NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Animal Science 1-Cell Growth and Division-Mrs. Weimer

Cell Cycle and Reproduction

A. Cell Reproduction

* Prokaryotes-Bacteria
*  Eukaryotes-Plants & animals

B. Prokaryotes

* Lack a nucleus
* Have a single chromosome
* Reproduce by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Include bacteria

C. Steps in Binary Fission

* Used by bacteria
* Cells increase their cell mass slightly
* DNA & cell components are replicated
* Each cell divides into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. Eukaryotes

* Contain a nucleus & membrane bound organelles
* Asexually reproduce cells by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E. Cell Cycle (Overview)

* Stages in growth & division
* G1 Phase
* S Phase
* G2 Phase
* M Phase
* Cytokinesis

F. G1 Phase

* First \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cell increases in size
* Cell prepares to copy its DNA

G. Synthesis Phase

* Copying of all of DNA’s instructions
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

H. G2 Phase

* Time between DNA synthesis & mitosis
* Cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Needed proteins produced

I. M Phase

* Cell growth & protein production stop
* Cell’s energy used to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Called mitosis or karyokinesis (nuclear division)

J. Interphase – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Cells carrying on normal activities
* Chromosomes aren’t visible
* Cell metabolism is occurring
* Occurs before mitosis

K. Interphase

Stages of Mitosis (Overview)

* Prophase
* Metaphase
* Anaphase
* Telophase

L. Cells Undergoing Mitosis

Steps in Prophase

* DNA coils tightly & becomes visible as chromosomes
* Nuclear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nucleolus disappears
* Centrioles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Spindle begins to form

Steps in Metaphase

* Spindle fibers from centrioles attach to each chromosome
* Cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ its chromosomes
* Cell aligns its chromosomes in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Steps in Anaphase

* Cell chromosomes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Spindle fibers shorten so chromosomes pulled to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Steps in Telophase

* Separation of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cell Plate forms (plants)
* Cleavage furrow forms(animals)
* Nucleus & nucleolus reform
* Chromosomes uncoil

Cytokinesis

* Occurs \_\_\_\_\_\_\_\_\_\_\_ chromosomes separate
* Forms two, identical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CYCLE: G1, S, G2, M-IPMATC

MEIOSIS and GENETICS-MRS. WEIMER

MEIOSIS

Organisms that reproduce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are made up of two different types of cells.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are “body” cells and contain the normal number of chromosomes ….called the “Diploid” number (the symbol is 2n). Examples would be … skin cells, brain cells, etc.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are the “sex” cells and contain only ½ the normal number of chromosomes…. called the “Haploid” number (the symbol is n)….. Sperm cells and ova are gametes.

Gametes

The Male Gamete is the \_\_\_\_\_\_\_\_\_\_\_\_\_ and is produced in the male gonad the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Female Gamete is the \_\_\_\_\_\_\_\_\_\_\_ (ova = pl.) and is produced in the female gonad the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

During\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the ovum is released from the ovary and transported to an area where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the joining of the sperm and ovum, can occur…… fertilization, in Humans, occurs in the Fallopian tube. Fertilization results in the formation of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(fertilized egg)

Fertilization

The fusion of a sperm and egg to form a zygote.

A zygote is a fertilized egg

DRAW THE PICTURE WITH THE CHROMOSOME NUMBERS:

Chromosomes

If an organism has the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2n) it has two matching homologues per set. One of the homologues comes from the mother (and has the mother’s DNA).… the other homologue comes from the father (and has the father’s DNA).

Most organisms are diploid. Humans have 23 sets of chromosomes… therefore humans have 46 total chromosomes….. The diploid number for humans is \_\_\_\_\_\_ (46 chromosomes per cell).

Homologous Chromosomes

Pair of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (maternal and paternal) that are similar in shape and size.

Homologous pairs (tetrads) carry genes controlling the same inherited traits.

Each l\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (position of a gene) is in the same position on homologues.

Humans have 23 pairs of homologous chromosomes.

 22 pairs of autosomes

 1 pair of sex chromosomes

Homologous Chromosomes(because a homologous pair consists of 4 chromatids it is called a “Tetrad”)

 Humans have 23 Sets of Homologous Chromosomes
 Each Homologous set is made up of 2 Homologues.

Autosomes
(The Autosomes code for most of the offspring’s traits)

Sex Chromosomes
The Sex Chromosomes code for the sex of the offspring.
\*\* If the offspring has two “X” chromosomes it will be a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \*\* If the offspring has one “X” chromosome and one “Y” chromosome it will be a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sex Chromosomes
Meiosis is the process by which ”gametes” (sex cells) , with half the number of chromosomes, are produced.
During Meiosis diploid cells are reduced to haploid cells

 Diploid (2n)  Haploid (n)

If Meiosis did not occur the chromosome number in each new generation would double…. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Meiosis

Meiosis is Two cell divisions (called meiosis I and meiosis II)with only one duplication of chromosomes.

 Meiosis in males is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and produces sperm.

 Meiosis in females is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and produces ova.

Interphase I

Similar to mitosis interphase.

Chromosomes replicate (S phase).

Each duplicated chromosome consist of two identical sister chromatids attached at their centromeres.

Centriole pairs also replicate.

Nucleus and nucleolus visible.

Meiosis I (four phases)

Cell division that reduces the chromosome number by one-half.

four phases:

 a. prophase I

 b. metaphase I

 c. anaphase I

 d. telophase I

**Prophase I**

Longest and most complex phase.

90% of the meiotic process is spent in Prophase I

Chromosomes condense.

\_\_\_\_\_\_\_\_\_\_\_\_ occurs: homologous chromosomes come together to form a tetrad.

Tetrad is two chromosomes or four chromatids (sister and nonsister chromatids).

During Prophase I “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” occurs.

During Crossing over segments of nonsister chromatids break and reattach to the other chromatid. The Chiasmata (chiasma) are the sites of crossing over.

Crossing Over creates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the offspring’s traits.

**Metaphase I**

Shortest phase

Tetrads align on the metaphase plate.

INDEPENDENT ASSORTMENT OCCURS:

 1. Orientation of homologous pair to poles is random.

 2. Variation

 3. Formula: 2n

 Example: 2n = 4

 then n = 2

 thus 22 = 4 combinations

**Anaphase I**

Homologous chromosomes separate and move towards the poles.

Sister chromatids remain attached at their centromeres.

**Telophase I**

Each pole now has haploid set of chromosomes.

Cytokinesis occurs and two haploid daughter cells are formed.

Meiosis II

No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 (or very short - no more DNA replication)

Remember: Meiosis II is similar to mitosis

Prophase II

same as prophase in mitosis

Metaphase II

same as metaphase in mitosis

Anaphase II

same as anaphase in mitosis

sister chromatids\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Telophase II

Same as telophase in mitosis.

Nuclei form.

Cytokinesis occurs.

Remember: four haploid daughter cells produced.

gametes = sperm or egg

Telophase II