Review for test 5

Replication/Asexual Reproduction

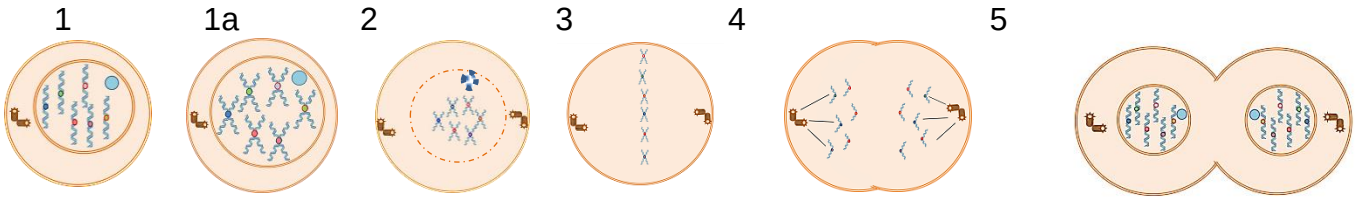
Mitosis

Cells divide over and over again. So that each new daughter cell is genetically identical to the original parent cell, and to each other, the DNA has to replicate before the cell divides. The splitting of the nucleus, and division of a cell into 2 (#) daughter cells is called mitosis.
There are 5 stages of cell life (mitosis starts at prophase) :

1) During interphase the cell grows and does its job,
   and during 1a late interphase the DNA replicates (doubles);
2) During prophase the chromosomes become short, thick and visible so that they don't break, the nuclear membrane breaks up and the nucleolus disappears so that they don't get in the way and the centrioles move to opposite sides of the cell so that they can pull the sister chromatids apart
3) During metaphase the chromosomes line up in center of cell, so that they can be evenly split in ½. They are pulled around by spindle fibers that are made by the centrioles
4) During anaphase the chromosomes are pulled apart by the spindle fibers , and the cell membrane starts splitting,

and

5) During telophase the cell membrane finishes splitting, the nucleolus and nuclear membrane reform and the chromosomes unwind and become long, skinny, and invisible again.



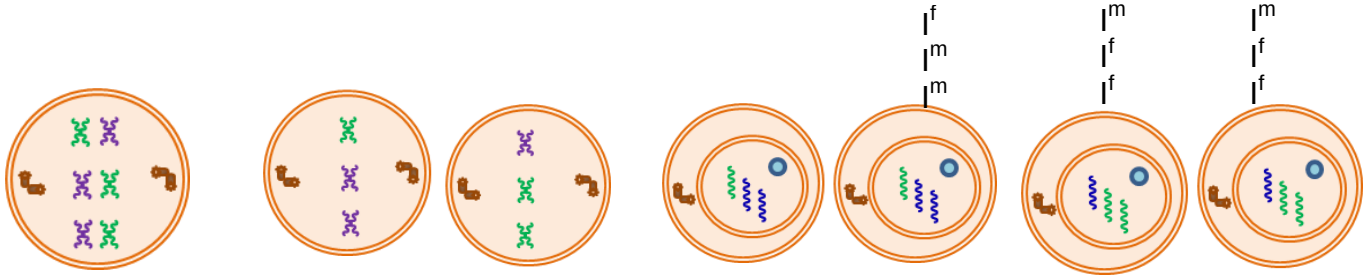
The end products of mitosis are 2 daughter cells that are diploid (have the full number of chromosomes).
Organisms use mitosis for growth, and for asexual reproduction.
The daughter cells produced by mitosis are genetically identical to the original cell.

Plant cells aren't squishy because of their cell wall. They don't pinch-in in the middle. Instead, A new cell wall and cell membrane grow down the middle of the dividing cell (a cell plate)

