Chapter 2
Structure of Chromosomes, Cell Cycle and Cell Division

Multiple Choice Type

1. Cytokinesis is the division of:
(a) Cell
(b) Cytoplasm
(c) Cell wall
(d) Nucleus

2. Karyokinesis is the division of:
(a) Cytoplasm
(b) Nucleus
(c) Celiwall
(d) Pollen grains

3. Cell division occurring in somatic cells is:
(a) Mitosis
(b) Meiosis
(c) Diplotene
(d) Diakinesis

4. In meiotic cell division four daughter cells are produced by two successive divisions in which:
(a) First division is equational and second is reductional
(b) First division is reductional and second is equational
(c) Both divisions are reductional
(d) Both divisions are equational.

5. Duplication of DNA occurs in:
(a) G1-phase
(b) G2-phase
(c) S-phase
(d) M-phase

6. The nuclear membrane disappears in:
(a) Prophase
(b) Anaphase
(c) Zygotene

(d) Pachytene

7. How many chromosomes are found in a cell of human?

(a) 20 Pairs
(b) 46
(c) 23
(d) 46 Pairs

8. The nuclear membrane and nucleolus become indistinguishable during:

(a) Telophase
(b) Metaphase
(c) Prophase
(d) Interphase

9. The disappearance of spindle and uncoiling of chromosomes takes place in:

(a) Anaphase
(b) Telophase
(c) Pachytene
(d) Meiosis

10. The regions where crossing-over takes place are called:

(a) Chiasmata
(b) Cell plate
(c) Spindle fibres
(d) Chromosomes

11. Duplicated chromosomes are joined at a point termed:

(a) Centrosome
(b) Centromere
(c) Centriole
(d) Chromatid

12. The centromere divides into two in:

(a) Prophase
(b) Metaphase
(c) Anaphase
(d) Telophase

13. After mitotic cell division, a female human cell will have:

(a) yy + xx chromosome
(b) yy + xy chromosome
(c) 22 + x chromosome
(d) 22 + y chromosome

14. The period between two successive mitotic divisions is:

(a) Diakinesis
(b) Interphase
(c) Anaphase
(d) Mitosis

15. The term meiosis was coined by:
(a) Farmer and Moore
(b) Winiwarter
(c) Flemming
(d) Strasburger

16. Meiosis I is also known as:
(a) Equational division
(b) Reductional division
(c) Direct cell division
(d) All of the above

17. Meiosis occurs in:
(a) Vegetative cells
(b) Reproductive cells
(c) Meristematic cells
(d) None of the above

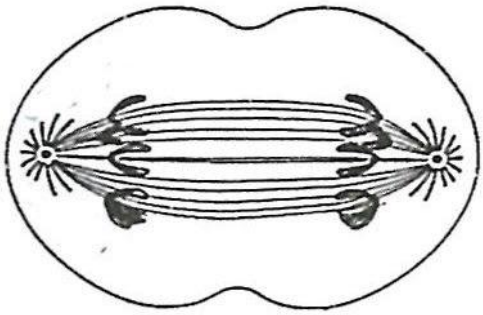
18. The process of meiosis takes place to produce:
(a) Cells of the body
(b) Cells of the brain
(c) Sperms and ova
(d) Testis and ovary

19. Leptotene, Zygotene and Diplotene phases are found in:
(a) Mitosis
(b) Prophase of Meiosis-I
(c) Interphase
(d) Prophase of Meiosis-II

20. After mitotic cell division a female ovum cell has:
(a) 44 + XX chromosome
(b) 22 + X chromosome
(c) 44 + xy chromosome
(d) 22 + Y chromosome

21. The regions where crossing over take place are called:
(a) Chiasma
(b) Cell plate

(c) Spindle fibre
(d) Chromosomes.
22. The basic structural unit of human chromosome is
(a) Nucleotide
(b) Nucleic acid
(c) Nucleoside
(d) Nucleosome.
23. The figure given alongside was shown to students of class 10 in the laboratory under a compound microscope. They were told to observe the slide, identify the stage of mitotic cell division and mention the number of chromosomes which would be found in the daughter cells. Which of the following will be the correct response?



(a) Anaphase, 8 chromosomes
(b) Metaphase, 8 chromosomes
(c) Anaphase, 4 chromosomes
(d) Telophase, 4 chromosomes
24. The structure that helps the centromere attach to spindle fibres during cell division is called the
(a) Kinetochore
(b) Chromatid
(c) Centromere
(d) Chromosome
25. The chromosomes are duplicated in:
(a)M phase
(b)G_1 phase
(c) S phase
(d) G_2 phase
26. Triple hydrogen bonds are present between:
(a) Adenine and Thymine
(b) Adenine and Cytosine

(c) Adenine and Guanine
(d) Guanine and Cytosine

Answer:

1.(b), 2.(b), 3.(a), 4.(b), 5.(c), 6.(a), 7.(b), 8.(b), 9.(b), 10.(a), 11.(b), 12.(b), 13.(a), 14.(b), 15.(a), 16.(b), 17.(b), 18.(c), 19.(b), 20.(b), 21.(a), 22.(d), 23.(c), 24.(a), 25.(c), 26.(d).

Assertion Reason Type

1. Assertion. Both centromere and centrosome are parts of chromosome.
Reason. The centromere is the region where spindle fibres attach, while the centrosome helps in the formation of spindle fibres.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer
A is False and R is True.
Explanation
Centromere is the place where spindle fibres attach and centrosome is the organelle which helps in forming spindle fibres. Centromere and centrosome are not parts of chromosome.

2. Assertion. The basic structural unit of DNA is nucleotide.
Reason. DNA is composed of repeating nucleosome which are made up of three components - pentose sugar, phosphate group and nitrogenous bases.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer
A is True and R is False.
Explanation
DNA is composed of repeating nucleosome which are made up of nucleotide and histone proteins. Nucleotide are composed of pentose sugar, phosphate group and nitrogenous bases.

3. Assertion. Centrosome is the point of attachment of two chromatids of a chromosome.
Reason. Centrosome initiates and regulates the process of cell division as it helps in the formation of spindle fibres.

1. Both A and R are True.
2. Both A and R are False.

3. A is True and R is False.
4. A is False and R is True.

Answer

A is False and R is True.

Explanation

Centromere is the point of attachment of two chromatids of a chromosome. Centrosomes or centrioles are structures present in cell that initiate and regulate cell division.

