A Level OCR Biology

7 Cell division, diversity and organization – answers

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>Letter</th><th>Phase</th><th>Event</th></tr>
<tr><td>A</td><td>prophase</td><td>nuclear envelope disappears</td></tr>
<tr><td>B</td><td>anaphase</td><td>sister chromatids split and travel to opposite poles</td></tr>
<tr><td>C</td><td>interphase</td><td>cell size increase/organelles duplicate/DNA duplicates/protein synthesis</td></tr>
<tr><td>D</td><td>cytokinesis</td><td>cytoplasm splits by cleavage furrow</td></tr>
<tr><td>E</td><td>telophase</td><td>chromosomes uncoil</td></tr>
<tr><td>F</td><td>metaphase</td><td>chromosomes line up along the equator</td></tr>
</table>
</td><td>One mark per row</td><td>6</td><td>AO1
2.1.6(b)
2.1.6(c)
2.1.6(d)</td></tr>
<tr><td>1(b)</td><td>C → A → F → B → E → D
✓ ✓ ✓</td><td>If all correct, award 3 marks
Award 2 marks for any two of the following pairs:
A–F, B–E, E–D
Award 1 mark for any one of the pairs</td><td>3</td><td>AO1
2.1.6(b)
2.1.6(c)
2.1.6(d)</td></tr>
<tr><td>1(c)</td><td>Animal cell ✓
AND
cytokinesis describes a cleavage furrow being formed, which only occurs in animal cells OR plant cells forms cell plate instead of cleavage furrow ✓</td><td>One mark for correctly identifying cell
One mark for correct explanation</td><td>2</td><td>AO1
2.1.6(b)
2.1.6(c)
2.1.6(d)</td></tr>
<tr><td>2(a)(i)</td><td>Cell B ✓
AND
homologous chromosomes paired up / lined up in the equator OR crossing over occurs ✓</td><td>One mark for correctly identifying cell
One mark for correct explanation</td><td>2</td><td>AO1
AO2
2.1.6(b)
2.1.6(f)
2.1.6(g)</td></tr>
</table>

A Level OCR Biology

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Question	Answers	Extra information	Mark	AO Spec reference
(ii)	Cell **B** ✓		1	AO1 2.1.6(b) 2.1.6(f) 2.1.6(g)
2(b)	Any **one** for cell **A**: two daughter cells ✓ that are genetically identical ✓ are diploid cells ✓ **AND** Any **one** for cell **B**: four daughter cells ✓ that are genetically different ✓ are haploid cells / gametes ✓		2 max	AO1 AO2 2.1.6(b) 2.1.6(f) 2.1.6(g)
2(c)(i)	Spindle fibres are attached correctly to the centromere ✓		1	AO1 AO2 2.1.6(b) 2.1.6(f) 2.1.6(g)
(ii)	G_1 / S checkpoint ✓ checks for correct cell size / correct number of organelles / DNA damage ✓ G_2 / M checkpoint ✓ checks for if DNA was replicated correctly / correct cell size / energy or nutrient levels ✓		4	AO1 AO2 2.1.6(b) 2.1.6(f) 2.1.6(g)
(iii)	Cell enters G_0 phase / cell arrest ✓ eventually undergoes apoptosis ✓		2	AO1 AO2 2.1.6(b) 2.1.6(f) 2.1.6(g)

A Level OCR Biology

7 Cell division, diversity and organization – answers

Question	Answers	Extra information	Mark	AO Spec reference
(iv)	Cell becomes specialized / differentiated ✓		1	AO1 AO2 2.1.6(b) 2.1.6(f) 2.1.6(g)
3(a)	A group of similar cells ✓ working together for a similar function ✓		2	AO1 2.1.6(i) 2.1.6(j) 2.1.6(k)
3(b)(i)	Totipotent – undifferentiated cells that has the ability to specialise into all types of cells ✓ Pluripotent – can specialise into most types of cells, except extra embryonic cells ✓ Multipotent – can specialise into specific types of a specific tissue ✓		3	AO2 2.1.6(i) 2.1.6(j) 2.1.6(k)
(ii)	Totipotent – zygote, <u>early</u> embryonic stem cells ✓ Pluripotent – embryonic stem cells ✓ Multipotent – bone marrow / hemopoietic stem cells ✓		3	AO2 2.1.6(i) 2.1.6(j) 2.1.6(k)
(iii)	Erythrocytes: no nucleus – more space for haemoglobin to bind and transport oxygen biconcave shape – larger surface area to volume ratio for faster diffusion	1 mark for erythrocyte adaptation ✓ 1 mark for its explanation 1 mark for neutrophil adaptation ✓ 1 mark for its explanation	4	AO2 2.1.6(i) 2.1.6(j) 2.1.6(k)