Meiosis

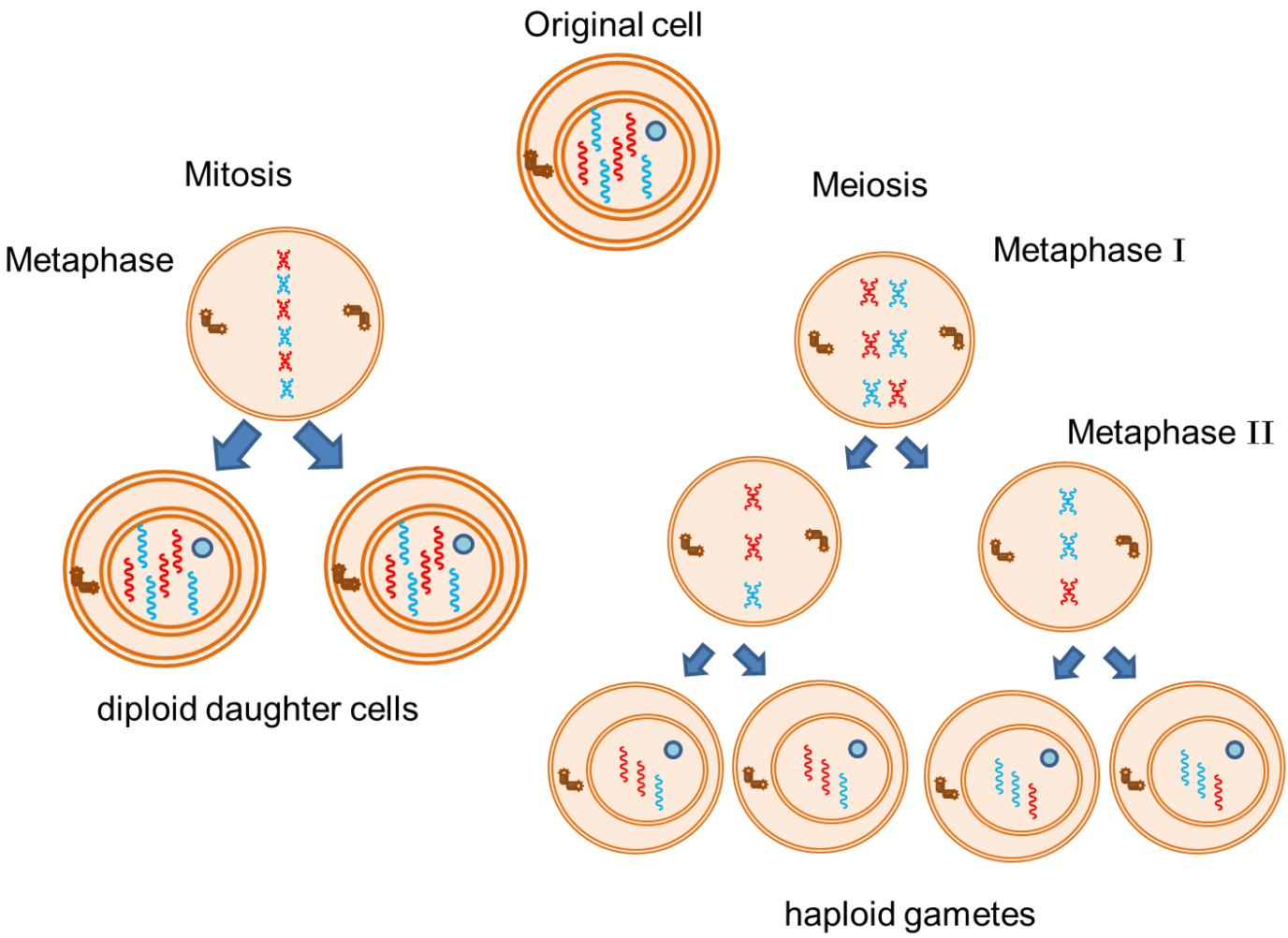
Meiosis is the cell division used in sexual reproduction.
Meiosis I is different from mitosis, because during metaphase, the chromosomes line up in pairs, instead of in a single line. The chromosomes from the two grandparents line up randomly, in no particular order. Some from the grandfather move to the right, with the matching pair from the grandmother on the left, and some line up with the one from the grandfather on the left, and the matching pair from the grandmother on the right. Then, in Meiosis II, chromosomes get split apart into sister chromatids.

The end products of meiosis are (4) special cells called gametes each of which is haploid (have half the normal number of chromosomes). The gamete from the female is called an egg; the gamete from the male is called the sperm.