4. Assertion. Meiosis is the kind of cell-division which occurs during gamete formation in the gonads.

Reason. During meiosis, chromosome number remains the same in parent cell and daughter cells which is very significant to maintain the identity of the organism.

1. Both A and R are True.
2. Both A and R are False.
3. A is True and R is False.
4. A is False and R is True.

Answer

A is True and R is False.

Explanation

During meiosis, chromosome number is halved. During fertilisation, two haploid gametes/cells fuse to restore normal chromosome count.

Name the Following

1. The process by which cell divides into two equal daughter cells.
2. The type of cell division present in unicellular organisms.
3. The two kinds of cell division found in living organisms.
4. Mitosis takes place in which cells.
5. Replacement of dead cells is accomplished by which process.
6. The kind of division normally seen at the tip of root and shoots system.
7. Microtubules formation as a bipolar spindle in which stage.
8. The structure responsible for initiating cell division in animal cells.
9. The part of the cell associated with heredity.
10. Process by which gametes are produced by.
11. The process responsible for variation.
12. The kind of division takes place in the reproductive tissues.
13. The largest phase of a normal cell cycle.
14. The stage when chromosomes arrange at the equator.
15. Separation of sister chromatids takes place in which stage.

16. Stage in which the crossing-over takes place.
17. The point at which the explicated chromosomes are joined.
18. Name the stage during which nuclear membrane and nucleoide reappear.
19. 'V' shaped chromosome having the centromere at the centre.
20. Nuclear envelope and nucleoli reappear in which stage.
21. Result of uncontrolled cell division.

Answer:

1. Cell division
2. Amitosis
3. Mitosis, Meiosis
4. Somatic cells
5. Mitosis
6. Mitosis
7. Metaphase
8. Centrioles
9. Chromosome
10. Meiosis
11. Crossing-over
12. Meiosis
13. Prophase
14. Metaphase
15. Anaphase
16. pachytene
17. Centromere
18. Telophase
19. Metacentric
20. Telophase
21. Cancer

Fill in the Blanks

Complete the following sentences with appropriate words:

1. The type of cell division that occurs in apical meristem of plants is _____.
2. _____ means splitting of nucleus.
3. The stage between Meiosis-I and Meiosis-II is called _____.
4. Colchicine arrests cell division at _____.
5. _____ is the point at which sister chromatids are held together.
6. The spindle fibres are made of _____

7. The pairing of homologous chromosomes is called _____
8. Chromosomes are _____ material.
9. Polytene chromosomes are found in _____ of fly larvae.

Answer: 1. Mitosis, 2. Karyokinesis, 3. Interkinesis, 4. Metaphase., 5. Centromere, 6. Microtubules, 7. Synapsis, 8. Hereditary, Salivary glands.

True & False: Mention, if the following statements are True or False. If false rewrite the wrong statement in its correct form:

1. Somatic cells of a multicellular organisms arise from a single cell by mitosis.
2. Mitosis results in four daughter cells.
3. Mitosis keeps the chromosome number constant through the generations.
4. Germ cells divide meiotically to produce gametes.
5. The alkaloid coichicine inhibits formation of mitotic spindle.
6. Asexual reproduction is accomplished through mitosis.
7. Chromosomes other than sex-chromosomes are autonomous.
8. Cytokinesis takes place through cleavage furrow in animal cells.
9. Chromosomes are arranged in the form of chromatids at the equator in prophase.
10. Chromosomes are the thickest and shortest in telophase.
11. Meiosis is also called heterotypic division.
12. Prophase of meiosis-I has five sub-stages.
13. Meiosis leads to recombination of characters.

Answer:

1. (True)
2. (False, meiosis results in four daughter cells)
3. (False, meiosis keeps the chromosome number constant through the generations.)
4. (True)
5. (True)
6. (True)
7. (True)
8. (True)
9. (False, chromosomes are arranged in the form of chromatids at the equator in metaphase.)
10. (False, chromosomes are thickest and shortest in anaphase.)
11. (True)

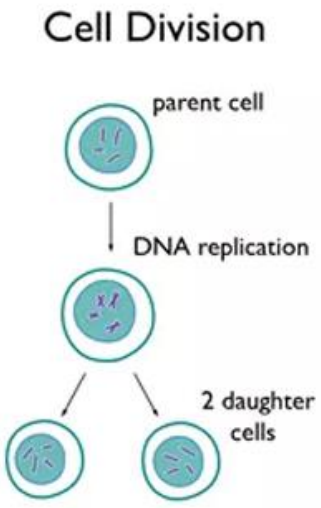
12.(True)
13.(True)

Give Reasons

Question 1: The mitosis is called equational division.
Answer: Mitosis is called equational division because during mitosis the cell divides equally into two identical daughter cells.
Question 2: The meiosis is called reductional division.
Answer: The meiosis is called reductional cell division since the four daughter cells formed have half the number of chromosomes than the mother cell.
Question 3: Gametes must be produced by meiosis for sexual reproduction.
Answer: The number of chromosomes in sex cell is halved.
Question 4: Chromosomes are the carriers of heredity.
Answer: The chromosomes contain gene which carry specific features to the offsprings.

