Full Name:	Civics group: 21S	Index no.:	Date:

Core Idea 2: Genetics & Inheritance

Mitosis and Meiosis
Tutorial 10

Record your answers below:

1	2	3	4	5	6	7	8

1 Which set of terms matches the definitions in the table?

Definition	the structure that replicates in the S phase	in animal cells, the 'pinching in' process that divides the cytoplasm	the cell structure that disintegrates to allow chromosome attachment to the spindle	the phase of the cell cycle immediately prior to entering mitosis
A	centriole	cytokinesis	nuclear envelope	S phase
B	centriole	late telophase	nucleolus	S phase
C	chromatid	cytokinesis	nuclear envelope	G_2 phase
D	chromatid	late telophase	nucleolus	G_2 phase

2 When human cells undergo mitosis, two daughter cells are produced.

Which essential organelles must be supplied to each daughter cell?

1 a pair of centrioles
2 some mitochondria
3 some lysosomes
4 a small quantity of rough endoplasmic reticulum

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

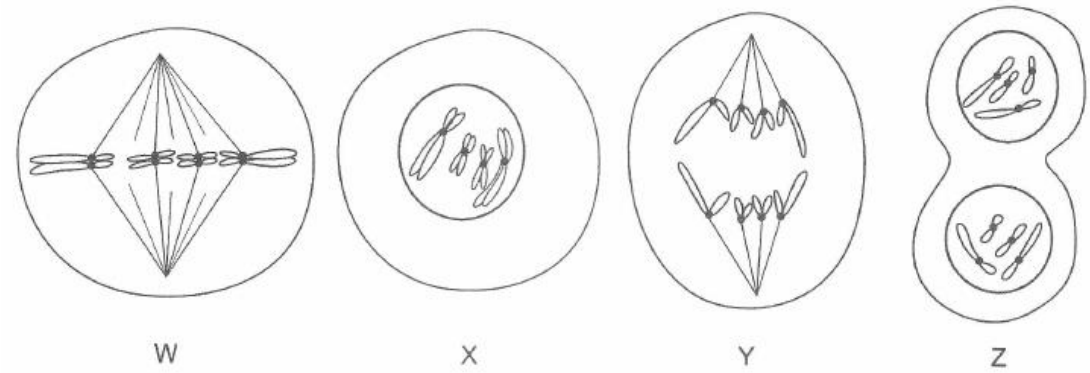
3 If 2 DNA molecules have the same length, centromere position, genes but different alleles, they are likely to be _____.

A sister chromatids
B homologous chromosomes
C duplicated chromosomes
D non-sister chromatids

4 X units of DNA is present in a somatic cell. What is the relative amount of DNA present in each daughter cell if the parent cell undergoes mitosis and meiosis respectively?

	Mitosis	Meiosis
A	X/2	X/4
B	X	X/4
C	2X	X
D	X	X/2

5 The diagrams show the cell cycle of a cell involved in asexual reproduction and the arrangement of two pairs of its chromosomes at different stages of the cycle.



Which combination represents the correct match between stage of cell cycle and arrangement of chromosomes?

	stage of cell cycle	arrangement of chromosomes
A	prophase	Z
B	anaphase	Y
C	metaphase	X
D	telophase	W

6 Vincristine is a drug used in chemotherapy to treat cancer which results from uncontrollable cell division. Vincristine binds with tubulin molecules in spindle fibres and prevents them from behaving normally.

During cancer treatment with vincristine, which stage of the mitotic cell cycle is affected and prevents the cancer cells from multiplying?

