
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI SUBJECT: BIOLOGY	Department: SCIENCE 2023-24 (Biology)	Date of submission: 23.11.2023
Worksheet 6 with answers	CHAPTER: Cell Division and Cycle	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

MCQ type Questions (1 Mark Each)

Q1. The term "meiosis" was coined by.

- A) Hertwig and Van Bevedin
- B) Sutton and Boveri
- C) Hofmeister and Waldeyer
- D) Farmer and Moore

Q2. As there occurs more and more condensation of chromatin during cell division, there occurs.

- A) Increase in heterochromatin
- B) Increase in euchromatin
- C) Differentiation of heterochromatin and euchromatin decreases.
- D) Differentiation of heterochromatin and euchromatin increases.

Q3. Condensation of chromosomes occurs in [AFMC 2002]

- A) Prophase I
- B) Prophase II
- C) Anaphase
- D) Metaphase

Q4. The replication of nuclear DNA occurs in

- A) G1 phase
- B) G2 phase
- C) S phase
- D) M phase

Q5. The role of meiosis

- A) Formation of gametes
- B) Bringing haplophase
- C) Bringing diplophase
- D) Completing life cycle

Q6. The number of DNA in chromosome at G2 stage of cell cycle

- A) One
- B) Two
- C) Four
- D) Eight

Q7. Which stage connecting link between Meiosis I and Meiosis II

- A) Interphase I
- B) Interphase II
- C) Interkinesis
- D) Anaphase I

Q8. G0 state of cells in eukaryotic cell cycle denotes.

- A) Check point before entering the next phase
- B) Pausing in the middle of a cycle to cope with a temporary delay
- C) Death of a cell
- D) Exit of cells from cell cycle.

Q9. Synapsis is pairing of

- A) Any two chromosomes
- B) Non homologous chromosomes
- C) Acentric chromosomes
- D) Homologous chromosomes

Assertion Reason type Question Answers (2 Mark each)

Q10. In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.

Q.1. Assertion: Interphase is resting stage.

Reason : The interphase cell is metabolically inactive.

Q2. Assertion: Mitosis is known as equational division and meiosis is known as reduction division.

Reason: During meiosis, the non-sister chromatids of homologous chromosomes cross-over and exchange genetic information. This step does not occur during mitosis.

Short Type Answer Questions (2 Marks)

- Q11. Which cell between a eukaryote and a prokaryote has a shorter cell division time?
- Q12. Name the cell cycle phase that has the longest duration.
- Q13. Which stain is usually used to colour chromosomes?
- Q14. Name the plant and animal tissue that undergoes meiosis.
- Q15. What is the role of centrioles apart from spindle formation?
- Q16. What happens to the DNA of the plastids and mitochondria during nuclear divisions such as mitosis?

Long type Answer Questions (3 Marks)

Q17. A cell having 32 chromosomes undergoes mitotic division. During metaphase, what will the chromosome number (N) of the cell? During anaphase, what will the DNA content of the cell be?

Q18. Which tissue of animals and plants exhibit meiosis?

Q19. Under uncontrolled cell division, what is the pathological condition that occurs?

Q20. Write the phases of the cell cycle against each of the events

- a) The disintegration of the nuclear membrane
- b) The appearance of the nucleolus
- c) Division of centromere
- d) Replication of DNA

Very long type Answer Questions (5 Marks)

Q.21. Explain:

- a) Synaptonemal complex
- b) Metaphase plate

Q22. State differences between the events of meiosis and mitosis.

CASE STUDY QUESTIONS

CASE STUDY #1

Cell division is a very important process in all living organisms. During the division of a cell, cell division, DNA replication, and cell growth, hence, must take place in a coordinated way to ensure correct division and formation of progeny cells containing intact genomes. The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of the cell, and eventually divides into two daughter cells is termed cell cycle. Although cell growth (in terms of cytoplasmic increase) is a continuous process, DNA synthesis occurs only during one specific stage in the cell cycle. The replicated chromosomes (DNA) are then distributed to daughter nuclei by a complex series of events during cell division. These events are themselves under genetic control.

The cell cycle is divided into two basic phases: Interphase and M Phase (Mitosis phase). The M Phase represents the phase when the actual cell division or mitosis occurs, and the interphase represents the phase between two successive M phases.

Cells in the adult animals do not appear to exhibit division (e.g., heart cells) and many other cells divide only occasionally, as needed to replace cells that have been lost because of injury or cell death. These cells that do not divide further exit G1 phase to enter an inactive stage called quiescent stage (G0) of the cell cycle. Cells in this stage remain metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism.

1) _____ is the procedure in which cell nucleus division occurs through series of events and the daughter chromosome get separated into two daughter nuclei.

- a) Cytolysis
- b) Karyokinesis
- c) Karyocytosis
- d) Cytokinesis

2) _____ is the sequence of events through cell duplicates its genome, synthesises of cell constituent takes place and divides into daughter cells.

- a) Karyokinesis
- b) Cell-division cycle
- c) Replication
- d) Cytokinesis

3) Name the phase of cell cycle in which DNA replication occurs.

4) Define cytokinesis.

5) What is cell cycle?

