

WJEC (Eduqas) Biology A-level
1.6: Cell Division
Questions by Topic - Mark
Scheme

1.

Question			Marking details	Marks Available
1.	(a)		Root <u>tip</u> / shoot <u>tip</u> / meristem;	1
	(b)	A Anaphase; B Prophase; C Telophase; D Metaphase;		4
	(c)		Interphase; It is the longest phase;	2
	(d)		(All cells) would be {haploid/half the number of chromosomes}; NOT cells have fewer/ less chromosomes (All cells) would be genetically different;	2
			Question 1 Total	[9]

2.

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			J, K & M = 2 marks 2 correct = 1 marks 0/1 correct = 0 marks If use more than three letters then deduct one mark for each additional letter		2		2		
	(b)	(i)		<p>4 correct for 2 marks 2/3 correct for 1 mark 0/1 correct = 0</p>		2		2		
		(ii)		Eggs/ female gametes/ ova are produced by <u>meiosis</u> (1) Sperm/male gametes are produced by <u>mitosis</u> (1)			2	2		
	(c)	(i)		1. 3.4 units DNA {before replication / in <u>early</u> interphase}/ {quantity of DNA halves/ returns to original value} {following cytokinesis / (at the end of)telophase} (1) 2. {6.8 units of DNA/ DNA doubles} due to <u>DNA replication</u> (1) 3. (6.8 units of DNA will be present during) (Late) interphase/ prophase/ metaphase/ anaphase(1)		3		3		
		(ii)		{mitosis is <u>faster/ more</u> mitosis} in young spider mites than older spider mites/ ORA (1) Young spider mite - mitosis required for growth (and repair of muscle tissue) / Older spider mite – mitosis required for repair (of muscle tissue only) (1)			2	2		
				Question 2 total	0	7	4	11	0	0

3.

Question			Marking details	Marks Available
3	(a)	(i)	Produce {gametes / sex cells} / halves chromosome number / produces haploid cells / introduce <u>genetic</u> variation;	1
		(ii)	Testes / ovaries;	1
	(b)	(i)	X-centriole AND Y-spindle (fibre) / microtubules;	1
		(ii)	div I 2 chromosomes in each cell 1 big 1 little; straddling equator; Ignore lack of crossing over div II 2 chromosomes in each cell 1 big 1 little; showing correct recombinants;	4
	(c)		1 pair reversed across equator;	1
	(d)	(i)	Prophase I; NOT prophase alone	1
		(ii)	Drawing showing non sister chromatids <u>crossing over</u> ; and parts being exchanged; Accept correct annotations or second diagram	2
		(iii)	Crossing over / chiasmata;	1
	Question 3 Total			[12]

4. (a)

2 chromosomes in female cell;

1 chromosome in male cell;

Diagrams must match each other.

Accept 'chromatids' in each cell. Do not accept chromatid in male cell if chromosomes drawn in female cell or opposite. [2]

(b)

(i)

2 Chromosomes arranged on equator of spindle; (ignore orientation) [2]

2 V shaped {chromosomes / chromatids} with centrosomes towards each centriole/pole;

Ecf from one diagram to other.

(ii)

Labelling: chromatids, centromere, spindle, centrioles, equator, cell membrane.

2 marks for 4 correct labels on either diagram;

1 mark for 3. [2]

(iii)

To provide {genetically identical cells / clones};

Repair / replacement {of cells / tissue} / regeneration qualified;

NOT growth. [2]

(iv)

Making gametes / sperm cells / sex cells / produce haploid cells for reproduction; [1]

(v)

Meiosis / reduction division;

Spelling must be correct. [1]

(vi)

Genetic variation (in the offspring) / restore diploid number (in zygote) OWTTE; [1]

(c)

Fertilised eggs will develop into females, unfertilised eggs into males; (both for 1 mark);

Accept: fertilised will give genetically varied ants, unfertilised would give clones;

IGNORE haploid / diploid. [1]

Question total 12

5.

Question

Marking details

Marks
Available

5

(a)

(i)

B, D, C, F, E;

1

(ii)

Cytokinesis;

1

(b)

(i)

4 cells are produced compared with 2 / cells are haploid as oppose to diploid/only contain one set of chromosomes compared with two sets of chromosomes;
NOT 2 chromosomes (can be neutral)
As a result of two (consecutive) divisions;

2

(ii)

(Meiosis produces haploid gametes which) allows the diploid state to be restored {at fertilisation/in the zygote} / prevents doubling of the chromosome number at fertilisation;
Meiosis produces genetically different {gametes/cells} / results in genetic variation (in the offspring);

2

Question 5 Total

[6]

6.

Question

Marking details

Marks Available

			AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		1		1		1
		(ii)	1	1		2		2
	(b)			2	1	3		
			1	4	1	6	0	3

7.

