

The Mitotic Cell Cycle

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	The Mitotic Cell Cycle
Sub Topic	
Booklet	Multiple Choice
Paper Type	Question Paper 2

Time Allowed : 62 minutes

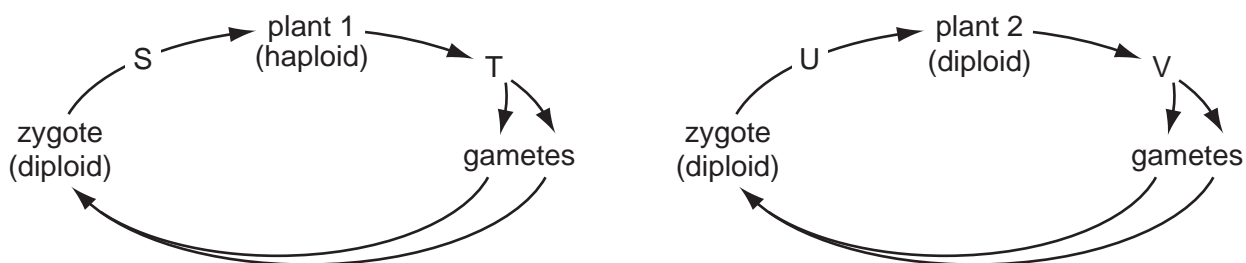
Score : / 51

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 The diagram shows the life-cycles of two types of simple plant.



Where will reduction divisions occur in the life cycles?

- A at S and U
 - B at S and V
 - C at T and U
 - D at T and V
- 2 Colchicine is a chemical that stops chromatids from separating during mitosis.

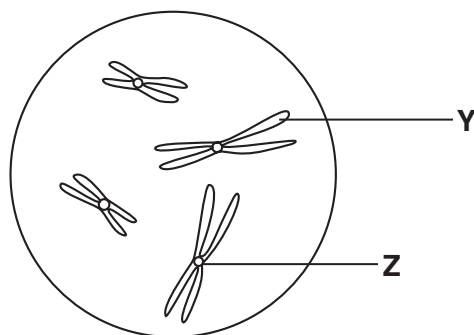
Which phase will the cell reach and then stop dividing?

- A anaphase
 - B interphase
 - C metaphase
 - D telophase
- 3 Which statement describes events during interphase of mitosis?
- A Chromosomes start to coil, becoming shorter and fatter.
 - B Chromosomes line up on the equator of the spindle.
 - C Chromatids are pulled apart by spindle fibres.
 - D Chromosomes are replicated ready for the next division.

4 What occurs in mitosis?

	homologous chromosomes pair	chromosome number remains the same
A	x	✓
B	✓	x
C	x	x
D	✓	✓

5 The diagram shows chromosomes in a nucleus.



What are Y and Z?

	Y	Z
A	centromere	centriole
B	centromere	chromatid
C	chromatid	centriole
D	chromatid	centromere

- 6 Which statement about a diploid cell is **not** correct?
- A It can undergo a mitotic division to allow growth to occur.
 - B It can undergo a mitotic division to repair a cell.
 - C It can undergo a reduction division to form haploid cells.
 - D It is one that possesses two complete sets of chromosomes.

- 7 Laboratory mice whose *p53* genes had been switched off developed tumours.

When their *p53* genes were switched on again, the tumour cells stopped dividing and died within a few days. Healthy cells in the mice were unaffected.

What do these observations suggest?

- A *p53* protein speeds up the mitotic cell cycle
 - B *p53* protein causes all cells to die
 - C the *p53* gene acts as a tumour suppressor gene
 - D the *p53* gene encourages the growth of tumours
- 8 A student examined the cells in the growing region (meristem) of an onion root and obtained the data below.

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

What percentage of cells contain chromosomes that appear as two chromatids?

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

9 Which definitions of *diploid* and *haploid* are true for typical eukaryotic cells?

- 1 *diploid* – any cell with an even number of homologous chromosomes
- 2 *diploid* – any cell with two copies of each homologous chromosome
- 3 *haploid* – any cell with half the diploid number of homologous chromosomes
- 4 *haploid* – any cell with one copy of each homologous chromosome

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

10 Which is always true of cytokinesis?

- 1 Cell structures replicate.
- 2 Cell structures are divided between two cells.
- 3 Nuclear envelope reforms.

