A Level AQA Biology

5 Cell structure and microscopes – answers

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>01.1</td><td>B, E, F, G (mitochondria, cell-surface membrane, nucleus, Golgi apparatus);
D (cell wall);
B, F, G (mitochondria, nucleus, Golgi apparatus);</td><td></td><td>3</td><td>AO1
AO3
3.2.1.1</td></tr>
<tr><td>01.2</td><td>Transmission electron microscope;
idea that can see chloroplast / mitochondria clearly OR detail inside organelles visible;
idea that a 2D image is shown (rather than 3D);</td><td></td><td>3</td><td>AO1
AO2
3.2.1.3</td></tr>
<tr><td>01.3</td><td>Magnification how many times larger the image is than the size of the real object;
Resolution the ability to distinguish two separate points;</td><td></td><td>2</td><td>AO1
3.2.1.3</td></tr>
<tr><td>02.1</td><td><table><tr><th>Feature</th><th>Prokaryotic cell</th><th>Eukaryotic cell</th></tr><tr><td>DNA structure</td><td>circular / without histones</td><td>linear / with histones</td></tr><tr><td>chemical that makes up the cell wall</td><td>murein / peptidoglycan</td><td>cellulose in plants, chitin in fungi</td></tr><tr><td>size of ribosomes</td><td>70S/smaller</td><td>80S/bigger</td></tr></table></td><td>One mark per correct box</td><td>6</td><td>AO1
3.2.1.1
3.2.1.2</td></tr>
<tr><td>02.2</td><td>Any six from:
Nucleus contains genes / codes for amylase;
Transcription occurs to produce mRNA;
Ribosomes / Rough endoplasmic reticulum - protein synthesis / translation occurs;
Golgi apparatus: modifies / packages proteins;
(Transport / Secretory) vesicles transport proteins between organelles / within cell;
Cytoskeleton moves vesicles between organelles / within cell / to the plasma membrane;
Vesicles fuse with plasma / cell-surface membrane releasing content by exocytosis;</td><td></td><td>6 max</td><td>AO2
3.2.1.1
3.4.2</td></tr>
</table>

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<tr><td>03.1</td><td>Tube B;
idea that Tube A can produce glucose by photosynthesis, animal cells cannot do so;</td><td></td><td>2</td><td>AO2
AO3
3.2.1.1</td></tr>
<tr><td>03.2</td><td>Chloroplasts;</td><td></td><td>1</td><td>AO3
3.2.1.1</td></tr>
<tr><td>03.3</td><td>Ribosomes;
Mitochondria;
Nuclei;</td><td></td><td>3</td><td>AO3
3.2.1.1</td></tr>
<tr><td>03.4</td><td>Ribosomes</td><td></td><td>1</td><td>AO3
3.2.1.2</td></tr>
<tr><td>03.5</td><td>Prokaryotes have smaller / 70S ribosomes OR Eukaryotes have larger / 80S ribosomes;
(Therefore) the band in prokaryotic tube should be slightly higher;</td><td></td><td>2</td><td>AO2
AO3
3.2.1.1
3.2.1.2</td></tr>
<tr><td>04.1</td><td>Similarities
Transcription occurs to produce mRNA;
Translation occurs to produce polypeptide chain/protein;
Ribosomes are involved in translation;
DNA codes for sequence of amino acids;

Differences
<table>
<tr><th>Prokaryotes</th><th>Eukaryotes</th></tr>
<tr><td>transcription occurs in cytoplasm</td><td>transcription occurs in nucleus</td></tr>
<tr><td>mRNA does not need to travel</td><td>mRNA needs to leave nucleus through nuclear pore</td></tr>
<tr><td>free ribosomes are involved</td><td>free ribosomes and/or ribosomes on rough ER</td></tr>
</table></td><td>Max 2 marks for similarities

Max 2 marks of differences</td><td>4</td><td>AO1
AO2
3.2.1.1
3.2.1.2
3.4.2</td></tr>
</table>

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<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
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<tr><td>04.2</td><td>Makes organelles visible;
To identify organelles;
Provides contrast;</td><td></td><td>2 max</td><td>AO1
3.2.1.3</td></tr>
<tr><td>04.3</td><td>Calibration:
1 µm = 4 graticule divisions;
Each graticule division = 1 ÷ 4 = 0.25 µm;

