

Interactive Example Candidate Responses

Paper 2 (May/June 2016), Question 5

Cambridge International AS & A Level Biology 9700

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5 Fig. 5.1 shows plant cells in stages of mitosis.



Fig. 5.1

(a) Individual chromosomes cannot be seen in the cell at the start of prophase. Changes to the chromatin occur so that by late prophase chromosomes are clearly visible.

(i) Outline what occurs during early prophase so that chromosomes become visible in late prophase.

The chromatin condenses and coils during early prophase.

[1]

(ii) Describe the structure of the chromosome in late prophase.

Two identical sister chromatids are attached to each other at the centromere. The chromosomes have a cap at the end called telomere. Coiled, so it looks like two identical strands with the attached at the centre which has the same length.

[3]

Your
Mark

5(a)(i)

5(a)(ii)

5(b)

5(c)

Q5	Mark scheme
(a)(i)	coiling / supercoiling / condenses / condensation ; A become shorter and thicker R contracts [1]
(a)(ii)	accept from labelled diagram two chromatids ; identical / sister, chromatids ; joined by a centromere ; A kinetochore one from (reach chromatid) DNA complexed with protein histone proteins / histones ; telomeres at end of chromatids [max 3]
(b)	metaphase versus anaphase idea of single chromosome of two chromatids versus two separated chromatids / daughter chromosomes e.g. two chromatids versus, one chromatid / one daughter chromosome ; sister chromatids joined at centromere versus chromatids separated distance between sister chromatids zero versus increasing distance between chromatids share a centromere versus do not share a centromere / centromere divides two DNA molecules versus one DNA molecule ; at, equator / metaphase plate versus towards / at, poles ; R centre R ends linear / straight versus V shape / AW ; [max 2]
(c)	acts at target cell ; binds to receptor ; R receptor cells allow ecf for other mps R trapped / caught ref. specificity ; A receptor complementary (shape) for cytokinin A cytokinin fits into receptor this is also mp2 A recognition of cytokinin by receptor receptor (located) in, cell surface / plasma, membrane ; A cell membrane A phospholipid bilayer A transmembrane receptor sets off / AW, response in the cell / described response(s) ; e.g. triggers secondary messenger activates enzyme(s) I signals / causes / stimulates, cell to divide / cytokinesis (acts) extracellularly / extracellular signal or (acts) intracellularly / intracellular signal ; must be in context of candidate's answer [max 3] [Total: 9]

- (b) State two differences between the chromosome at metaphase and the chromosome at late anaphase.

The chromosomes at metaphase is lined up at the equator, however, at anaphase it is at opposite poles.

The chromosomes at metaphase ~~is~~ consists of two sister chromatids

However, at anaphase there is only 1 ^{connected at} the centromere single chromatid, centromere pointing towards poles.

- (c) One of the functions of a plant hormone known as cytokinin is to act as a cell signalling molecule and promote cytokinesis.

Suggest how cytokinin acts as a cell signalling molecule.

Cytokinin ~~attaches~~ ^{specific} attaches to the chemical receptors on the cell membrane ~~#~~, the chemical receptors then activates the G-protein to send out a secondary messenger ~~that~~ which amplifies the original signal, sending it to enzymes or specific causing them to response which give a specific

is cytokinesis. [3]

[Total: 9]

Your
Mark

5(a)(i)

5(a)(ii)

5(b)

5(c)

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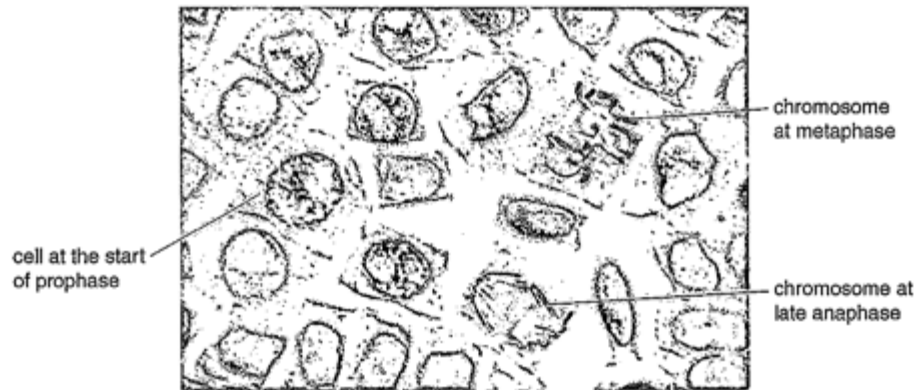


Fig. 5.1

(a) Individual chromosomes cannot be seen in the cell at the start of prophase. Changes to the chromatin occur so that by late prophase chromosomes are clearly visible.