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

11 The statements are about genes and proteins, involved in breast cancer.

- The protein coded by the *BRAC1* gene inhibits the growth of breast cancer cells.
- The protein coded by the *p53* gene suppresses tumours.

Which combination of genes is most likely to result in breast cancer?

	gene	
	<i>BRAC1</i>	<i>p53</i>
A	x	x
B	x	✓
C	✓	x
D	✓	✓

key

✓ = normal active gene

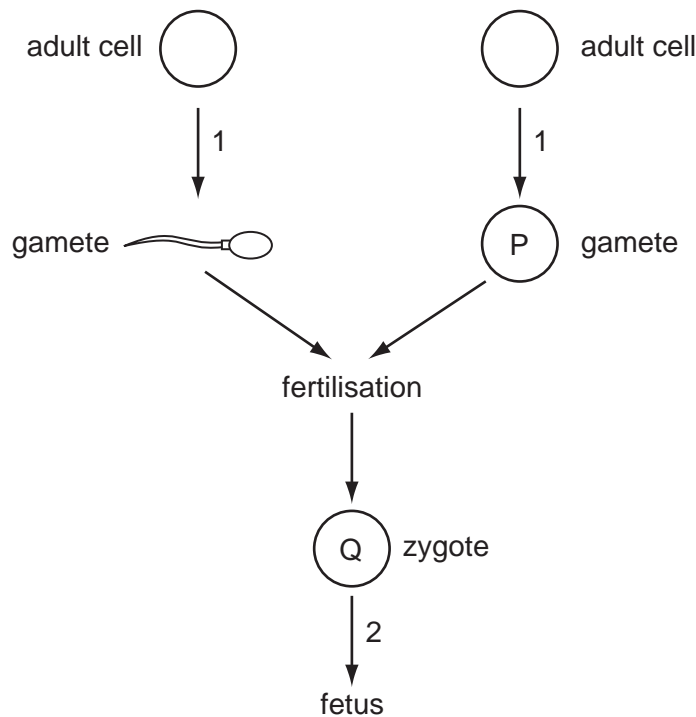
x = mutated gene

12 Exposure to which of the following increases the risk of developing a cancerous growth?

	ultraviolet light	viruses	carbon monoxide	X-rays
A	✓	✓	x	✓
B	✓	x	✓	✓
C	x	✓	✓	x
D	✓	x	✓	x

key
 ✓ increases risk
 x does not increase risk

13 The diagram shows an outline of the process of sexual reproduction.



Which row identifies the type of cell division occurring during stages 1 and 2 and the number of chromosomes in cells P and Q?

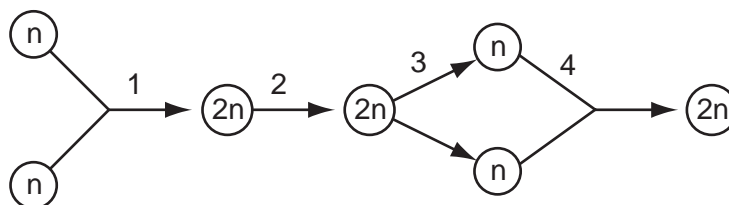
	1	2	P	Q
A	meiosis	meiosis	diploid	haploid
B	meiosis	mitosis	haploid	diploid
C	mitosis	meiosis	haploid	diploid
D	mitosis	mitosis	diploid	haploid

14 Which statements about cancer are correct?

- 1 Exposure to UV light from the sun always causes skin cancer.
- 2 Some viruses can cause cancer.
- 3 The mutation of genes controlling the cell cycle may cause cancer.

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

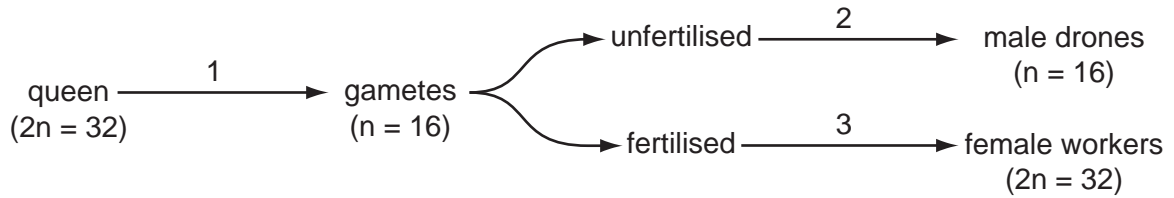
15 The diagram represents the life cycle of a sexually reproducing animal.