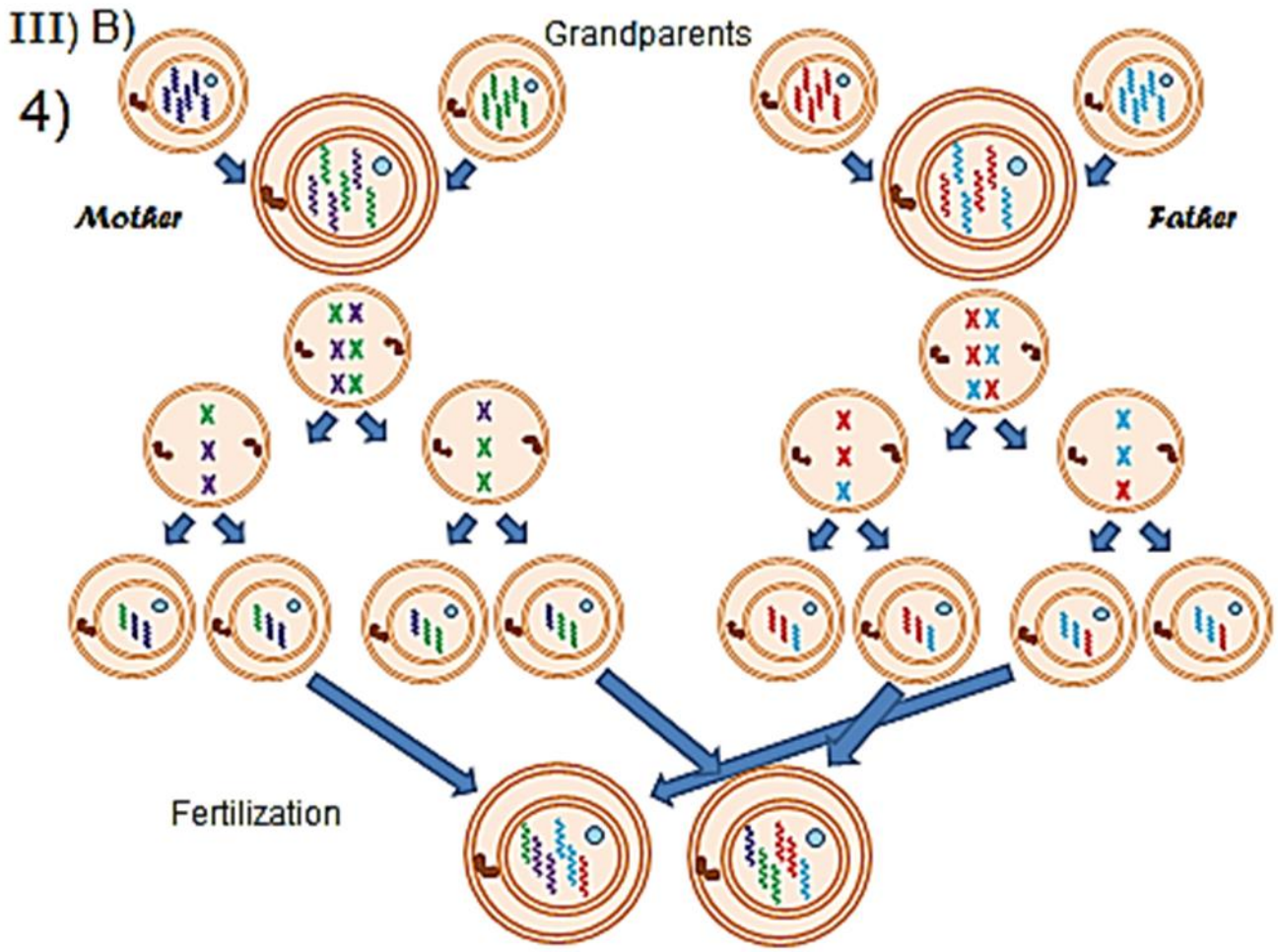


In meiosis, the chromosome pairs that came from the grandparents get separated. Each gamete has only 1 of the chromatids from each pair. Some of the chromatids in a gamete will come from its grandmother, some from its grandfather

Meiosis happens in both the male and female parent. The gametes from each parent have to join together in order to form the cell that will then do mitosis to grow into the offspring. Each haploid gamete contains genetic information from its parents. When fertilization occurs (2 gametes join together) the genetic information from each gamete adds together so that the offspring has the same (diploid) number of chromosomes as each of its parents, but each offspring is genetically different from either of its parents.
Gametes have to be haploid, because otherwise, after fertilization of the egg by the sperm, the offspring would have double the normal number of chromosomes, and wouldn't develop properly.