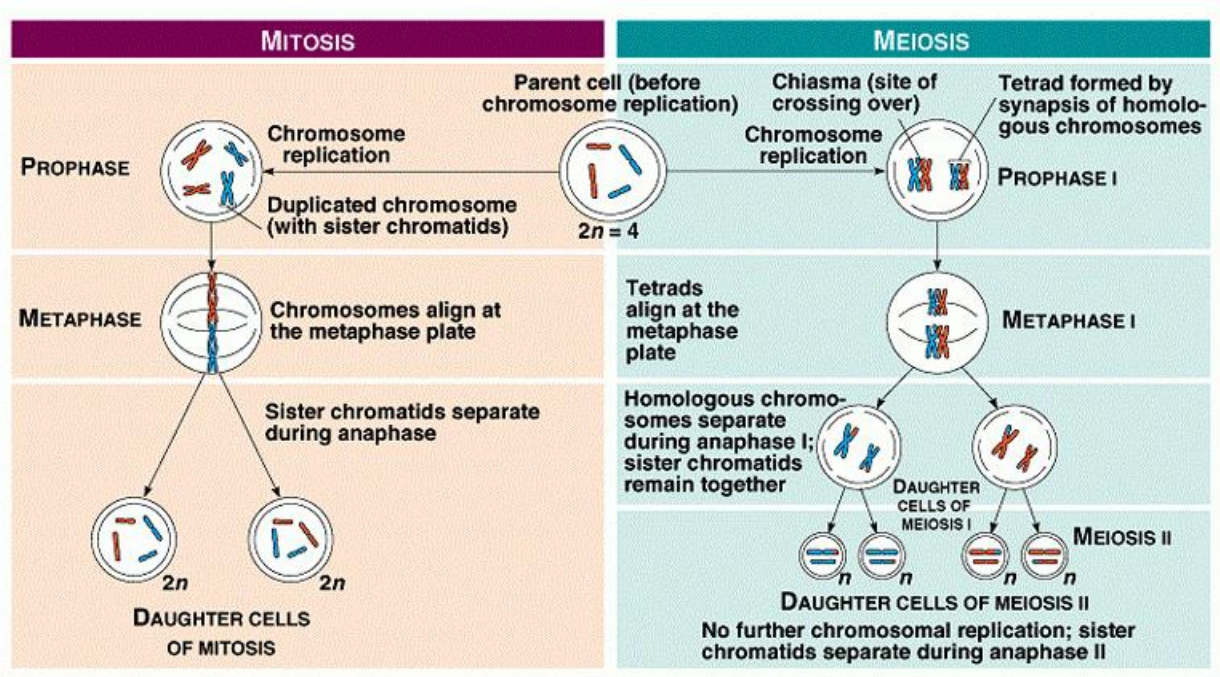
Short Questions

Question 1: What is direct cell division? Explain with an example.
Answer: Amitosis is the direct cell division. It is the simplest type of cell division in which there is no spindle formation or condensation of fibres. Nucleus is directly divided into two, e.g., bacteria.



Question 2: Name the two kinds of cell division found in living organisms.

Answer: Meiosis and Mitosis.



Question 3: What type of cell division does occur in somatic cells of the body?
Answer: The mitotic cell division occurs in somatic cells of the body.

Question 4: Where does the meiosis occur in our body?
Answer: In our body meiosis occurs in germ cells i.e. in gonads.

Question 5: What do you mean by cell-cycle?
Answer: Every cell capable of cell division passes through different stages or phases in a cyclic maimer. It is called the cell cycle.

Question 6: Write the name of various steps of cell cycle.
Answer: Cell Cycle

Question 7: Name the structure which initiates cell division?
Answer: Centriole (Centrosome).

Question 8: Why gametes have a haploid number of chromosomes?
Answer: The gametes are produced as a result of meiosis hence they have haploid number of chromosomes.

Question 9: Mention three significant changes that occur in a cell during interphase.
Answer: The three significant changes that occur in a cell during interphase are:

(i) The cell grows in size.
(ii) New DNA is synthesized as per the old DNA templet.
(iii) Synthesis of RNA and protein takes place.

Question 10: What is cytokinesis?
Answer: During cell division karyokinesis (division of nucleus) is followed by the division of cytoplasm. It is called cytokinesis. Or in other words cytokinesis is the division of cytoplasm.

Question 11: How does colchicine act as mitotic poison ? Is there any advantage of it?
Answer: Colchicine is an alkaloid obtained from Autumn crocus (Colchicum autumnale). It inhibits the formation of mitotic spindle. As a result, chromosomes duplicate but they remain within the same cell, increasing in number (endoduplication). Such cells are called polyploid cells. Its advantage is that, plant breeders have used colchicine-induced polyploidy as a means of producing variants of agricultural and horticultural crops.

Question 12: Explain the significance of mitosis.
Answer:
(i) It helps to maintain linear heredity of an organism by keeping the chromosome number constant in daughter cells.
(ii) It helps in development of organism from zygotic stage to adult stage.
(iii) It is the means of repair and regeneration of cells.
(iv) Asexual reproduction is accomplished only through mitosis.
(v) Details of mitosis are similar in all organisms which emphasizes the unity of life.

Question 13: Why is meiosis referred to as reduction division ?
Answer: The meiosis is referred to as reduction division because the number of chromosomes in the daughter cells is half than that of the mother cell.

Question 14: What is the importance of meiosis in creating variations ?
Answer: During meiosis, the exchange of chromosomal material takes place between the non-sister chromatids forming new combinations. These new combinations give rise to variations which result in the evolution of species and even in the origin of new species.

Question 15: State how does meiosis maintain chromosome number in a species.
Answer: The gametes are formed by meiosis. During meiosis the number of chromosomes is reduced to half i.e. the gametes contain haploid number of chromosomes. The male and

female gametes fuse to form a diploid zygote. In this way meiosis maintains chromosome number in a species.

Question 16: How prophase-I of meiosis differs from prophase of mitosis in an essential way ? Describe how it affects the daughter cells ?

Answer: Prophase-I of meiosis has five sub-stages namely Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis. In pachytene exchange of genetic material between non-sister chromatids takes place through crossing over and chiasma formation which does not occur in prophase of mitosis. As a result, the daughter cells have a variation in their genetic composition contrary to identical daughter cells of mitosis.

Question 17: What is the importance of chiasma formation ?

Answer: Chiasma is the region where crossing-over takes place. By the formation of chiasma, exchange of genetic material between non-sister chromatids of the homologous chromosomes is accomplished. So, chiasma is the means of bringing about recombination of characters and thus variations in multicellular organisms.

Descriptive Type Question

Question 1

Define the following terms:

(a) Chromosome

(b) Gene

(c) Cell division

(d) Chromatid

(e) Aster

Answer

(a) Chromosome — Chromosomes are formed of very long, highly coiled and condensed chromatin fibres which are made of DNA (about 40%) and histones (about 60%). They are present in the nucleus of the cell. They carry the chemical instructions for the reproduction of the cell.

(b) Gene — Genes are specific sequences of nucleotides on a chromosome that encode particular proteins which express in the form of some particular feature of the body. They are the units of heredity which are transferred from parents to offsprings and are responsible for some specific characteristics of the offspring.

(c) Cell Division — Cell division is the method in which the cell divides and the duplicated chromosomes get evenly distributed into the daughter cells.