A crossing-over in meiosis
B cytokinesis after mitosis
C formation of bivalents during meiosis
D separation of chromatids during mitosis

7 The statements are about meiosis.

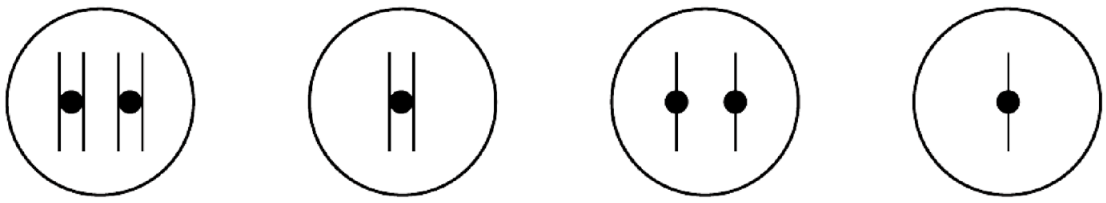
1 Homologous pairs of chromosomes form bivalents and cross-over.
2 Chromatids of homologous chromosomes undergo independent segregation.
3 Crossing-over occurs between chromatids of non-homologous chromosomes.
4 Cells at the end of meiosis are haploid.
5 Homologous chromosomes undergo independent segregation.

Which features of meiosis contribute to variation?

A 1, 2 and 3
B 1, 2 and 5
C 2, 3 and 5
D 3, 4 and 5

8 A cell with one pair of chromosomes (2n = 2) undergoes meiosis. Which nucleus is formed at the end of meiosis I?

A B C D



STRUCTURED QUESTIONS

QUESTION 1

Fig. 1.1 represents the behaviour of one pair of chromosomes during meiosis.

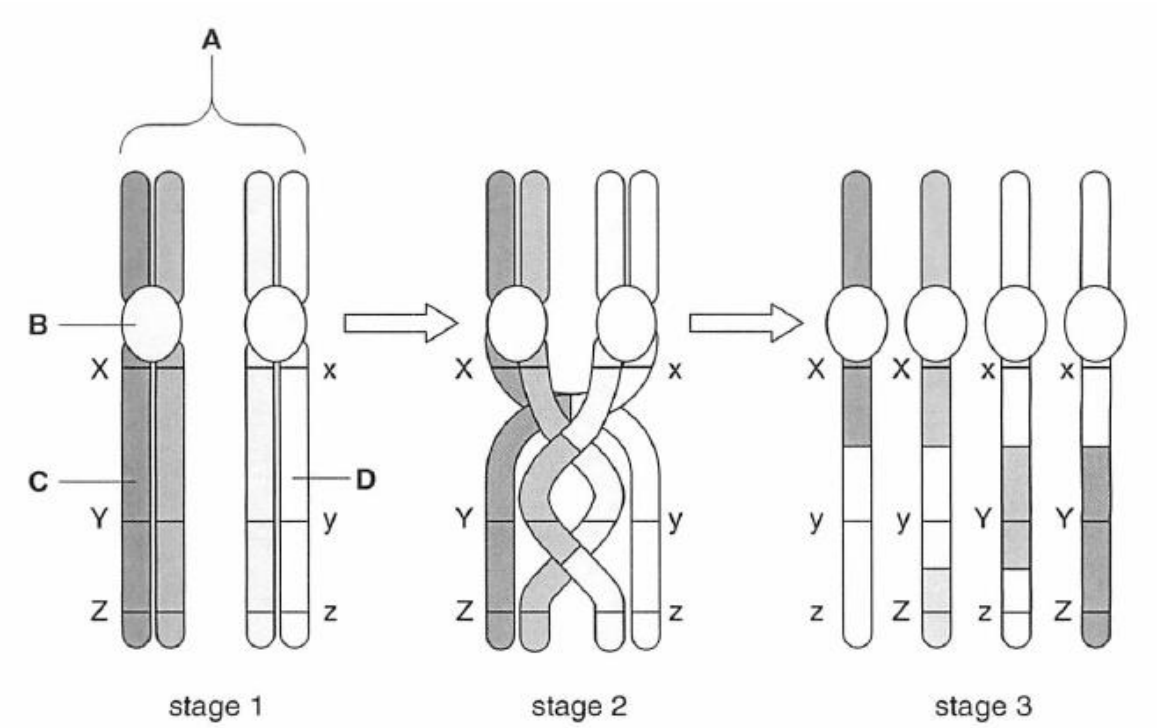


Fig. 1.1

(a) Name structures **A**, **B** and **C**.

