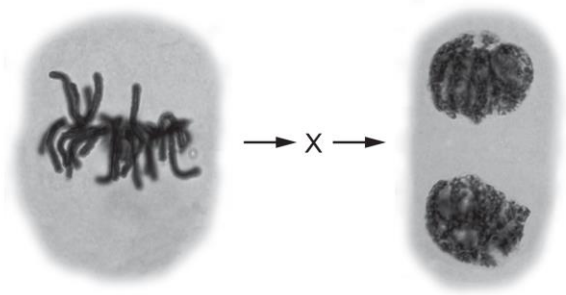
5. The Mitotic Cell Cycle

5.2 Chromosome behaviors in mitosis

Paper 1

Question Paper

1 Eukaryotic organisms grow and increase in size as a result of cell division. The diagram shows some stages of mitosis with one stage missing, labelled X.



What happens in stage X?

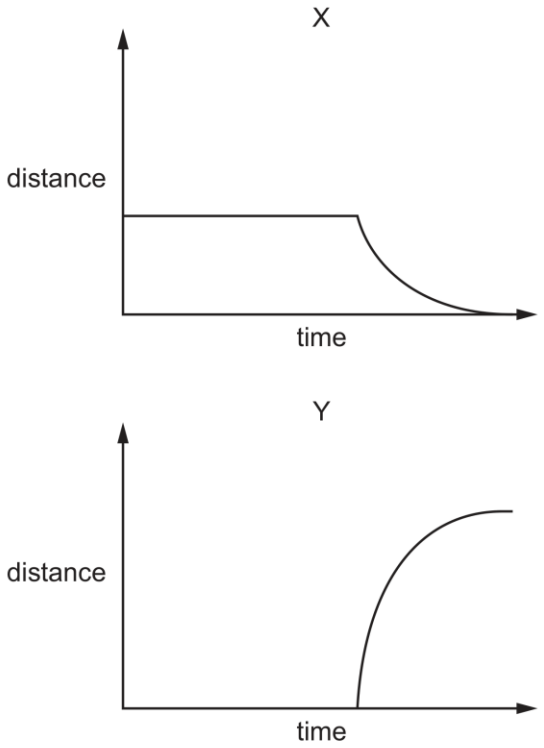
A Spindle fibres attach to the centromeres and the chromosomes line up along the equator.

B The chromatin coils and condenses and the nuclear membrane disintegrates.

C The chromosomes line up in pairs along the equator of the cell.

D Microtubules shorten so that spindle fibres contract and the centromeres divide.

2 The graphs show various distance measurements taken from the start of metaphase of mitosis. The graphs are to scale when compared to one another.



Which row correctly identifies the distance measurement for each graph?

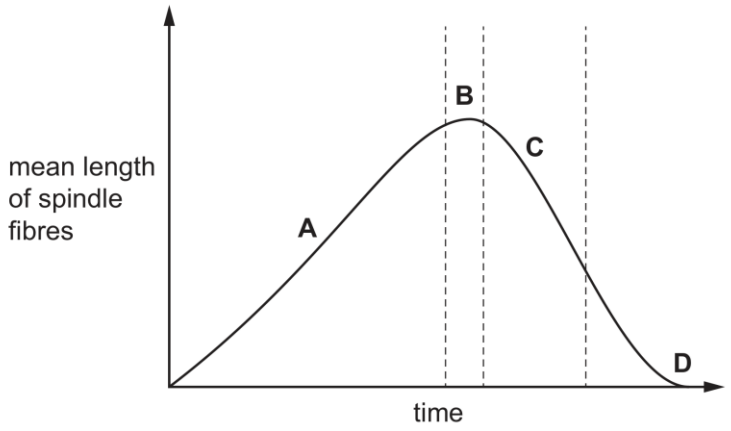
	X	Y
A	distance between poles of spindle	distance of centromeres from poles of spindle
B	distance between poles of spindle	distance between sister chromatids
C	distance of centromeres from poles of spindle	distance between sister chromatids
D	distance of centromeres from poles of spindle	distance between poles of spindle