(d) Chromatid — Duplicated chromosomes consist of two identical strands, each of these is called a chromatid. Before replication, one chromosome is composed of one DNA molecule. In replication, the DNA molecule is copied, and the two molecules are known as chromatids. During the later stages of cell division these chromatids separate longitudinally to become individual chromosomes.
(e) Aster — During mitosis in an animal cell, after the centrosome splits into two along with simultaneous duplication of the centrioles contained in it, each centriole is surrounded by radiating rays and is termed aster (meaning star).

Question 2

Give reason:
(a) Gametes must be produced by meiosis for sexual reproduction.
(b) Why is meiosis referred to as 'reductional division'?
(c) The children of the same parents, howsoever similar, are different from each other in certain aspects.

Answer

(a) Gametes must be produced by meiosis for sexual reproduction because the numbers of chromosomes are reduced to half during meiosis and then the normal diploid numbers of chromosomes are regained during the process of fertilization.
(b) Meiosis is referred to as 'reductional division' because the number of chromosomes are reduced to half i.e. out of the 23 pairs of chromosomes in humans, only single set of chromosomes are passed on to the sex cells. This is essential because when the male and female gametes fuse during fertilization, the normal double (diploid) number of chromosomes is reacquired. The diploid number, as a rule, is expressed as “2n” and the haploid number as "n".
(c) The mixing up or recombination of genes during meiotic division provides for the innumerable variations and diversity in the progeny. That is how, the children of the same parents, howsoever similar, are different from each other in certain aspects.

Question 3

Distinguish between the following pairs:
(a) Cytokinesis and Karyokinesis
(b) DNA and RNA
(c) Nucleosome and Nucleotide
(d) Centrosome and Centromere
(e) Haploid and Diploid

Answer

(a) Difference between Cytokinesis and Karyokinesis

Cytokinesis	Karyokinesis
It is the division of the cytoplasm.	It is the division of the nucleus.
It occurs after karyokinesis.	It is the first division.
It results in the formation of two daughter cells.	It results in the formation of two nuclei.

(b) Difference between DNA and RNA

DNA	RNA
DNA is Deoxyribonucleic acid.	RNA is Ribonucleic acid.
It consists of four distinct bases: Thymine, Adenine, Cytosine and Guanine.	It consists of four distinct bases: Uracil, Adenine, Cytosine and Guanine.
The DNA is a double-stranded molecule.	The RNA is a single-stranded molecule.
It is located in the nucleus of a cell and in the mitochondria.	It is found in the cytoplasm, nucleus, and in the ribosome.

(c) Difference between Nucleosome and Nucleotide

Nucleosome	Nucleotide
Nucleosome is the complex that is made up of DNA wrapped around histone proteins.	The chemical composition of nucleotide consists of a phosphate group, a sugar and a nitrogenous base.

(d) Difference between Centrosome and Centromere

Centrosome	Centromere
It is an organelle of the animal cell surrounding the centrioles, located near the nucleus.	It is a non-stainable part of chromosome at which two chromatids join.
It contains one or two centrioles which move towards the opposite poles and forms spindle fibres during cell division.	It provides attachment of spindle fibres during cell division.

(e) Difference between Haploid and Diploid

Haploid	Diploid
Only half the number of chromosomes (only one member from each pair) is passed on to each daughter cell.	Full Set of chromosomes is passed on to each daughter cell.
It is denoted by n.	It is denoted by 2n.
This state is found during meiotic division.	This state is found during mitotic division.

Question 4

Write full form of the following abbreviations:

(a) DNA

(b) RNA

Answer

(a) DNA — Deoxyribonucleic acid

(b) RNA — Ribonucleic acid

Question 5

Given below are the sets of four terms. Choose the odd one and write the category of the remaining terms:

(a) Adenine, Guanine, Adrenaline, Thymine

(b) Pentose sugar, Histones, Phosphate group, Nitrogenous bases

(c) Metaphase, Anaphase, Interphase, Telophase

(d) G1 phase, M phase, G2 phase, S phase

(e) Chromoplast, Chromosome, Chloroplast, Leucoplast

Answer

(a) Odd one out — Adrenaline

Adenine, Guanine, Thymine — Nitrogenous bases

(b) Odd one out — Histones

Pentose sugar, Phosphate group, Nitrogenous bases — form nucleotide

(c) Odd one out — Interphase

Metaphase, Anaphase, Telophase — Phases of Mitosis

(d) Odd one out — M phase

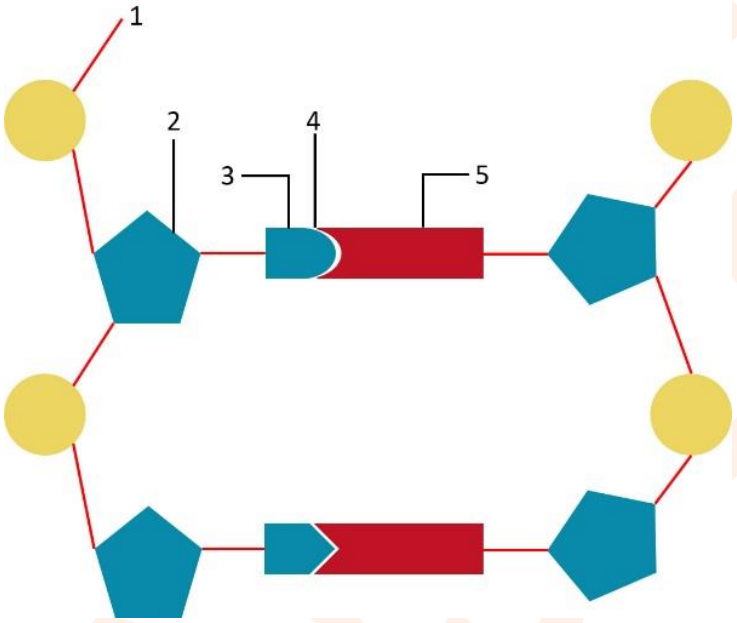
G1 phase, G2 phase, S phase — Phases of Interphase

(e) Odd one out — Chromosome
Chromoplast, Chloroplast, Leucoplast — Plastids

Structured/ Application/ Skill Type

Question 1

Given below is a schematic diagram of a portion of DNA.