A ……

B ……

C ……

[3]

(b) (i) Compare the structure of **C** and **D**.

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…… [3]

(ii) Explain the difference stated above between **C** and **D**.

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(c) Describe the process occurring during stage 2 and explain its effects on the products of meiosis.

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[Total: 11]

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QUESTION 2

Fig. 2.1 shows an immuno-fluorescent image of a cell undergoing mitosis.

In immuno-fluorescence, specific antibodies with fluorescent dyes attached are used to target specific bio-molecules within a cell. In Fig. 2.1, dark regions contain little fluorescent dye. The pale regions within **A** and **B** show the location of structures that have been stained with two different fluorescent dyes.

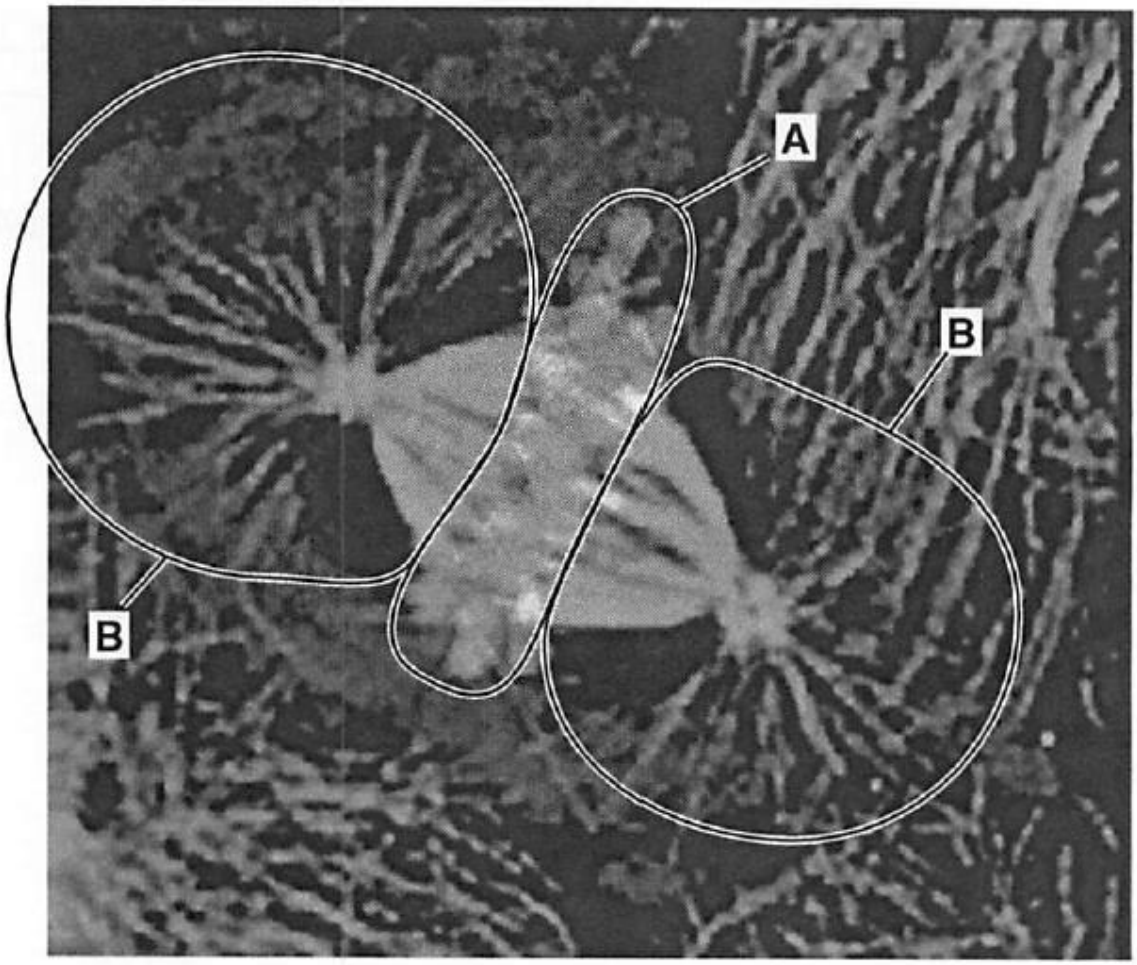

Fig. 2.1

(a) Identify the stage of mitosis shown in Fig. 2.1.

…… [1]

(b) Describe what happens in the next stage of mitosis.

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(c) Outline the role of centrioles in mitosis.