3 Which row is correct for the start of anaphase of mitosis?

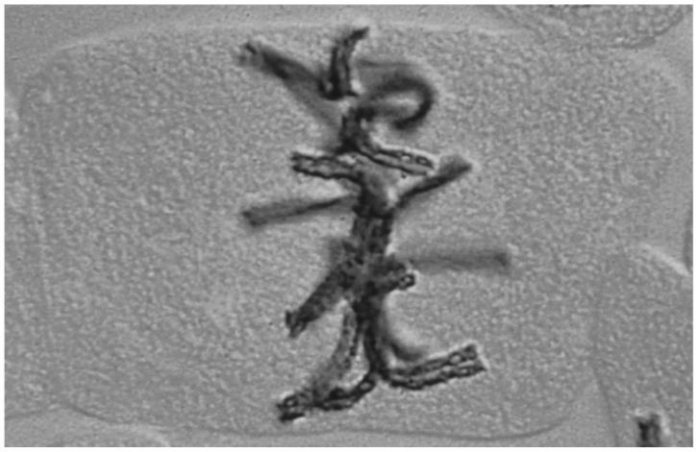
	form of DNA	DNA is associated with histone proteins	state of the cell surface membrane
A	chromosomes	always	broken apart
B	chromosomes	sometimes	intact
C	separated sister chromatids	always	intact
D	separated sister chromatids	sometimes	broken apart

4 The graph shows the mean length of the spindle fibres during mitosis.

Which region of the graph shows when all the centromeres have detached from the spindle fibres?



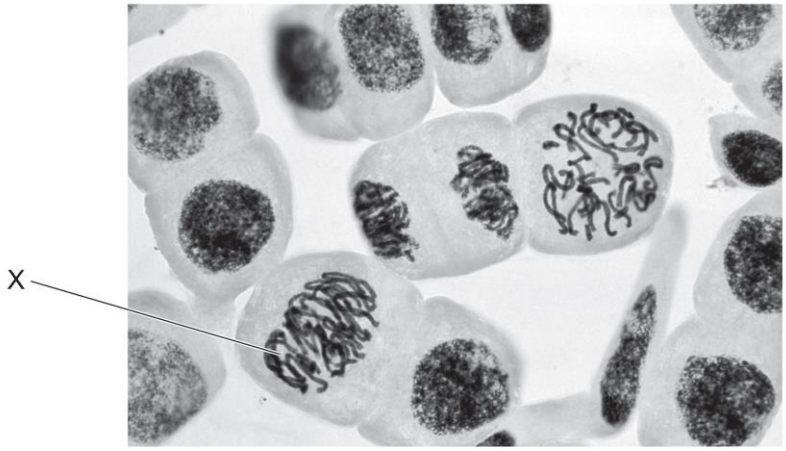
5 The photomicrograph shows a stage of mitosis.



What would be correct for the next stage in mitosis?

	two sister chromatids remain attached	nuclear membrane
A	no	**not** present
B	no	re-forming
C	yes	**not** present
D	yes	breaking down

6 The photomicrograph shows cells undergoing mitosis.



Which statement describes what will happen next in cell X?

A Chromatin coils up tightly and the nuclear envelope breaks down.

B Chromosomes line up along the equator of the cell and attach to the spindle.

C Sister chromatids move towards opposite poles, pulled by the spindle fibres.

D Spindle fibres break down and the cell prepares for cytokinesis.

7 A student observed the cells in the growing region (meristem) of an onion root and obtained the data shown.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

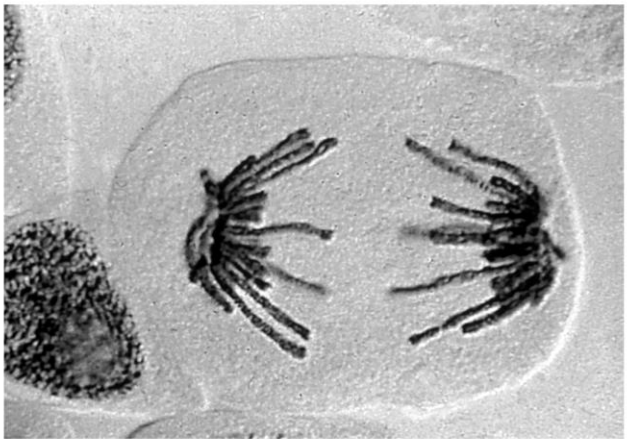
Which percentage of cells contains chromosomes that appear as two chromatids?

A 7.3% **B** 8.9% **C** 95.9% **D** 97.5%

8 Which row is a representation of one chromosome at the beginning of prophase of mitosis and the number of DNA strands in the chromosome?

	appearance of one chromosome	number of DNA strands
A		2
B		4
C		1
D		2

9 The photomicrograph shows a cell during mitosis.



What is happening in this cell?