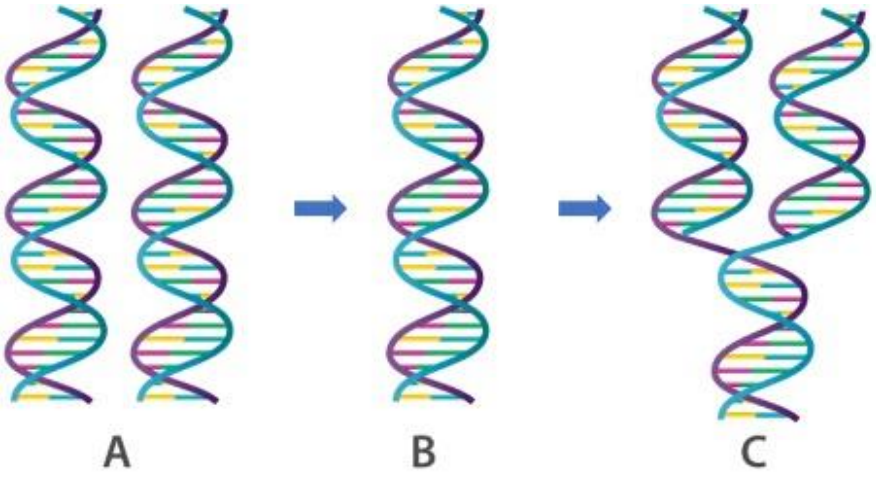
(a) How many strands are shown in the diagram?
(b) How many nucleotides have been shown in each strand?
(c) Name the parts numbered 1,2,3,4 and 5 respectively.
(d) Name the DNA unit constituted by the parts 1, 2 and 3 collectively.

Answer

(a) 2 strands are shown in the diagram.
(b) 2 on each strand.
(c) The parts are as follows:
1 → Phosphate
2 → Sugar
3 → Bases
4 → Hydrogen Bond
5 → Base
(d) The DNA unit constituted by the parts 1, 2 and 3 collectively is called Nucleotide.

Question 2

The three sketches given below (A, B and C) are intended to represent the replication of DNA. What should be their correct sequence starting with the first and ending with the last?



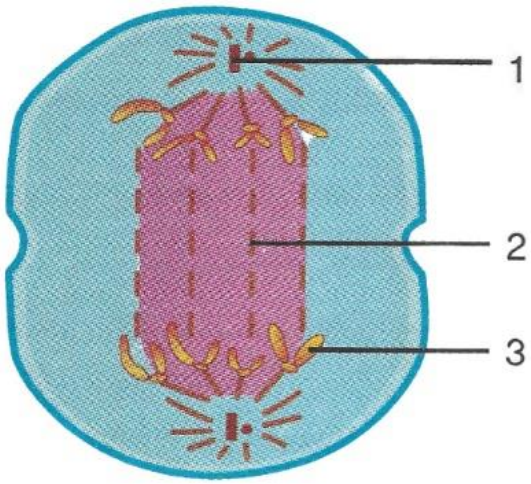
Answer

The correct sequence is:

B, C and A

Question 3

The diagram below represents a stage during cell division. Study the same and then answer the questions that follow:



a. Name the parts labelled 1, 2 and 3.

b. Identify the above stage and give a reason to support your answer.

c. Mention the type of cells in our body where this type of cell division occurs.

d. Name the stage prior to this stage and draw a diagram to represent the same.

Answer

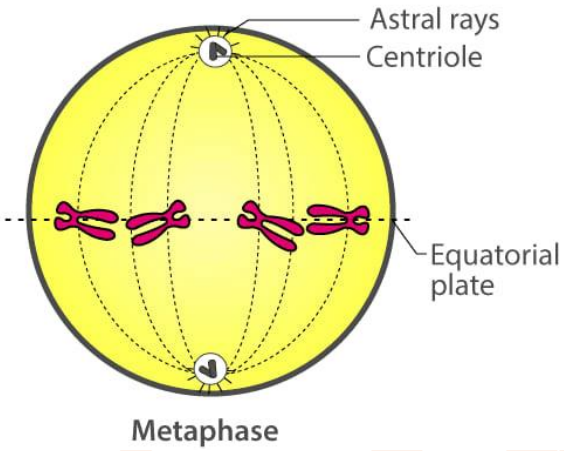
(a) The parts are as follows:

1 → Centromere

2 → Spindle fibres

3 → Chromatids

(b) The stage described in the diagram is the late anaphase of mitosis in an animal cell. The stage can be identified by the presence of separated chromatids which are found at the two poles of the cell. The appearance of the furrow in the cell membrane classifies the stage as the late anaphase.
(c) The division is mitotic and this kind of cell division occurs in all the cells of the body except for the reproductive cells.
(d) The stage before anaphase is metaphase. Below diagram shows metaphase:

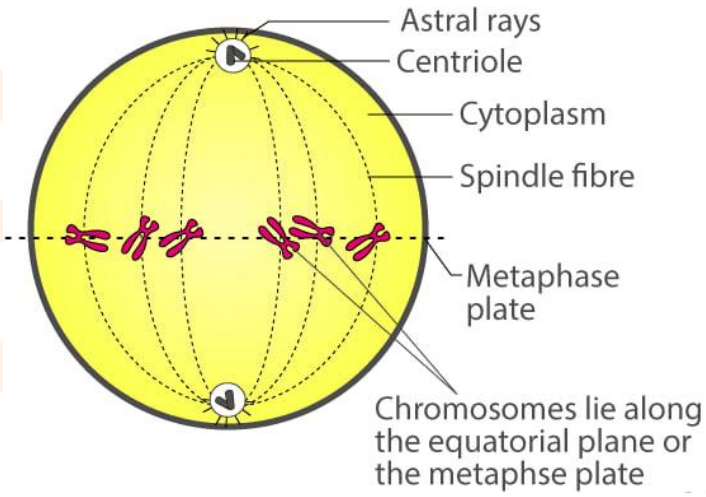


Question 4

Draw a labelled diagram to show the metaphase stage of mitosis in an animal cell having "6" chromosomes.

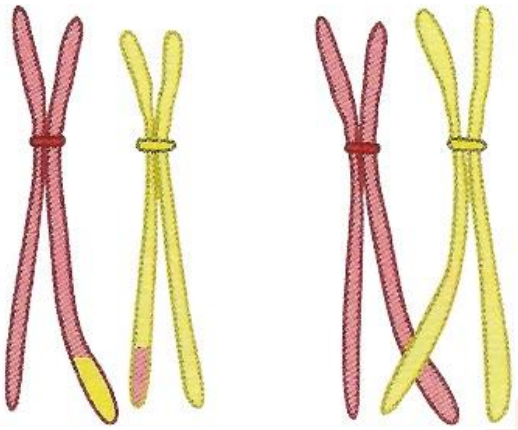
Answer

Below diagram shows the metaphase stage of mitosis in an animal cell having 6 chromosomes:



Question 5

The diagram given below represents a certain phenomenon which occurs during meiosis. Name and explain the phenomenon by using the terms - homologous chromosomes, chromatids, and crossing-over.