Make sure you follow directions for diploid # - the full number of chromosomes in the cells.
Make sure you keep the colors in the appropriate locations for meiosis!



Chromosome pair # 23 determines gender in humans.
This pair includes the X or Y chromosomes. The presence of a Y makes the baby male (no matter how many X's there are), and the absence of a Y makes the baby female.
XX is female. XY is male.
The Y chromosome is about ½ the size of the X. It does not contain all of the genes found on the X chromosome (the genes are not only for gender). A baby needs to have at least one X chromosome in order to survive.

	Will it survive? (with problems)	Male or female?
XØ	yes	female
YØ	no	
XXXX	yes	female
XXXY	yes	male

You need to know all of these definitions/names of terms!

Dominant/Recessive genes:
Some versions of genes are "stronger" than other versions. The strong versions are called dominant The weak versions are called recessive If an organism inherits a dominant gene from one parent, and a recessive gene from the other parent, the dominant version will be expressed.

Gene Frequency
In any population, some versions of genes are more common, and will be seen more frequently . Others are rare, and will be seen less frequently This is true whether the particular gene is dominant or recessive If you have a population where most of the people have the double recessive gene, like blond hair, then most of the children will also have the double recessive.

Recessive genetic illnesses
Genetic diseases are caused by mutations in the DNA that get passed down through the generations. If the disease is a recessive trait, the person has to inherit two copies of the disease gene, one from each parent, in order to have the illness. A person with one dominant (healthy) and one recessive (disease) copy of the gene is not affected. They are called carriers.

Incomplete dominance:
Some genes are not completely dominant. With one of each version of the gene, the offspring will be an in-between mixture of the two traits. (make 2 proteins that both contribute)

Multi-gene traits: Some traits are determined by more than one gene. Several genes, often on different chromosomes, work together to control the way the offspring looks.

Linkage:
Linkage is when 2 genes are found near each other on the same chromosome The two genes are often inherited together .

Control over genes
Not all genes are " turned on" at all times. Only some DNA in each cell is used to make protein at any one time.

During development different genes get turned on at different times
Example: caterpillar vs. butterfly
Within an organism different organs have different genes turned on.
Example: brain cell vs. muscle

Some DNA is used to makecontrol RNA that controls which genes are turned on and which genes are turned off in each cell.
The rest of the DNA has no known function; it is sometimes called "junk" DNA.

Draw a Punnett square to diagram the chromosomes in parents and their possible .
Know how to identify what the offspring will look like if the genes are completely or incompletely dominant.

If the genes are G and g…..

1) Both parents are mixed – one dominant and one recessive gene for each parent….

	G	g
G	GG	Gg
g	Gg	gg

2) Parents are both double recessive….

	g	g
g	gg	gg
g	gg	gg

3) One parent is double recessive and one is mixed dominant and recessive….

	G	g
g	Gg	gg
g	Gg	gg

Stem cells

Totipotent means the cells do not have any of their genes permanently turned on or off, so they can become any type of cell in a person's body or in the tissues that help a baby develop.

Pluripotent means the cells have **only a few of** their genes permanently turned on or off, so they can become any type of cell in a person's body

Multipotent means the cells have ~~only~~ some of their genes permanently turned on or off, so they can become many different types of cells

Differentiated means the cells have their genes either permanently turned on or off, so they have a fixed structure and function

TPMD

Stem cells are cells that are undifferentiated, meaning they are either totipotent, pluripotent, or multipotent. They have the ability to turn into many different types of cells.

Embryonic stem cells come from an embryo (baby) that has not yet formed the structures of an organism.

Adult stem cells are found in the organs of a fully formed organism. They are used by the body to repair damage

Scientists would like to learn how to use stem cells to make replacement organs for people who are ill.

Cloning

Cloning is forming a new organism that is genetically identical to an already existing organism. (Identical twins are natural clones.)

Clones are not exactly the same as the original. Some genes are randomly turned on/off during development and some traits are affected by the environment in which the organism develops and grows up.