Which row correctly identifies meiosis and mitosis?

	meiosis	mitosis
A	1	4
B	2	1
C	3	2
D	4	3

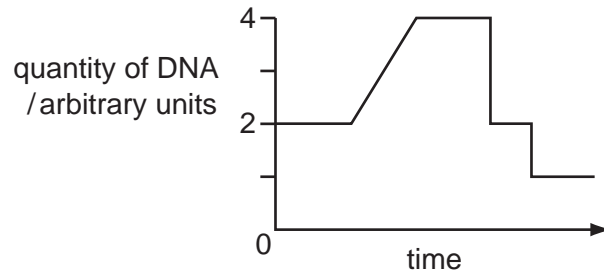
16 The diagram shows part of the life cycle of the honey bee, *Apis mellifera*.



Where does mitosis occur?

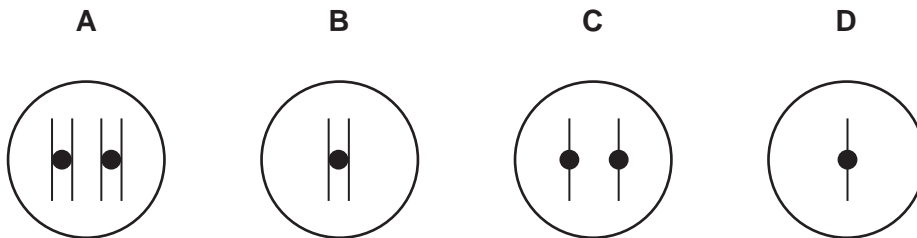
- A 1 only
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

17 The graph shows the change in the quantity of DNA in a cell during a reduction division (meiosis).



A cell with one pair of chromosomes ($2n = 2$) undergoes meiosis.

Which nucleus is formed as a result of this division?



18 Which statement is **incorrect** for mitotic cell division?

- A DNA is replicated semi-conservatively during mitosis.
- B DNA is normally unchanged from one generation of cells to the next.
- C The daughter cells have the potential to produce the same enzymes as the parent cell.
- D The same quantity of DNA is distributed to the nuclei of two new cells.

19 The diagram shows the chromosomes of one cell which has been squashed during mitosis.



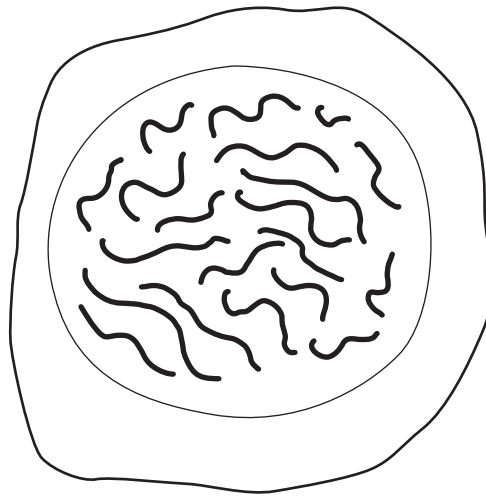
Which stage of mitosis is shown and what is the haploid chromosome number in this species?

	stage of mitosis	haploid chromosome number
A	anaphase	5
B	anaphase	10
C	metaphase	5
D	metaphase	10

20 Immediately after which stage in mitosis in an animal cell does the cytoplasm start to divide?

- A anaphase
- B metaphase
- C prophase
- D telophase

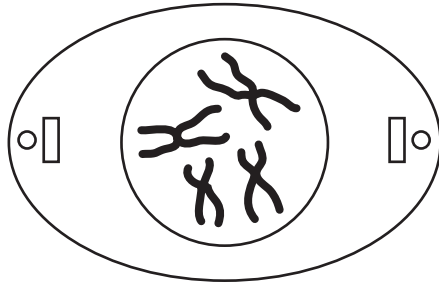
21 The diagram shows a cell of an organism formed by reduction division.