Question			Marking details	Marks Available
7	(a)		<p>Any 4 from</p> <ol style="list-style-type: none"> 1. {nuclear membrane / nucleolus} disappear; 2. <u>chromosomes</u> {shorten / thicken / contracts / condense} / chromatin condenses; 3. (appear as) <u>{two / pair / sister}</u> chromatids; NOT pairing up 4. chromatids joined at centromere; 5. spindle forms; Reject ref to centrioles making spindle fibres <p>Accept labelled diagram for 3, 4 and 5</p>	Max 4
	(b)		<p>$5/100 \times (24 \times 60)$ or $(24 \times 60)/20 = 72$ Correct Answer = 2 marks correct calculation, incorrect answer = 1 mark</p>	2
	(c)		<p>Any 3 from</p> <ol style="list-style-type: none"> 1. both show <u>interphase</u> because DNA {doubles / changes from 2 to 4 / replicates}; NOT DNA increases unqualified 2. (with vincristine) there is {no halving of DNA / DNA does not decrease from 4 to 2 arbitrary units}; 3. (lack of spindle fibres) prevents chromatids being pulled to the {poles / ends of spindle}(in anaphase); allow chromosomes 4. therefore no cytokinesis / no separation into two cells; 5. daughter cells not produced 	Max 3
	(d)		<p>meiosis produces <u>genetically</u> different cells AND mitosis produced <u>{genetically}</u> identical cells / clones}; meiosis halves chromosome number AND mitosis maintains chromosome number / cells produced by meiosis are haploid AND those by mitosis are diploid ;</p>	2
			Question 7 total	[11]

8. (a)

[4]

Role	Mitosis	Meiosis
	✓	X
	X	✓
	X	✓
	✓	✓

(not: hybrid ticks)

(b) joined pair of chromatids;
chromatid labelled and centromere labelled;

[2]

(c) centromere splits;
chromatids pulled to (opposite) poles;
by shortening/ contraction of spindle fibres;

[3]

(d) centrioles;

[1]

(Total 10 Marks)

- 9.
- | | | | |
|-----|-------|--|---|
| (a) | (i) | Stage A – telophase;
Stage C – metaphase; | 2 |
| | (ii) | Centromeres split/ divide;
<u>Chromatids/ chromosomes</u> are being <u>pulled</u> to (opposite) poles;
(due to) contraction/ shortening of the spindle (fibres); | 2 |
| (b) | (i) | Interphase; | 1 |
| | (ii) | The (quantity of) DNA has <u>doubled</u> / (quantity of) DNA changes from 6 to 12; NOT increase | 1 |
| | (iii) | Meiosis; (correct spelling)
(At the end of the cell cycle) the (quantity) of DNA has been <u>halved</u> (and halved again) / can describe with numbers
/involves 2 (consecutive) divisions;
Ignore reference to chromosomes | 2 |

10.	Question	Marking details	Marks Available
	(a)	40;	1
	(b) (i)	Correct diagram; two chromosome pairs vertically orientated one of each pair on each side of the equator one pair of chromosomes bigger than the other	1
	(ii)	Correct labelling of chromatid, <u>centromere</u> , <u>centriole</u> , spindle fibres 2 marks for 4 correct labels 1 mark for 2 or 3 correct labels	2
	(iii)	Correct diagrams; Two chromosomes in each cell (one large and one small) Centromeres on dotted line	1
	(iv)	{Random/independent} assortment of {chromosomes/ chromatids}/ description of {random/independent assortment}; crossing over/ chiasmata; produces haploid cells;	3
Question 10 Total			[8]

11. (a) (i)	J K L H I	1
(ii)	I = telophase	1
	L = metaphase	1
(b) (i)	interphase	1
(ii)	ATP production/ metabolically active; Replication of DNA; NOT synthesis/ doubling {Making/ replacing} new organelles/ replication of mitochondria/ chloroplasts NOT replication of organelles Protein synthesis; Cell increase in size (not growth) (any two)	2
(c)	DNA Doubled / DNA content increased from 20 to 40	1
	and then halved (to maintain DNA content) (in two daughter cells.) (ignore reference to chromosomes)	1
(d)	Two genetically identical daughter cells are produced; {Genetically identical/ clone} of parent cell.	2

(Total 10 marks)

12.

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
12	(a)	(i)	They have no nucleus/chromosomes NOT DNA	1			1		
		(ii)	Male + Not all homologous/ Different sex chromosomes/ there is one pair where the chromosomes are different/ one large and one small/ X and Y chromosomes It has a Y chromosome	1			1		
		(iii)	I = 6 chromosomes/3pairs + II = 3 chromosomes	1			1		
		(iv)	One large X shaped chromosome and one small ^ shaped chromosome drawn either side of the equator (1) Spindle fibres drawn (1)		2		2		
			Question 2 total	3	2	0	5	0	0