

Shunyu Wu

# 4 Questions Mitosis and Meiosis

October 2021

## 1) Mitosis Compared to Meiosis

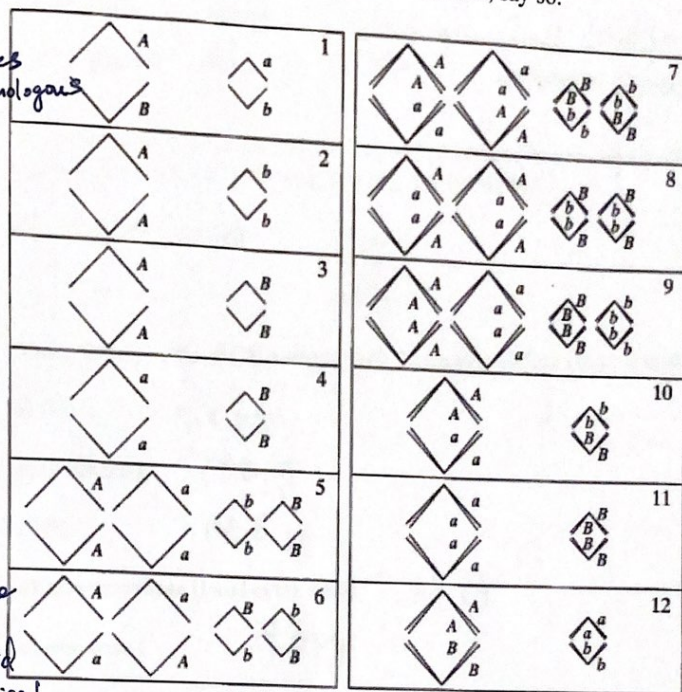
	Mitosis	Meiosis
When does the process occur?	fetal ovaries somatic cell division after fertilization	germ maturation <del>germ</del> ✓
Where in the body does it occur?	Occurs in somatic cells and germ-line precursor cells. <b>SOMA</b>	occurs in germ cells as part of sexual cycle <b>germ line</b>
How are the chromosomes organized on the equatorial plate?	<del>as single chromosomes</del> pair of chromatid line up along the plate sister chromatids are identical so the orientation of the chromosome doesn't matter	<del>pairs of homologous chromosomes</del> line up along the plate. <b>tetrads</b>
How many cells are the result of the process?	two	four human female: 1 oocyte and 3 polar bodies
How are the resulting cells compared to each other?	two daughter cells are identical to each other and the original cell <b>identical</b>	four haploid cells. <b>different. recombined</b> one egg or all sperm of which become gametes None of these is identical to each other
How many sets of chromosomes do the cells contain after the cell division?	two sets of one-chromatid chromosomes <b>2 diploid</b>	one set of one-chromatid chromosome <b>1 haploid</b>
How are the cells called?	somatic cells	sperm cells / <del>germ</del> cells egg cells / polar cells <b>spermatocytes and oocytes</b>
What is the significance of the process	In a unicellular organism, the purpose of mitosis is to proliferate as a species. In a multicellular organism, the purpose can be to grow during development, or to repair or regenerate damaged tissue. - pass on identical info to next generation of cells - growing body and regeneration	in preparation for sexual reproduction. Various steps in meiosis create opportunity for genetic diversity in the daughter cells. - to reduce the number of chromosomes (haploid) for function germ cells - recombine, remix of DNA



## 2) Mitosis and Meiosis in *Haplopappus gracilis*

The plant *Haplopappus gracilis* is diploid and  $2n=4$ . It contains one long pair and one short pair of chromosomes. The diagrams below represent anaphases of individual cells in meiosis in a plant that is genetically a dihybrid ( $A/a ; B/b$ ) for genes on different chromosomes. The lines represent chromosomes or chromatids, and the points of the V's represent the centromeres. In each case, say if the diagram represents a cell in meiosis I, meiosis II or mitosis. If a diagram shows an impossible situation, say so.

the alleles of the same genes are on nonhomologous chromosomes



too many chromosomes

appears to be mitotic anaphase but alleles of sister chromatids are not identical

appears to be meiosis of homozygous

the alleles of the same genes are on nonhomologous chromosomes

1. impossible
2. meiosis II
3. meiosis II
4. meiosis II
5. mitosis
6. impossible
7. impossible
8. impossible
9. impossible
10. meiosis I
11. impossible
12. impossible

3) A horse has 64 chromosomes and a donkey has 62 chromosomes. A cross between a female horse and a male donkey produces a mule, which is usually sterile. How many chromosomes does a mule have? Explain why it usually is perfectly viable but sterile?

63 chromosomes. A mule has 32 horse chromosomes from mom and 31 donkey chromosomes from dad.

meiosis go wrong, 1. chromosomes fail to align properly in metaphase perhaps due to mismatch between horse and donkey chromosomes

4) The amount of DNA per cell of a particular species is measured in cells found at various stages of meiosis. The following amounts are obtained:

amount of DNA per cell: 3.7 pg  
7.3 pg  
or 14.6 pg

Match the amounts of DNA above with the corresponding stage of meiosis.

- a) G1 7.3 pg
- b) prophase I 14.6 pg
- c) G2 14.6 pg
- d) after telophase II and cytokinesis 3.7 pg
- e) anaphase I 14.6 pg
- f) metaphase II 3.7 pg  
7.3

5) If a geneticist were to closely examine the make-up of a single autosomal chromosome from one of your cells, that chromosome would be found to be:

- a. derived entirely from genes from just one of your grandparents
- b. a mosaic of genes derived from your mother and father
- c. a mosaic of genes derived from all four of your grandparents
- d. a mosaic of genes derived from just two of your grandparents - either your two grandfathers or your two grandmothers
- ☒ e. a mosaic of genes derived from just two of your grandparents - either your maternal grandparents, or your paternal grandparents