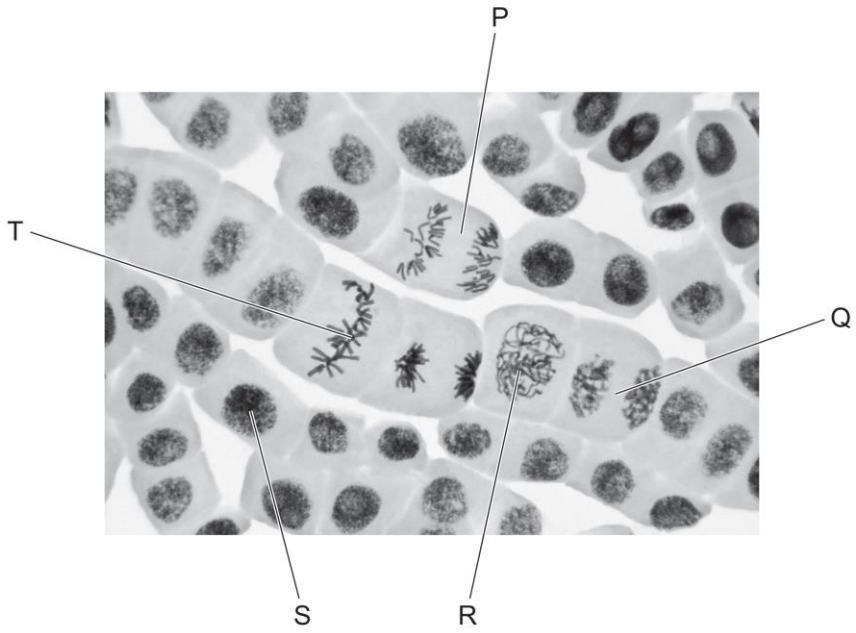
1 Chromosomes are condensing.

2 Centromeres are moving to opposite poles.

3 Spindle microtubules are shortening.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

10 The photomicrograph shows cells at different stages of mitosis.



A student wrote four statements about the photomicrograph.

1 Cell P shows anaphase.

2 Spindle formation is occurring in cell Q.

3 The amount of DNA in cell R is the same as in cell T.

4 The correct order for the stages is S → R → T → P → Q.

Which statements are correct?

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

11 What occurs during prophase in animal cells?

1 fragmentation of the nuclear envelope

2 nucleolus disappears

3 stained chromosomes become visible

4 centrioles replicate

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 3 only

D 1 and 4 only

12 Stained onion cells undergoing mitosis were observed using a microscope.

Which row is correct for mitosis in plant cells?

	prophase	metaphase	anaphase	telophase
A	centrioles visible	chromosomes pair up at the equator	two telomeres are visible on each chromatid	two nuclear membranes form
B	centromeres present	chromosomes align at the equator	chromosomes replicate to form chromatids	centrioles disappear
C	each chromosome is visible as two chromatids	centromeres attach to spindle fibres	chromatids separate and migrate to opposite poles	chromosomes decondense
D	spindle fibres formed by centrioles	centromeres attach to spindle fibres	chromatids are pulled apart by centrioles	spindle fibres form new nuclear membranes

13 At which stages of mitosis are chromosomes composed of two chromatids that are held together by a centromere?

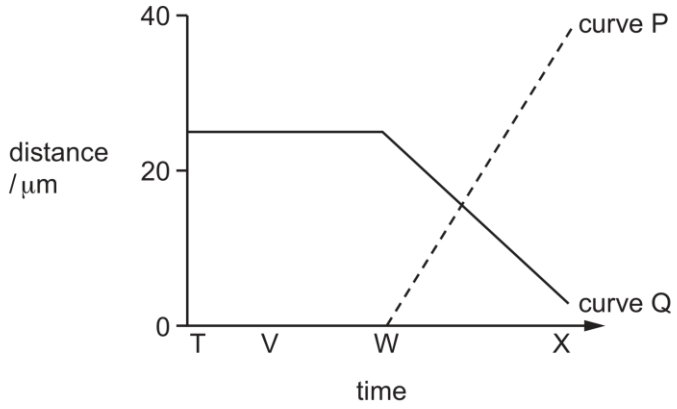
A anaphase and telophase

B anaphase and prophase

C metaphase and prophase

D metaphase and telophase

14 The graph shows how the distance between sister chromatids (curve P) and the distance between chromatids and centrioles (curve Q) changes during part of mitosis.



