGNORE** trait is passed on / genes are passed on Examiner's Comments Candidates had to apply their knowledge of natural selection to explain why the percentage of resistant rats was increasing. There were a range of marks given for this question. Most none scoring responses were too vague and not using key terms. Most candidates did not appreciate that there was variation for resistance within the population.
	d		**Any two from:** (stops/less) respiration ✓ (no/less) energy/ATP ✓ key process interrupted e.g. cell metabolism/protein synthesis/chemical reactions/active transport ✓	3 (AO 2.1)	Examiner's Comments This question was one of the most challenging application of knowledge and understanding questions. The most common awarded mark was appreciation that energy release would be affected. A lot of responses were very general and would say the rat can't breathe or can't get any oxygen.
			Total	**11**	
25			A ✓	1 (AO1.2)	
			Total	**1**	
26			D ✓	1 (AO2.2)	
			Total	**1**	

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK

<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>27</td><td>a</td><td></td><td>
<table>
<tr><th>Feature</th><th>Structure</th></tr>
<tr><td>chlorophyll for photosynthesis</td><td>chloroplast ✓</td></tr>
<tr><td>enzymes for respiration</td><td>mitochondria ✓</td></tr>
<tr><td>receptor molecules for communication</td><td>cell membrane ✓</td></tr>
</table>
</td><td>3
(AO1.1)</td><td></td></tr>
<tr><td></td><td>b</td><td>i</td><td>FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = (×) 2000 award 2 marks

60(mm) ÷ 0.03(mm) ✓
= (×) 2000 ✓</td><td>2
(AO2.2)</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td>(use of a) stain ✓</td><td>1
(AO1.2)</td><td>ALLOW named stain e.g. iodine / methylene blue / eosin
ALLOW dye
IGNORE colouring</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
<tr><td>28</td><td></td><td></td><td>D ✓</td><td>1
(AO2.2)</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>1</td><td></td></tr>
</table>

© OCR 2022. You may photocopy this page.

Created in ExamBuilder

STEMUP.CO.UK