**HANDOUT FOR CELL CYCLE AND CELL DIVISION**

* According to the cell theory, cells arise from preexisting cells.
* The process by which this occurs is called cell division.
* Any sexually reproducing organism starts its life cycle from a single-celled zygote.
* Cell division does not stop with the formation of the mature organism but continues throughout its life cycle
* The stages through which a cell passes from one division to the next is called the cell cycle. Cell cycle is divided into two phases called (i) Interphase – a period of preparation for cell division, and (ii) Mitosis (M phase) – the actual period of cell division.
* Interphase is further subdivided into G1 , S and G2 . G1 phase is the period when the cell grows and carries out normal metabolism.
* Most of the organelle duplication also occurs during this phase. S phase marks the phase of DNA replication and chromosome duplication.
* G2 phase is the period of cytoplasmic growth.
* Mitosis is also divided into four stages namely prophase, metaphase, anaphase and telophase.
* Chromosome condensation occurs during prophase. Simultaneously, the centrioles move to the opposite poles.
* The nuclear envelope and the nucleolus disappear and the spindle fibres start appearing.
* Metaphase is marked by the alignment of chromosomes at the equatorial plate.
* During anaphase the centromeres divide and the chromatids start moving towards the two opposite poles.
* Once the chromatids reach the two poles, the chromosomal elongation starts, nucleolus and the nuclear membrane reappear. This stage is called the telophase.
* Nuclear division is then followed by the cytoplasmic division and is called cytokinesis.
* Mitosis thus, is the equational division in which the chromosome number of the parent is conserved in the daughter cell.
* In contrast to mitosis, meiosis occurs in the diploid cells, which are destined to form gametes.
* It is called the reduction division since it reduces the chromosome number by half while making the gametes.
* In sexual reproduction when the twogametes fuse the chromosome number is restored to the value in the parent.
* Meiosis is divided into two phases – meiosis I and meiosis II.
* In the first meiotic division the homologous chromosomes pair to form bivalents, and undergo crossing over. Meiosis I has a long prophase, which is divided further into five phases.
* These are leptotene, zygotene, pachytene, diplotene and diakinesis.
* During metaphase I the bivalents arrange on the equatorial plate.
* This is followed by anaphase I in which homologous chromosomes move to the opposite poles with both their chromatids.
* Each pole receives half the chromosome number of the parent cell. In telophase I, the nuclear membrane and nucleolus reappear.
* Meiosis II is similar to mitosis. During anaphase II the sister chromatids separate. Thus at the end of meiosis four haploid cells are formed.