Which statements could be correct?

1 T to V represents interphase.

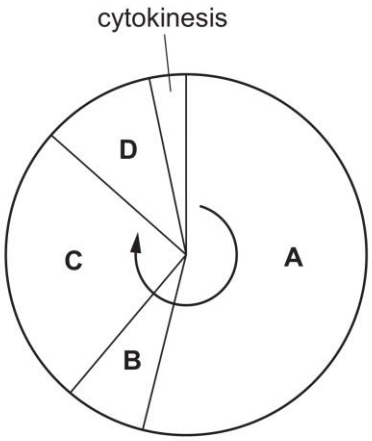
2 T to W represents metaphase.

3 W to X represents anaphase.

A 1 and 3 **B** 2 and 3 **C** 1 only **D** 2 only

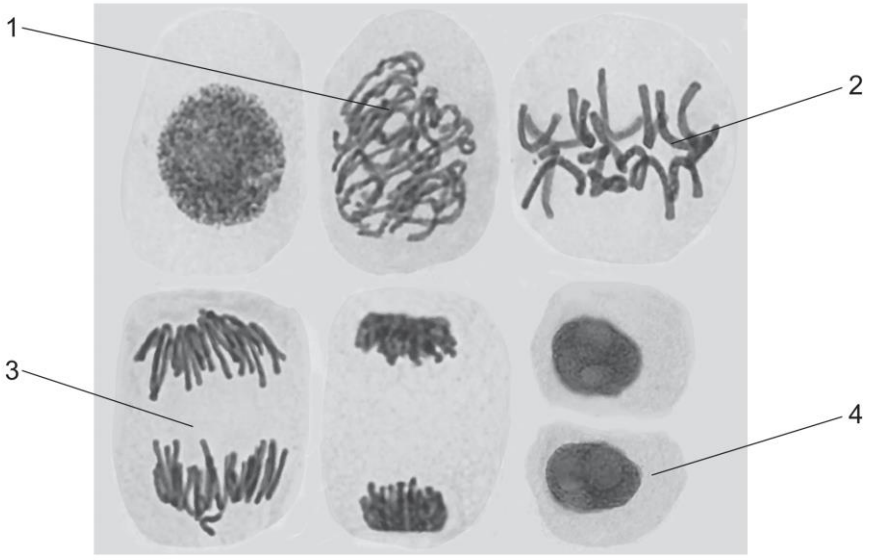
15 The diagram shows the cell cycle.

During which phase do chromosomes condense and become visible?



16 A drug has been developed to treat certain types of cancer. It prevents mitosis by binding to the spindle and preventing sister chromatids being separated and moving to opposite poles of the cell.

The photomicrograph shows cells in different phases of mitosis.



What represents the stages of mitosis that will be able to occur in a cell which is entering prophase when treated with this drug?

A 1 and 2 **B** 2 and 3 **C** 2 only **D** 3 and 4

17 Which stage of mitosis is correctly described?

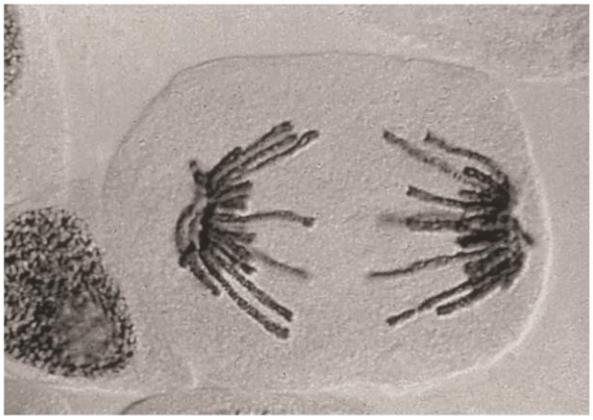
A In anaphase chromosomes line up across the equator.

B In metaphase the centrosomes replicate.

C In prophase chromatids move to opposite poles.

D In telophase chromosomes uncoil to form chromatin.

18 The photomicrograph shows a cell during mitosis.



What is happening in this cell?