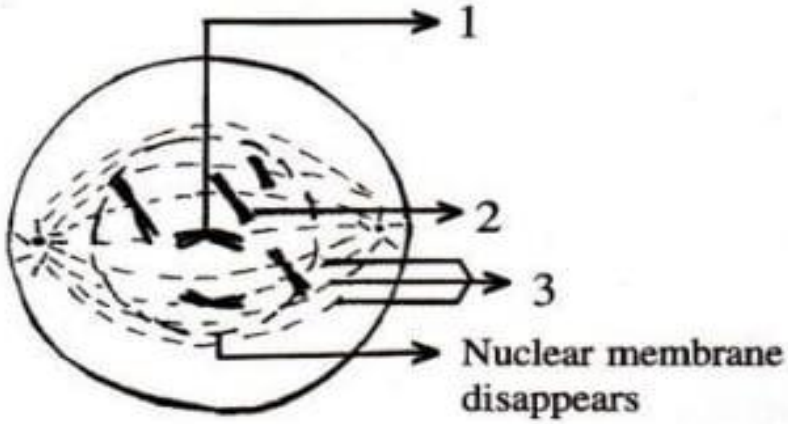


Answer

The phenomenon shown in the diagram is termed Crossing-Over. It is the exchange of chromatid material between the two members of a homologous pair of chromosomes while the maternal and paternal chromosomes are separating.

Question 6

Given below is a diagram representing a stage during mitotic cell division in an animal cell. Examine it carefully and answer the questions which follow.



(a) Identify the stage. Give one reason in support of your answer.
(b) Name the cell organelle that forms the 'aster'.
(c) Name the parts labelled 1, 2 and 3.
(d) Name the stage that follows the one shown here. How is that stage identified?
(e) Mention two points of difference between mitosis and meiosis with regard to:
The number of daughter cells produced.
The chromosome number in the daughter cells.

Answer

(a) By observing the given figure we can say that it is the late prophase stage because the nuclear membrane and nucleolus have disappeared.
(b) Centrioles is the cell organelle that form the aster.
(c) The parts are as follows:

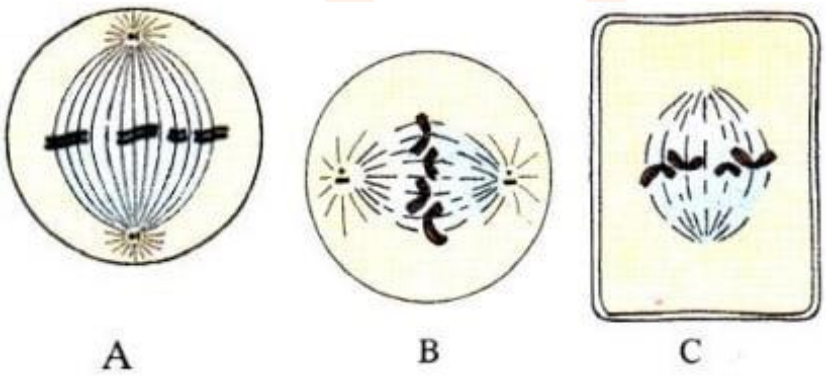
1 → Centromere
2 → Chromatids
3 → Spindle fibre
(d) The stage that follows the one shown here is Metaphase. In Metaphase, the centromeres of chromosomes are drawn to the equator by equal pull of two chromosomal spindle fibres that connects each centromere to the opposite poles, forming a metaphasic plate.

(e) Difference between mitosis and meiosis:

Mitosis	Meiosis
It produce two daughter cells.	It produce Four daughter cells.
Full set of chromosomes is passed on to each daughter cell. This is the diploid (2n) number of chromosomes.	Only half the number of chromosomes is passed on to each daughter cell. This is the haploid (n) number of chromosomes.

Question 7

Given below are three diagrammatic sketches (A, B and C) of one and the same particular phase during mitotic type of cell division.



(a) Identify the phase.
(b) What is the diploid number of chromosomes shown in them?
(c) Identify whether these are animal cells or plant cell? Give reasons.

Answer

(a) It is Metaphase.
(b) The diploid number of chromosomes shown in them is 4.
(c) Categorisation of cell A, B and C are as given below:

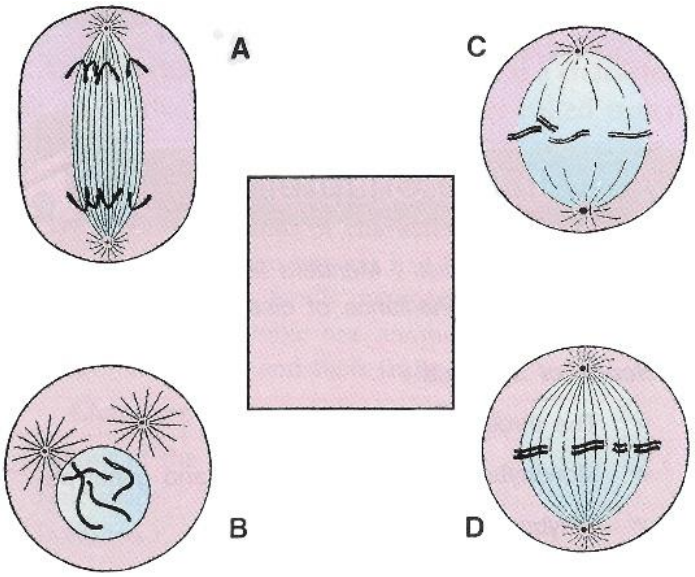
Cell A - It is an animal cell as the centrosome has split into two centrioles and the centrioles have formed asters. Also, no cell wall is present.

Cell B - It is an animal cell as the centrosome has split into two centrioles and the centrioles have formed asters. Also, no cell wall is present.

Cell C - It is a plant cell as no centrioles are seen and cell wall is present.