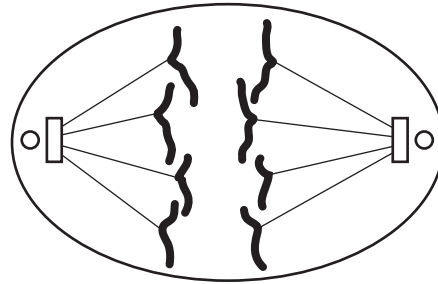
What is the diploid number for this organism?

- A 10
- B 20
- C 40
- D 46

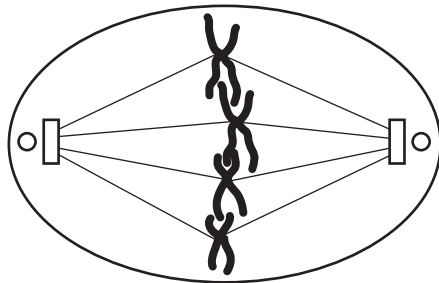
22 Which diagram represents a cell undergoing metaphase of mitosis?



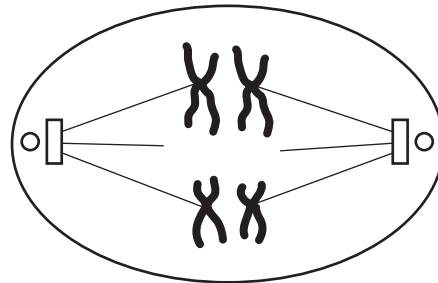
A



B



C



D

23 Colchicine is a substance which inhibits the formation of spindle fibres.

At which stage is the cell cycle interrupted?

- A cell division
- B DNA replication
- C interphase
- D mitosis

- 24 Which statement about a diploid cell is **not** correct?
- A It can undergo a mitotic division to allow growth to occur.
 - B It can undergo a mitotic division to repair a cell.
 - C It can undergo a reduction division to form haploid cells.
 - D It is one that possesses two complete sets of chromosomes.

- 25 Meiosis and mitosis are two types of cell division.

A cell has 10 chromosomes before it divides.

How many chromosomes will it have after dividing by meiosis or mitosis?

	meiosis	mitosis
A	5	10
B	5	20
C	10	5
D	20	5

- 26 Male bees are haploid. They develop from unfertilised eggs. Female bees are diploid.

Which statements are correct?

- 1 All male bees are genetically identical.
- 2 Male bee sperm cells are produced by mitosis.
- 3 New combinations of genes only occur in female bees.

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

27 What describes the behaviour of the nuclear envelope and the cell membrane during mitosis?

	nuclear envelope	cell membrane
A	breaks down	breaks down
B	breaks down	remains intact
C	remains intact	breaks down
D	remains intact	remains intact

28 The cell cycle includes mitosis.

Which are features of **nuclear** division?

- 1 forms cells of equal size to the parent cell
- 2 forms genetically identical cells
- 3 semi-conservative replication of DNA

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

29 In which process does mitosis **not** have an important role in living things?

- A** asexual reproduction
- B** growth of cells
- C** increase in size
- D** repair to damaged tissues

30 The diagram shows the chromosomes of a typical plant cell at the metaphase stage of mitosis.



Which row describes this cell during metaphase?

	diploid number (2n) for the plant	structures present at metaphase		
		cell wall	centriole	spindle
A	4	✓	x	✓
B	8	x	✓	✓
C	8	✓	x	✓
D	16	✓	✓	x

31 Which statement describes a cell that is capable of reproduction and belonging to a haploid organism?

- A** It has chromosomes that contain one polynucleotide chain.
- B** It is capable of carrying out a reduction division to form gametes.
- C** It possesses two copies of each gene as a result of fertilisation.
- D** It will undergo cell division by mitosis during asexual reproduction.

32 During which stage of the mitotic cell cycle is DNA replicated?

- A** anaphase
- B** interphase
- C** prophase
- D** telophase

33 Cancer cells divide out of control, forming tumours.

Which statement describes the difference between a cancer cell and a normal cell?

- A Cancer cells do not undergo cytokinesis.
- B Cancer cells have a shorter interphase.
- C Cancer cells do not have metaphase.
- D Only cancer cells have mutated DNA.