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(d) Describe and explain what happens to the nuclear envelope during mitosis.

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(e) Suggest the specific cell structures targeted by the two fluorescent dyes used in this preparation. Their binding is shown on Fig. 2.1 in regions **A** and **B**.

Structures in region **A** ……

Structures in region **B** ……
[2]

[Total: 12]

QUESTION 3

The graph below shows the DNA content per nucleus during nuclear division.

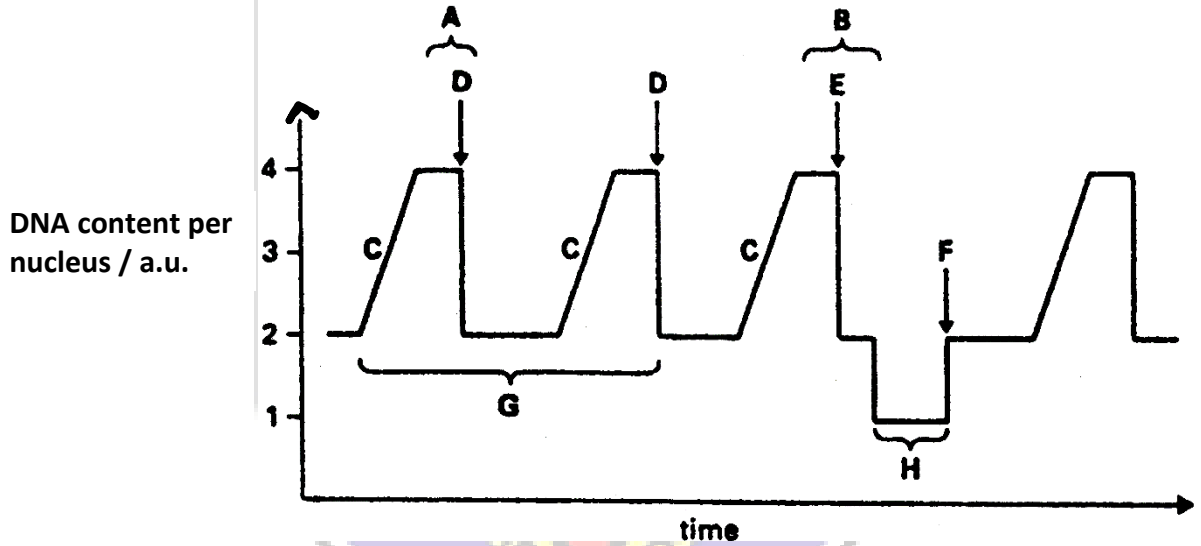

Fig 3.1

(a) Identify processes **A** to **F**.

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(b) With reference to Fig 3.1, describe and explain the change in ploidy of cells during **B**.

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(c) Describe the process occurring in C and explain how it aids in maintaining genetic stability of the daughter cells.

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(d) Another organism that reproduces sexually has a diploid chromosome number of 20.

Explain the importance of stage F in introducing genetic variation in the offspring of this organism.

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……..[2]

[Total: 13]

THE END