- (i) Outline what occurs during early prophase so that chromosomes become visible in late prophase.

During early prophase, chromatin in the nucleus condense to form chromosomes composed of two sister chromatids. [1]

- (ii) Describe the structure of the chromosome in late prophase.

The chromosomes are short and thick composed of two chromatids containing two DNA molecules

[3]

Your
Mark

5(a)(i)

5(a)(ii)

5(b)

5(c)

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- (b) State two differences between the chromosome at metaphase and the chromosome at late anaphase.

During metaphase, the chromosomes are aligned at the equator with spindle fibres attached to the kinetochore molecule at their centromere. By late anaphase, the sister chromatids have been moved apart to opposite ends of the poles which is achieved by shortening of microtubules.

- (c) One of the functions of a plant hormone known as cytokinin is to act as a cell signalling molecule and promote cytokinesis.

Suggest how cytokinin acts as a cell signalling molecule.

Cytokinin activates the receptors (proteins) in the cell surface membrane. The receptors then transmit the signal to the signal protein which activates the second messenger and begins a cascade of reactions activating other enzymes thereby amplifying the signal and causing the cell to undergo cytokinesis.

[3]

[Total: 9]

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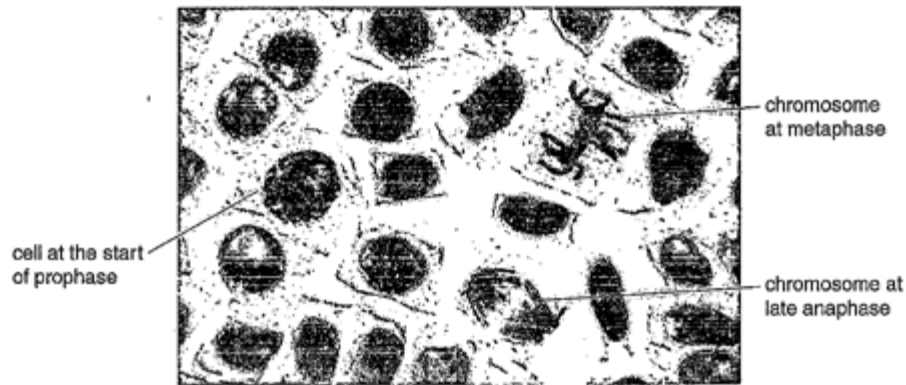


Fig. 5.1

(a) Individual chromosomes cannot be seen in the cell at the start of prophase. Changes to the chromatin occur so that by late prophase chromosomes are clearly visible.

(i) Outline what occurs during early prophase so that chromosomes become visible in late prophase.

the nuclear envelope breaks down; the chromosomes
are visible due to breakdown of nuclear envelope and nucleus
disappearance. [1]

(ii) Describe the structure of the chromosome in late prophase.

chromatids joined together at the centromere to make a chromosome.
The chromosomes are lying freely and slowly moving towards the
center (to move to metaphase). [3]

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- (b) State two differences between the chromosome at metaphase and the chromosome at late anaphase.

Chromosomes at metaphase are lying lining at the equator (middle)
whereas at anaphase they are pulled by spindle towards the
opposite poles.

Chromosomes at metaphase are composed of two chromatids
joined at centromere, whereas at anaphase they are two separate
sister chromatids moved to opposite poles (not connected at
centromere).

- (c) One of the functions of a plant hormone known as cytokinin is to act as a cell signalling molecule and promote cytokinesis.

Suggest how cytokinin acts as a cell signalling molecule.

the hormone attaches to the receptor cells and initiates a
signal (sends a signal) to the nucleus to start the specific
action, which is cytokinesis.

[3]

[Total: 9]

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