34 Which statement describes events during interphase of the mitotic cell cycle?

- A Chromatids are pulled apart by spindle fibres.
- B Chromosomes are replicated ready for the next division.
- C Chromosomes line up on the equator of the spindle.
- D Chromosomes start to coil, becoming shorter and fatter.

35 Chromosome telomeres promote DNA replication and are not completely replaced during mitosis. A substance **X** is known that completely replaces telomeres during mitosis.

What will be the effect of growing a cell culture with and without substance **X**?

	with substance X	without substance X
A	cells divide continually	cell division eventually slows and stops
B	cells divide more rapidly	cells divide continually
C	cell division eventually slows and stops	cell division stops immediately
D	cell division stops immediately	cells divide continually

36 What is a correct description of the centrioles, nuclear envelope and spindle during mitosis in animal cells?

	phase	centrioles	nuclear envelope	spindle
A	anaphase	replicate	absent	present
B	metaphase	present	reforms	present
C	prophase	move apart	breaks up	forms
D	telophase	replicate	breaks up	breaks up

37 Which part of a phospholipid molecule makes up most of the thickness of a cell surface membrane?

- A** glycerol
- B** hydrocarbon chains
- C** hydrophilic head
- D** phosphate group

38 Which of the following is true of cancer?

- A** Each mitotic division produces more than two daughter cells.
- B** Mitosis has stopped.
- C** Mitosis is uncontrolled.
- D** Mitosis results in cells with variable numbers of chromosomes.

39 Each of the following events takes place during mitosis.

- 1 centromeres divide
- 2 chromatids move to opposite poles of the cell
- 3 chromosomes line up along the equator of the spindle
- 4 chromosomes uncoil
- 5 two chromatids are joined by a centromere

In which order do the events take place?

	first → last				
A	1	2	4	5	3
B	3	1	2	4	5
C	4	5	3	1	2
D	5	3	1	2	4

40 To which of the processes shown does mitosis make a contribution?

	genetic variation	increase in cell number	replacement of damaged cells
A	x	✓	✓
B	✓	x	x
C	✓	✓	x
D	x	x	✓

key

✓ contributes to process

x does not contribute to process

41 The diagram shows the chromosomes of a cell at late prophase of mitosis.

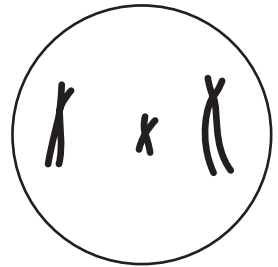
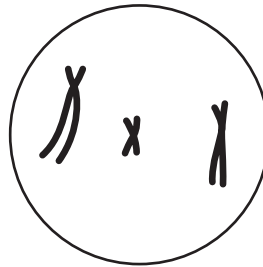


What will be the appearance of the products of this cell division as they enter prophase of their next division?

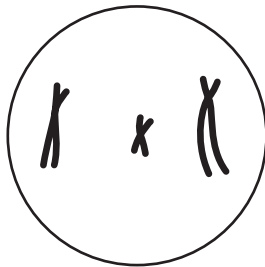
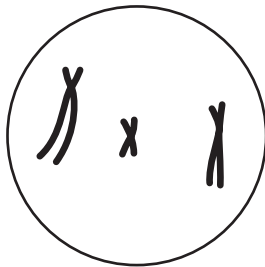
A



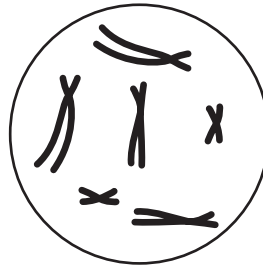
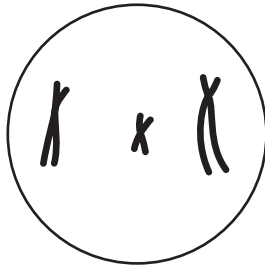
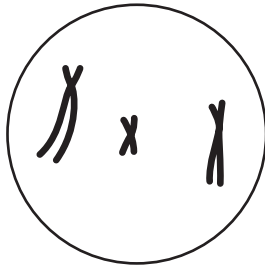
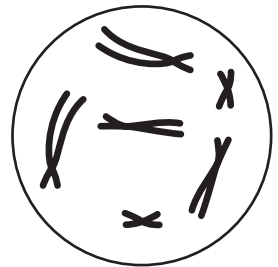
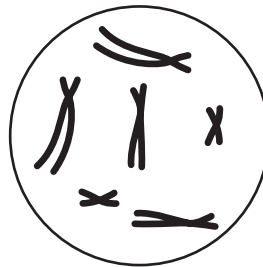
B



C



D



42 A diploid nucleus in a species of fruit fly has 8 chromosomes.

How many DNA molecules are present in the nucleus at the end of interphase?