Calculate size of cell:
Cell spans across 15 divisions

Size of cell = 15 × 0.25 = 3.75 µm;</td><td>Max 2 marks if answer in mm
Max 2 marks if wrong number of graticule divisions counted once

Max 1 mark if both graticule divisions counted incorrectly</td><td>3 max</td><td>AO3
3.2.1.3
AT d
MS 0.1
MS 1.8</td></tr>
<tr><td>05.1</td><td><table><tr><th>Organelle</th><th>Function</th></tr><tr><td>rough endoplasmic reticulum</td><td>synthesises and transports proteins</td></tr><tr><td>lysosomes</td><td>contain hydrolytic enzymes, to break down waste material / old organelles</td></tr><tr><td>nucleus</td><td>contains DNA, codes for protein</td></tr><tr><td>cytoskeleton</td><td>maintains shape / structure / scaffolding / stability of cell</td></tr><tr><td>permanent vacuoles</td><td>maintains turgor / shape of plant cells</td></tr></table></td><td>One mark per correct box</td><td>5</td><td>AO1
3.2.1.1</td></tr>
</table>

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Question	Answers	Extra information	Mark	AO Spec reference
05.2	**Organelle:** Mitochondria **OR** chloroplasts; **Reasons:** Have their own DNA, but no nucleus; Double-membrane, prokaryotes have cell walls; Smaller ribosomes (70S);	*One mark for the organelle* *Max two marks for reasons*	3 max	AO2 3.2.1.1 3.2.1.2
06.1	Any four from: Gently chew on the inside of cheeks; Use cotton swap to press/roll/brush against cheek wall; Smear cotton swap bud onto glass slide; Add a drop of (named) dye/stain (methylene blue) onto sample; Place cover slip over sample; Use tissue paper to soak up any excess stain;		4 max	AO1 3.2.1.3
06.2	Any four from: Cytoplasm of RBC has a lower water potential than distilled water; (Therefore) water moves into RBC; Down the water potential gradient; By osmosis; RBC/Animal cells do not have a cell wall **or** Only have plasma membrane, therefore cannot withstand pressure, so will burst; Epidermal cells/plant cells have cell wall, so can withstand pressure; Plant cells become turgid;	Max 3 marks for explaining the observations for the red blood cells Max 3 marks for explaining the observations for red onion epidermal cells.	6 max	AO2 AO3 3.2.1.1 3.2.3
06.3	Use salt solution / water; Use a solution that is isotonic to cytoplasm / similar water potential to cytoplasm;		1 max	AO3 3.2.3

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<tr><td>07</td><td>The following are suitable topic areas from the specification that could be used to give an account about how prokaryotic and eukaryotic cells are adapted to their function.

In order to fully address the question and reach the highest mark bands students must also include at least five topics in their answer, to demonstrate a synoptic approach to the essay.

<table>
<tr><th>Specification reference</th><th>Topic area</th></tr>
<tr><td>3.2.1</td><td>Cell structure</td></tr>
<tr><td>3.2.2</td><td>Cell division</td></tr>
<tr><td>3.2.3</td><td>Transport across cell membranes</td></tr>
<tr><td>3.2.4</td><td>Cell recognition and the immune system</td></tr>
<tr><td>3.4.1</td><td>DNA, genes and chromosomes</td></tr>
<tr><td>3.4.2</td><td>DNA and protein synthesis</td></tr>
<tr><td>3.5.1</td><td>Photosynthesis</td></tr>
<tr><td>3.5.2</td><td>Respiration</td></tr>
<tr><td>3.6.1.2</td><td>Receptors</td></tr>
</table>

Students may be able to show the relevance of other topics from the specification.

Note: other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.</td><td></td><td>25
max</td><td>AO1</td></tr>
</table>

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Skills box answers

Question	Answer
1	2.5×10^{4}
2	6.75×10^{8}
3	7.8×10^{-5}
4	0.0 000 428
5	9 700 000 000 000
6	0.00 000 002 473