<table>
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Spec reference</th></tr>
<tr><td></td><td>Neutrophils:<table>
<tr><td>lobed nucleus</td><td>for squeezing through capillaries to target infection in tissues</td></tr>
<tr><td>contains lysosomes</td><td>contains hydrolytic enzymes to digest pathogens</td></tr>
<tr><td>extensive cytoskeleton</td><td>for phagocytosis</td></tr>
<tr><td>extensive rough endoplasmic reticulum</td><td>to make many enzymes / lysozymes</td></tr>
<tr><td>large Golgi apparatus</td><td>to package enzymes into vesicles or make lysosomes</td></tr>
<tr><td>many mitochondria</td><td>for more aerobic respiration / making of ATP for endocytosis / phagocytosis</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>crossing over occurs in prophase 1 ✓
homologous chromosomes pair up / Bivalents are formed ✓
non-sister chromatids from different chromosomes within the pair switch over alleles at the chiasmata ✓

independent assortment of homologous chromosomes / bivalents occurs in metaphase 1 ✓
random arrangement of which side the homologous pairs face ✓
producing different possible combinations of chromosomes in resulting cells ✓

independent assortment of sister chromatids:
occurs in metaphase 2 ✓
gives different possible combinations of alleles (due to crossing over) ✓</td><td></td><td>9</td><td>AO2
AO3
2.1.6(f)
2.1.6(g)</td></tr>
</table>

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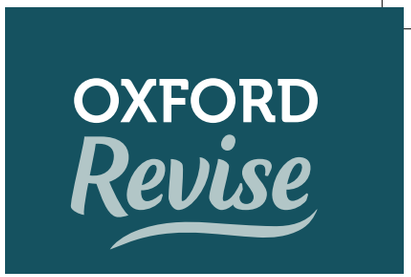

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO
Spec reference</th></tr>
<tr><td>5(a)</td><td><table><tr><th>Event</th><th>Mitosis</th><th>Meiosis 1</th><th>Meiosis 2</th></tr><tr><td>crossing over occurs</td><td></td><td>✓</td><td></td></tr><tr><td>diploid cells are made</td><td>✓</td><td></td><td></td></tr><tr><td>two daughter cells are made</td><td>✓</td><td>✓</td><td></td></tr><tr><td>chromosomes condense</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>centromeres split</td><td>✓</td><td></td><td>✓</td></tr></table></td><td>One mark per correct row</td><td>5</td><td rowspan="4">AO1
2.1.6(c)
2.1.6(g)
Synoptic:
2.1.1(k)
UF
AE</td></tr>
<tr><td>(b)(i)</td><td>Cell wall ✓</td><td></td><td>1</td></tr>
<tr><td>(ii)</td><td>Any two pairs from:
T. aquaticus would have a circular chromosome AND human cells would have linear chromosomes ✓
T. aquaticus would have one chromosome only AND human cells have 46 ✓
T. aquaticus would have plasmids AND human cells do not ✓</td><td></td><td>4 max</td></tr>
<tr><td>(iii)</td><td>Any one pair from:
Binary fission:
No breakdown / reforming nucleus (prophase / telophase) ✓
Because prokaryotic cells do not have nuclei ✓
OR
No metaphase ✓
Because no centrioles / spindle fibres to line up chromosomes ✓</td><td></td><td>2 max</td><td></td></tr>
<tr><td>6(i)</td><td>Meristem ✓</td><td></td><td>1</td><td rowspan="2">AO1
AO2
2.1.6(l)
2.1.6(h)</td></tr>
<tr><td>(ii)</td><td>The process by which a cell develops to have specific structures in order to perform a specific function ✓</td><td></td><td>1</td></tr>
</table>

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(iii)	Any **one** of similarities: • Phospholipid bilayer ✓ • Contains cholesterol ✓ • Carrier and channel proteins ✓ • Glycoproteins / Glycolipids ✓ Any **one** of differences: • Root hair cells have **larg**er SA:V than palisade mesophyll cells ✓ • Root hair cells have **more** carrier proteins ✓ Correlating explanation for difference: • For more efficient absorption of water / mineral ions ✓ • For more absorption of specific mineral ions by active transport ✓	Answer for the differences must be comparative	3 max	2.1.6(m) 2.1.5(b) 2.1.5(d) 2.1.2(n)
(b)(i)	Haemoglobin ✓ **AND** Any **three** of the following: • Conjugated protein ✓ • Contains 4 haem groups allowing it to bind to O_2 ✓ • Globular shape ✓ • Has hydrophilic amino acids on the outside so can interact with plasma / be soluble ✓ • Four subunits ($2\alpha + 2\beta$) ✓		4	
(ii)	Multipotent / Hemopoietic / stem cells ✓ found in bone marrow ✓		2	

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Skills box answers

Question	Answer
1	75 µm
2	5 µm
3	0.025 µm