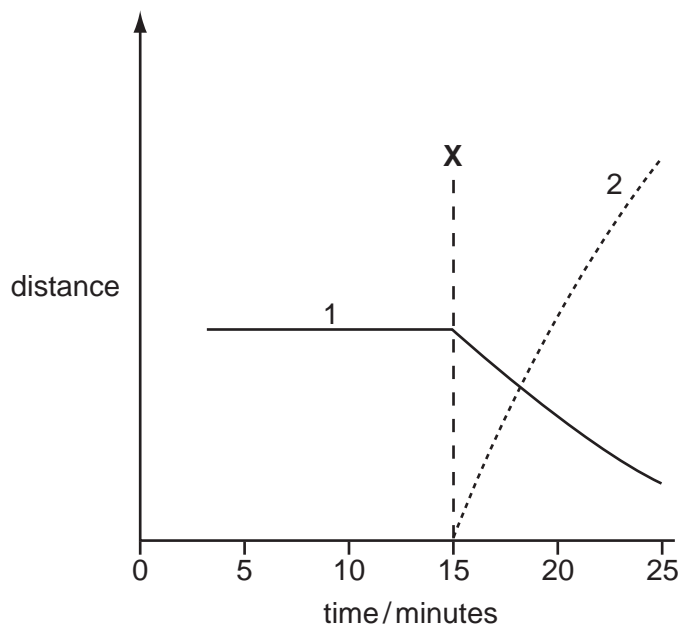
- A** 4 **B** 8 **C** 16 **D** 32

43 Mammalian skin cells in tissue culture were supplied with a source of radioactive thymine.

At which stage in the cell cycle will the thymine be used in the nuclei?

- A** interphase
B metaphase
C prophase
D telophase

44 The graph shows measurements taken during one mitotic cell cycle.

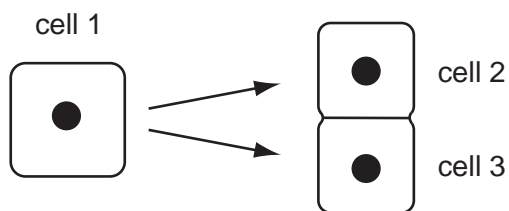


Which stage of mitosis begins at **X** and which measurements are shown by curves 1 and 2?

	stage beginning at X	distance between centromeres of chromosomes and poles of spindle	distance between centromeres of sister chromatids
A	anaphase	1	2
B	anaphase	2	1
C	metaphase	1	2
D	metaphase	2	1

45 Human cells contain 46 chromosomes.

The diagram shows a human cell in prophase of mitosis (cell 1) and the daughter cells just after telophase (cells 2 and 3).



How many DNA molecules are there in the nucleus of cell 1 and cell 2?

	cell 1	cell 2
A	46	23
B	46	46
C	92	23
D	92	46

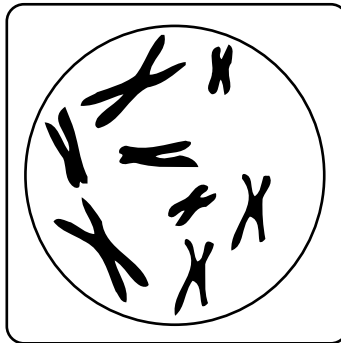
46 Which process occurs during prophase of mitosis in an animal cell?