Question 8

Shown below are four stages (A, B, C, D) (not in sequence) of a certain kind of cell division.



(a) Is it a plant cell or an animal cell? Give two reasons.
(b) Is it undergoing mitosis or meiosis?
(c) What should be the correct sequence of these four stages among themselves?
(d) Name the stage that should precede the earliest of these stages.
(e) Draw the stage named above inside the blank space provided.

Answer

(a) This figure is of the animal cell because:
Centrosomes on centrioles are present.
Cell wall is absent
(b) It is undergoing mitosis.
(c) The correct sequence is B, C, D and A
(d) The stage that should precede the earliest of these stages is interphase.
(e) Below diagram shows interphase stage of mitosis:

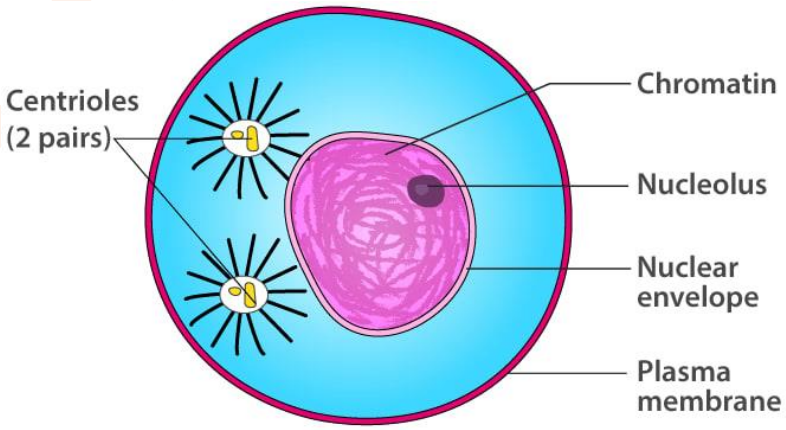
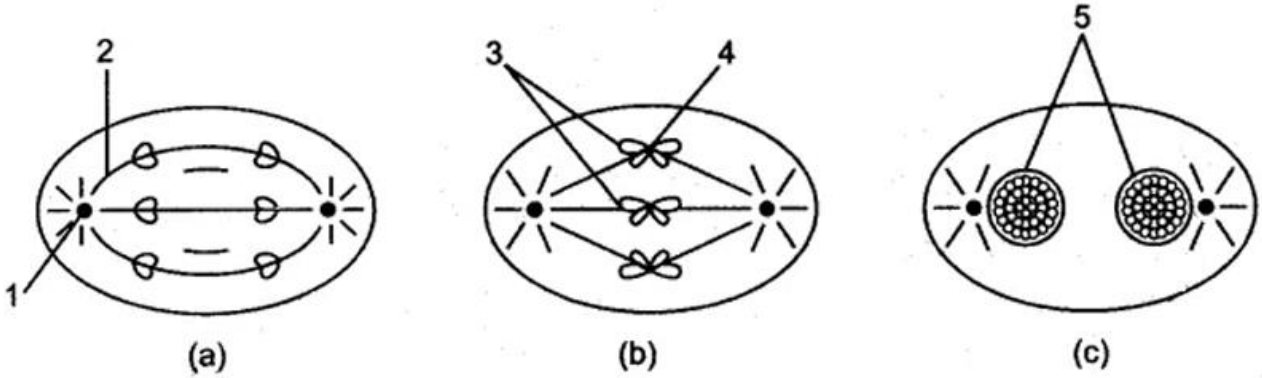


Diagram Based Questions

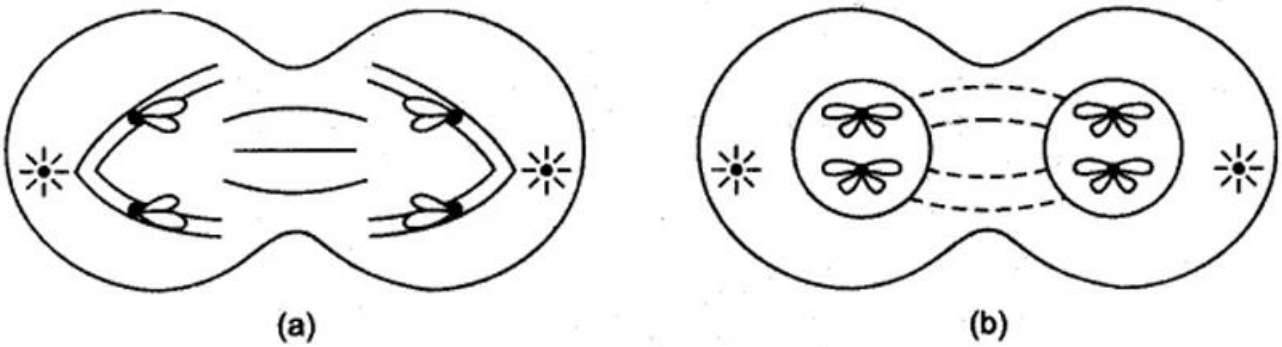
Question 1: Identify the stages of mitosis given below and label the figures.



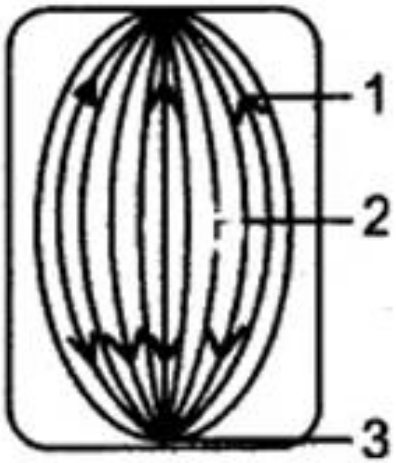
Answer: (a) Anaphase, (b) Metaphase, (c) Telophase.

1. Centriole, 2. Spindle fibres, 3. Chromosomes, 4. Centromere. 5. Daughter nuclei.

Question 2: Identify the stages of meiosven below and label them.



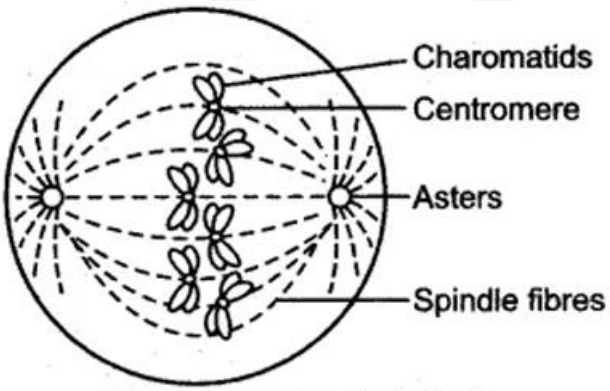
Answer: (a) Anaphase I, (b) Telophase I.