1 Centrioles are replicating.

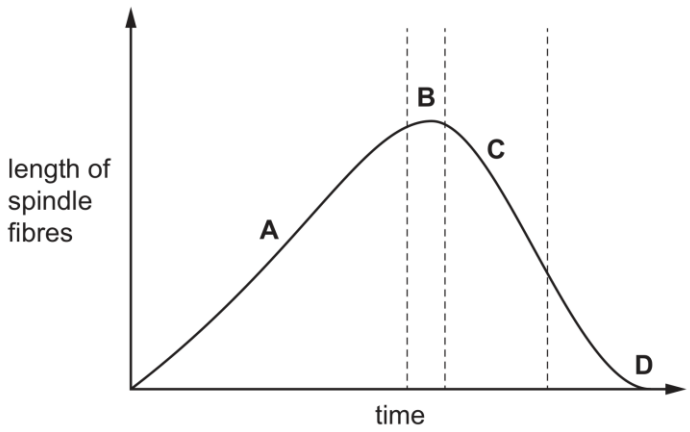
2 Spindle microtubules are shortening.

3 Chromatin is condensing.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 only **D** 3 only

19 The graph shows the length of the spindle fibres during mitosis.

Which region of the graph shows when all the centromeres have detached from the spindle fibres?



20 At which stage of mitosis do these events occur?

	centromeres separate	chromosomes become shorter and thicker
A	anaphase	interphase
B	anaphase	prophase
C	metaphase	interphase
D	metaphase	prophase

21 A student observed the cells in the growing region (meristem) of an onion root and obtained the data shown.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

Which percentage of cells contains chromosomes that appear as two chromatids?

A 7.3 **B** 8.9 **C** 95.9 **D** 97.5

22 The chromosome content of each daughter cell must be identical to that of the mother cell for successful cell replacement when repairing tissues.

Which stages of mitosis make sure that each daughter cell receives one chromatid from each chromatid pair?

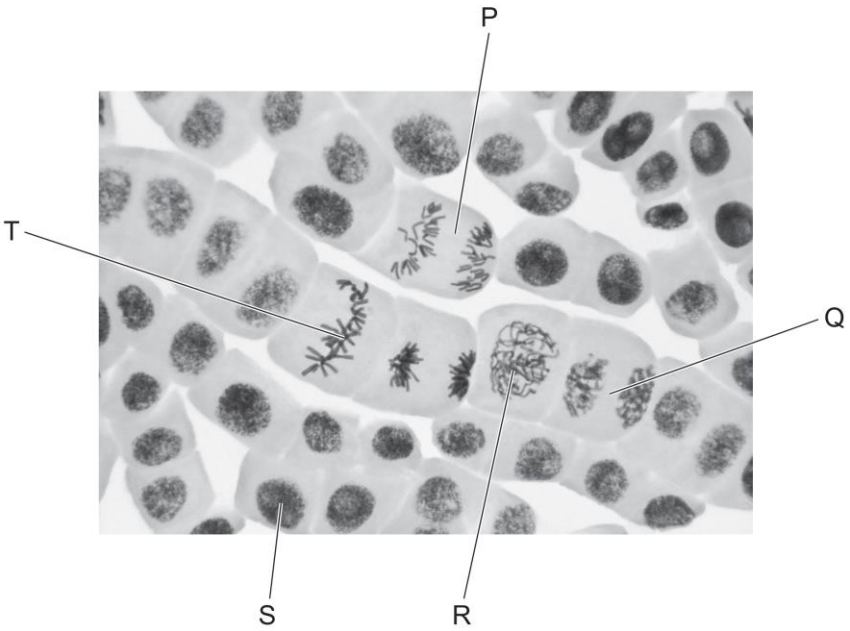
A prophase and metaphase

B metaphase and anaphase

C anaphase and telophase

D telophase and interphase

23 The photomicrograph shows cells in different stages of mitosis.



Which statements are correct?

1 Cell T shows metaphase.

2 DNA replication occurs in cell R.

3 The amount of DNA in cell P is the same as in cell T.

4 The correct order for the stages is S → R → T → P → Q.

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

24 Which row shows some of the events during a mitotic cycle in the correct time sequence?

	time →			
A	centromere of each chromosome splits	nucleoli become visible	nuclear envelope breaks into small vesicles	spindle microtubules produced
B	nuclear envelope breaks into small vesicles	spindle microtubules produced	centromere of each chromosome splits	nucleoli become visible
C	nucleoli become visible	nuclear envelope breaks into small vesicles	spindle microtubules produced	centromere of each chromosome splits
D	spindle microtubules produced	centromere of each chromosome splits	nucleoli become visible	nuclear envelope breaks into small vesicles