- A division of centromeres
- B formation of chromosomes
- C replication of DNA
- D separation of centrioles

47 Immediately after which stage in mitosis in an animal cell does the cytoplasm start to divide?

- A anaphase
- B metaphase
- C prophase
- D telophase

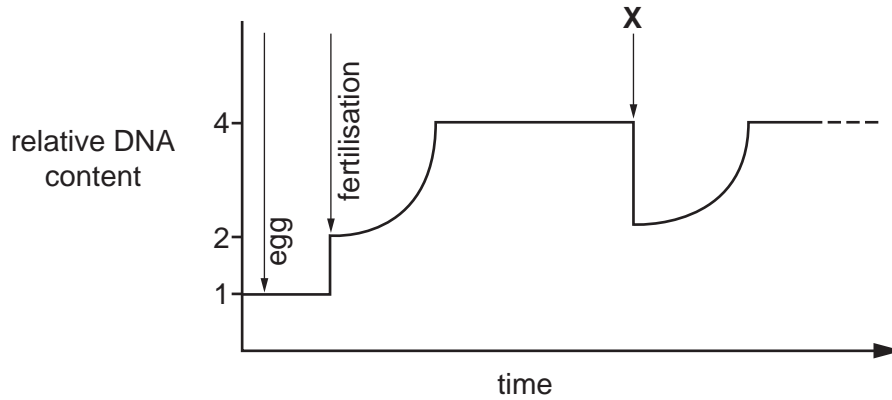
48 The diagram shows a diploid cell during mitosis.



Which stage of mitosis is shown?

- A anaphase
- B metaphase
- C prophase
- D telophase

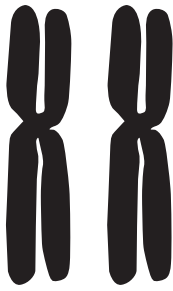
- 49 The graph represents the changes in the quantity of DNA present in one nucleus at different stages in the life cycle.



Which stage takes place at **X**?

- A interphase
 - B metaphase
 - C prophase
 - D telophase
- 50 The diagram shows chromosomes taken from the nucleus of a cell.

Which diagram represents a pair of homologous chromosomes?



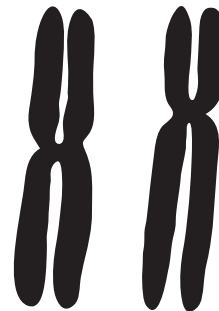
A



B

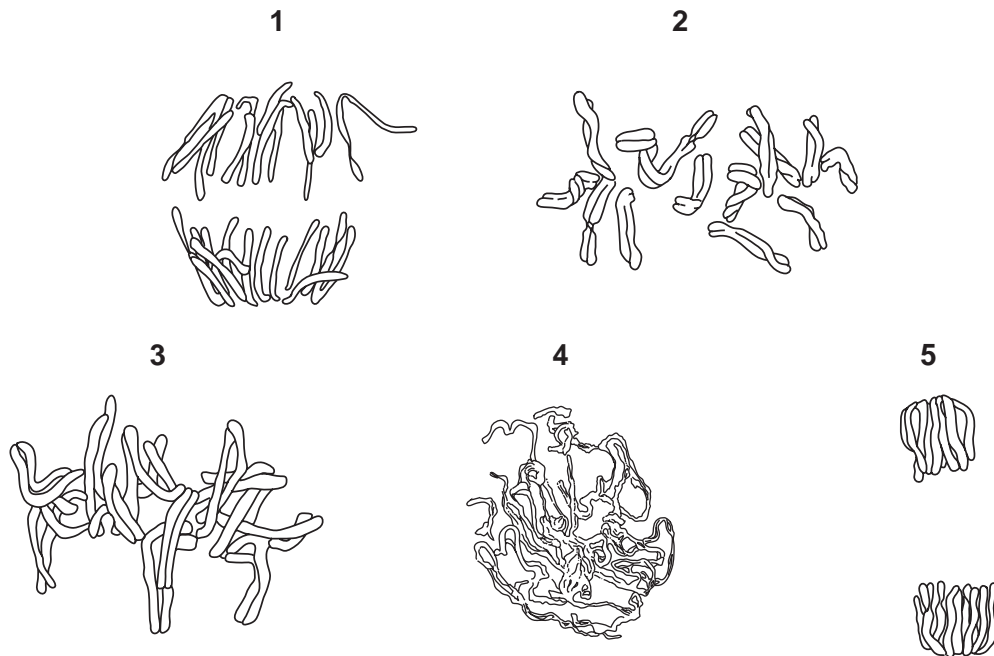


C



D

51 The drawings show stages of the mitotic cell cycle.



In which order do the stages occur?

	first	—————▶			last
A	2	1	3	5	4
B	2	4	1	5	3
C	4	2	1	3	5
D	4	2	3	1	5