Question 3: The diagram below represents a certain stage of a cell.

(i) Is it an animal cell or a plant cell ? Give one reason in support of your answer.
(ii) Label the parts numbered 1 – 3.
(iii) Which stage (phase) of mitosis is represented in this diagram.
Answer:
(i) It is a plant cell because it has cell wall.
(ii) 1. Chromatids 2. Spindle fibres 3. Centromere.
(iii) Anaphase.

Question 4:
(i) Draw a neat labelled diagram to show the metaphase stage of mitosis in an animal cell having '6' chromosome.
(ii) How many daughter cells are formed at the end of mitosis and at the end of meiosis?
(iii) With reference to cell division explain the following terms:
(Chromatid, Centromere, Haploid).
(iv) Name the type of cell division that occurs during:
1. Growth of shoot 2. Formation of pollen grains.
3. Repair of worn-out tissues.
Answer: (i) See diagram.

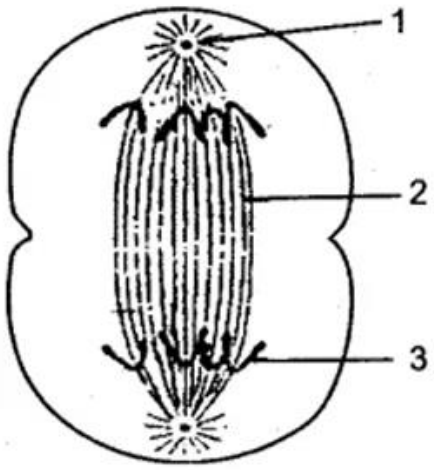


Metaphase stage in Mitosis

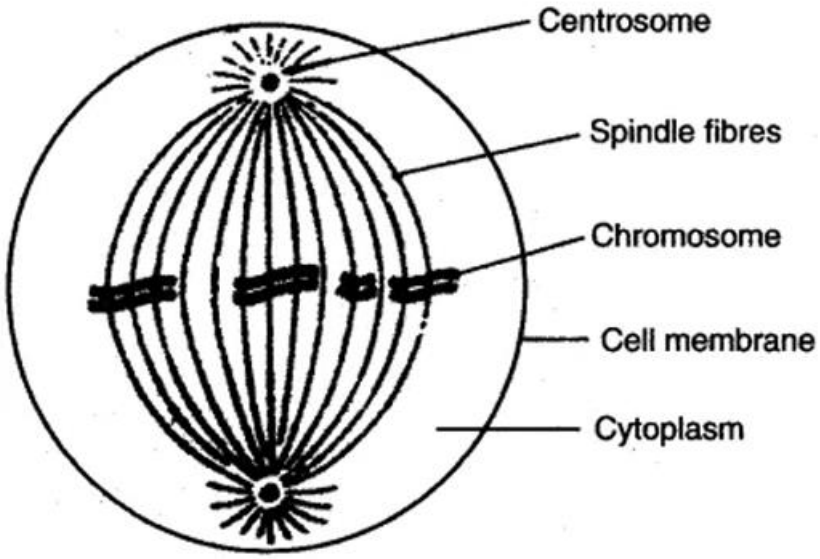
(ii) Mitosis: two daughter cells.
Meiosis: four daughter oeils.
(iii) Chromatid: Duplicated chromosomes consist of two identical strands, each of these is called a chromatid.
Centromere: It is the point at which the two chromatids remain attached. It is also the point of attachment for spindles.
Haploid: A cell having only one set of chromosomes is called haploid.
(iv) 1. Mitosis
2. Meiosis

3. Mitosis

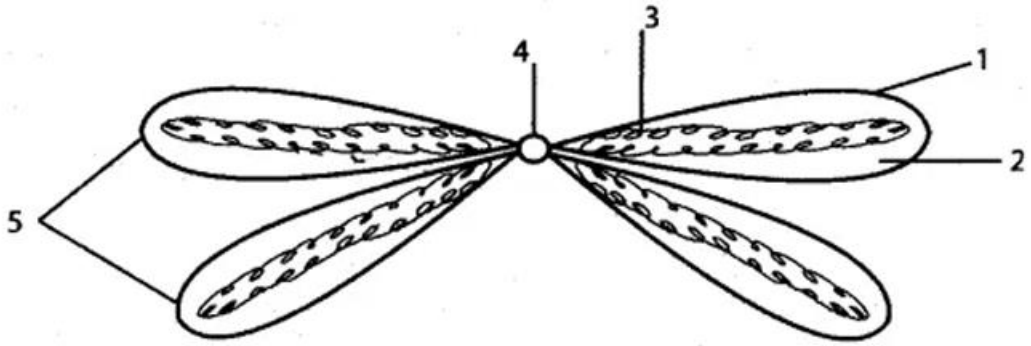
Question 5: The diagram below represents a stage during cell division. Study the same and then answer, the questions, that follow :



(i) Name the parts labelled 1, 2 and 3.
(ii) Identify the above stage and give a reason to support your answer.
(iii) Mentldh where in the body this type of cell division occurs.
(iv) Name the stage prior to this stage and draw a diagram to represent the same.
Answer: (i) 1. Centriole
2. Spindle fibres
3. Chromatid
(ii) Anaphase—The daughter chromosomes are reaching to the opposite poles of the cell.
(iii) In the somatic cells of the body.
(iv) Metaphase



Question 6: In the given diagram name the parts labeled 1, 2, 3,4 and 5 and describe about them in short.



Answer: 1. Pellicie: The matrix of chromosome is enclosed in a sheath called as pellicle.
2. Matrix: The chromatin of chromosome is embedded in the achromatic substance known as matrix.
3. Chromatin: Chromatin is the heredity material made-up of long fibres of DNA combined with proteins.
4. Centromere: A narrow constriction is seen in the chromosome at metaphase or anaphase is called primary constriction. The distinct area of light colour inside the primary constriction is called centromere.
5. Chromatids: Each metaphase chromosome consisi lied chromatids.