## **11th MAY, 2020 JESUS AND MARY SCHOOL AND COLLEGE MODULE 1**

## **CLASS-X**

### **BIOLOGY**

## **CELL DIVISION**

#### **Topics:**

1. Cell cycle and it’s phases
2. Amitosis cell division , Mitosis cell division and Meiosis cell division
3. Significance of Mitosis cell division
4. Stages of Mitosis- (a) Karyokinesis (b) Cytokinesis
5. The phases of karyokinesis
6. Process of cytokinesis
7. Meiosis Cell Division
8. Significance of Meiosis

**EXPLANATION**

Cell division is the process in which the parent cell divides into two or four cells, called daughter cells. It is a small part of cell cycle. The cell cycle is the series of changes that involve the growth and division of a cell. It has two phases – Interphase and Mitotic phase.

**Interphase-** It requires the preparation of the cell for division. In this the DNA replication, synthesis of protein and increase in cytoplasm takes place. It is subdivided into G1 phase , S phase and G2 phase.

During G1 phase RNA and protein are synthesized and the chromosomes are fully uncoiled.

During S phase DNA replication begins.

During G2 phase, protein and RNA are synthesized and cell organelles are duplicated.

**Mitotic phase-**This phase takes place after G2 phase and divided into karyokinesis and cytokinesis. Karyokinesis takes place by three methods- Amitosis, Mitosis and Meiosis.

* **Amitosis Cell Division-** It takes place in single celled organisms where nucleus and cytoplasm divides into two cells. In this the nuclear membrane does not disappear and there is no spindle formation. In protozoans and bacteria this type of cell division takes place.
* **Mitosis Cell Division-** This division occurs in body cells and responsible for growth in size. This is also called equational cell division because one cell gives two daughter cells and they have same number of chromosomes.
* **Meiosis Cell Division-** This takes place in reproductive cells and the mother cell gives four daughter cells. It is also called reductional cell division because the chromosome number in daughter cells is half of the mother cell.

**SIGNIFICANCE OF MITOSIS CELL DIVISION**

1. Due to mitosis, growth of animals and plants takes place.
2. By this division the repairing of tissues takes place.
3. The healing of wounds is also done by mitosis cell division.
4. It maintains the chromosome number in the daughter cells as parent cell.

**STAGES OF MITOSIS CELL DIVISION**

It is divided into two stages-

1. Karyokinesis
2. Cytokinesis

**Karyokinesis-** It is the division of nucleus and divided into four phases- Prophase, Metaphase, Anaphase and Telophase.

* Prophase- In this the cell becomes spherical and increase in cytoplasm takes place. In animal cell the two centrioles are present and one of them comes at the opposite pole where it produces astral rays. Astral rays are made up of protein tubulin. Chromatin fibres condense to form chromosomes and each chromosome has two chromatids with centromere. Nuclear membrane and nucleolus disappear. Spindle fibre formation also take place.

In plant cells astral rays are not formed because centrioles are not present but spindle formation takes place by the cytoplasmic activity. This is called anastral mitosis while in animal cells the astral rays formed and it is call amphiastral mitosis.

* Metaphase- During this phase the chromosomes reach in the middle or at equatorial plate of the spindle. The chromatids are directed towards the poles. In plant cells the chromosomes are irregularly arranged on the equatorial plate.
* Anaphase- It is important and shortest phase. The centromere splits and sister chromatids separate. Now the daughter chromosomes move towards the opposite poles. It takes place by the contraction of astral rays from centromeres.
* Telophase- It is the last phase of the cell division. In this the sister chromosomes get attached at opposite poles of the cell. The chromosomes uncoil, elongate and form chromatin reticulum. Spindle fiber and astral rays disappear. Nuclear membrane and nucleolus reappear.

**Cytokinesis-** The division of cytoplasm is called cytokinesis. In animal cells a furrow appears at the beginning of telophase. This furrow becomes deeper inside towards the cell in the center with the breakdown of spindle fibers. This type of furrow formation from outside to inside is called centripetal. In this way two daughter cells are formed.

In plant cells there is formation of cell plate from the middle towards the outside by golgi body. This plate formation is centrifugal i.e from center towards periphery. Thus two daughter cells are formed.

**MEIOSIS CELL DIVISION**

This division is called reductional cell division because the chromosomes number become half of the mother cell. It takes place in gonads. It helps in the production of gametes(sperms and ovum). The gametes are haploid having half number of chromosomes. The meiosis cell division gives four daughter cells. It involves two divisions-(a) Meiosis-1 (b) Meiosis-2

Meiosis-1 is reductional division while Meiosis-2 is equational division.

**Meiosis-1** – It is also called heterotypic division. It also contain all the stages like in mitosis. It takes place in diploid cell (having double set of chromosomes). Paired chromosomes carry similar characters and being similar in shape, size and structure. These are called homologous chromosomes. Now the pairing of homologous chromosomes takes place and this is called synapsis. Now the chromosomes have four chromatids. This condition is called tetrad. The non-homologous sister chromatids of tetrad come close to each other and focus chiasma. This chiasma is the point of attachment of two non sister homologous chromosomes. After this the process of crossing over takes place. It is the process of exchange of parts of chromatid segments between homologous chromosomes. The most important phenomenon, variation takes place by crossing over. It results the differences in the members of the same species.

After all the phases in karyokinesis two haploid daughter cells are formed.

**Meiosis-2** – It is equational division. In this division two daughter cells are formed by two haploid daughter cells of meiosis-1 . Thus at the end of meiosis four haploid daughter cells are formed.

**SIGNIFICANCE OF MEIOSIS CELL DIVISION**

1. Meiosis gives haploid cells which are used in sexual reproduction. By the fusion of two opposite gametes, zygote is formed and chromosomes number are restored.
2. In meiosis the crossing over preforms variation and afterward in evolution.

**WORKSHEET-1**

**EXERCISES**

**Answer the following questions**

1. What are the different types of cell division?
2. Explain cytokinesis in a plant cell?
3. Give the two significance of mitosis cell division?
4. Give the two significance of meiosis cell division?
5. Write down two main differences between mitosis in animal cell and plants cell?
6. Why the meiosis cell division is called reductional division?
7. Write two differences between mitosis and meiosis cell division?
8. What is amitosis cell division?
9. Explain cytokinesis in animal cell?
10. Write down two points about anaphase in mitosis cell division?

**Give one-one differences between these**

1. Diploid cell and haploid cell.
2. Karyokinesis and cytokinesis.
3. Centrioles and centromeres.
4. Interphases and prophase.

**Define the following**

* 1. Cell cycle
	2. Crossing over
	3. Variation
	4. Chiasma
	5. Homologous chromosome

**Name the following**

* 1. The cell division takes place in the reproductive cells.
	2. The point of attachment of two chromatids in the chromosome.
	3. Pairing of homologous chromosomes.
	4. The exchange of parts of chromatid segments between homologous chromosomes.
	5. The division of cytoplasm.

**NOTE-**

Please do all this work in your old copies which will be checked when school reopens. Please consider this important.

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