CASE STUDY #2

Metaphase – The complete disintegration of the nuclear envelope marks the start of the second phase of mitosis, hence the chromosomes are spread through the cytoplasm of the cell. By this stage, condensation of chromosomes is completed and they can be observed clearly under the microscope. This then, is the stage at which morphology of chromosomes is most easily studied. At this stage, metaphase chromosome is made up of two sister chromatids, which are held together by the centromere. Small disc-shaped structures at the surface of the centromeres are called kinetochores. These structures serve as the sites of attachment of spindle fibres (formed by the spindle fibres) to the chromosomes that are moved into position at the centre of the cell. Hence, the metaphase is characterised by all the chromosomes coming to lie at the equator with one chromatid of each chromosome connected by its kinetochore to spindle fibres from one pole and its sister chromatid connected by its kinetochore to spindle fibres from the opposite pole. The plane of alignment of the chromosomes at metaphase is referred to as the metaphase plate. The key features of metaphase are:

- Spindle fibres attach to kinetochores of chromosomes.

Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles

1.) _____ is the initial stage of karyokinesis

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

2.) Prophase is characterised by _____

- a) Condensation of chromosomes
- b) Condensation of chromatin into chromosomes
- c) Replication of DNA
- d) Both a and b

3.) What is metaphase plate?

4.) Define kinetochores.

5.) Give the characteristics events which indicates the completion of prophase.

6.) What are the stages involved in karyokinesis?

ANSWERS

1. D)Farmer and Moore
2. C)Differentiation of heterochromatin and euchromatin decreases
3. A) Prophase I
4. C)S phase
5. B) Bringing haplophase
- . B) Two
7. C)Interkinesis
8. D)Exit of cells from cell cycle.
9. D)Homologous chromosomes
10. 1. (Ans: c)
2. (Ans: b)
11. A prokaryotic cell has a shorter cell cycle compared to a eukaryotic cell.
- 12.The interphase
- 13.Giemsa and Acetocarmine
14. It occurs in the sex cells or the germ cells of female and male reproductive organs in animals and plants, which produces female and male gametes that participate in sexual reproduction.
15. In the centrosome, the two centrioles align perpendicular to each other, organized in a cartwheel pattern. Besides the spindle fibre formation seen in animal cell division, they form the basal body of cilia and flagella of animal/plant cells. They also assist in the formation of the sperm tail and microtubules.
- 16.Chloroplasts and mitochondria possess DNA in the form of extrachromosomal DNA and have no role in nuclear division. Only nuclear DNA takes part in mitosis.
- 17.Mitosis occurs in somatic cells of entities. The number of chromosomes is the same in both parent and daughter cell and remains unchanged even at anaphase or metaphors. The content of DNA, however, is doubled at the interphase or synthetic phase. The division takes place at the anaphase but the number of chromosomes remains unchanged.
18. Meiosis takes place only in the tissues which produce gametes. In animals, the meiosis occurs within the reproductive cells or germ cells of the body and it includes the cells of the testes and ovaries. In plants, the meiosis occurs in the Androecium (male reproductive) and Gynoecium (female reproductive) parts of the plant.
19. It is cancer. In this condition, the cells lose control of cell division and result in malformation of the organs where cell division takes place.
- A20. a) Prophase.
b) Telophase.
c) Anaphase.
d) S-phase.
- A21.a) These are zipped-structures that are assembled during the prophase of the meiosis – I between homologous chromosomes. This disassembly and assembly is interlinked with the

continuous rearrangements of the chromatin during the meiotic prophase such as the poring, recombination, condensation, and dysfunction of homologous chromosomes. These regulate the number and distribution of reciprocal exchanges between the homologous chromosomes. They convert cross over to functional chiasmata.

b) The centromeres of the chromosomes in the metaphase gather on the metaphase plate which is an imaginary line at an equal distance from the two centrosome poles. The alignment is even due to the opposite kinetochore microtubules. The chromosomes at this plate, the sister chromatids, in particular, are connected to the package of four to eight spindle fibres.

A22. Following are the differences

Attributes	Mitosis	Meiosis
Place of occurrence	Somatic cells	Germ cells
Nature of Organisms	A sexually and sexually reproducing organisms	Sexually reproducing organisms
Nuclear and cell division	One cycle	Two sequential cycles – Meiosis I & II
DNA replication	Once for each cell division	Once for two cell divisions
Duration of prophase	Short	Long
Nature of prophase	Simple	The first meiotic division is in comparison to prophase of mitosis
Cell division and chromosome division	Both divide once each	Two cell divisions, but one chromosome division
Product	Two cells	Four haploid cells

Answer key for Case Study #1

1) b

2) b

3) Synthesis phase (S phase) is the phase in cell cycle marks the period during which DNA replicates. During this time the amount of DNA per cell doubles.

4) Cytokinesis is the process of cell division, which divides the cytoplasm of a parental cell and leads to formation of two daughter cells.

5) Cell cycle is defined as, the series of events through cell duplicates its genome, synthesises of other cell constituent takes place and, divides into daughter cells.

The cell cycle is divided into two basic phases:

Interphase

- M Phase (Mitosis phase).

The M Phase represents the phase when the actual cell division or mitosis occurs and the interphase represents the phase between two successive M phases.

Answer key For Case Study #2

1.) c

2.) d

3.) In metaphase, the microtubules start pulling the chromosomes with equal force and the chromosome ends up in the middle of the cell. This region is known as the metaphase plate. Thus, each cell gets an entire functioning genome.

4.) Kinetochores are Small disc-shaped structures at the surface of the centromeres, which serve as the sites of attachment of spindle fibres to the chromosomes that are moved into position at the centre of the cell.

5.) The completion of prophase is marked by the following characteristic events:

- Chromosomal material condenses to form compact mitotic chromosomes. Chromosomes are seen to be composed of two chromatids attached together at the centromere.

Centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell. Each centrosome radiates out microtubules called asters. The two asters together with spindle fibres forms mitotic apparatus.

6.) Karyokinesis involves following four stages:

- Prophase
- Metaphase
- Anaphase
- Telophase

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