DAYTONA STATE COLLEGE

GENERAL BIOLOGY I
TEST IV

REVIEW

TERMS TO KNOW

- Cell Cycle
  - Interphase (G0, G1, S, G2) and mitosis
- Prophase
  - Chromatin condenses into chromosomes, nuclear membrane dissolves
- Metaphase
  - Chromosomes line up along the center of the cell
- Anaphase
  - Chromatids begin pulling apart
- Telophase
  - Chromosomes move to opposite ends of the cell, nuclear membranes reform
- Cytokinesis
  - Cleavage of the cell, involves cleavage furrow in animal cells and cell plate formation in plant cells
- Chromosome
  - Tightly bundled DNA
- Chromatid
  - One of a pair of duplicated chromosomes
- Chromatin
  - Loose DNA

TERMS TO KNOW

- Karyotype
  - The number and appearance of chromosomes in the nucleus of a eurkaryotic cell.
  - Karogram - A graph depicting all 23 pairs of chromosomes lined up in order from largest to smallest
- Haploid
  - One complete set of chromosomes, i.e. 23 chromosomes in haploid human gametes
- Diploid
  - Two complete sets of chromosomes, i.e. 23 pairs of chromosomes in somatic human cells
- Gamete
  - Haploid reproductive cells
- Centromere
  - Center of a chromosome
- Kinetochore
  - Protein in the center of a chromosome where spindle fibers attach
- Homologous Chromosomes
  - A pair of the same chromosomes, one from each parent, may have different versions of the same alleles
- Fission of Bacteria
  - The method by which bacteria reproduce, doubling of chromosomes and splitting of one cell into two with no mitosis occurring. This takes place with out the formation of spindles.

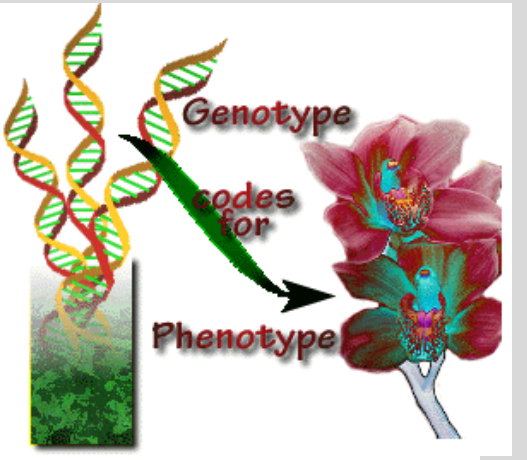
TERMS TO KNOW

- Autosomes
  - A chromosome that is not a sex chromosome.
  - Chromosomes responsible for normal body function and body parts
- Sex Chromosomes
  - Chromosomes that determine sex and male/female body parts
- Gametophyte
  - Haploid organism that makes gametes via mitosis
- Sporophyte
  - Diploid organism that makes spores via meiosis
- Recombination
  - Crossing over of chromosomes during meiosis 1
- Gregor Mendel
  - First to prove inheritance using discrete units or particulate units and not due to inheritance blending
- Allele
  - Alternative forms of the same gene
  - A single type of a gene, i.e. brown eye vs blue eye genes
- Genotype
  - The genetic makeup of a cell, organism or individual.
- Phenotype
  - Composite of an organism's observable characteristics
  - Expression of genes + environmental factors

Genotype vs Phenotype

Phenotype This is the "outward, physical manifestation" of the organism. These are the physical parts, the sum of the atoms, molecules, macromolecules, cells, structures, metabolism, energy utilization, tissues, organs, reflexes and behaviors; anything that is part of the observable structure, function or behavior of a living organism.

Genotype This is the "internally coded, inheritable information" carried by all living organisms. This stored information is used as a "blueprint" or set of instructions for building and maintaining a living creature. These instructions are found within almost all cells (the "internal" part), they are written in a coded language (the genetic code), they are copied at the time of cell division or reproduction and are passed from one generation to the next ("inheritable"). These instructions are intimately involved with all aspects of the life of a cell or an organism. They control everything from the formation of protein macromolecules, to the regulation of metabolism and synthesis.



The relationship between the genotype and phenotype is a simple one ...

The **Genotype** codes for the **Phenotype**

The "internally coded, inheritable information", or **Genotype**, carried by all living organisms, holds the critical instructions that are used and interpreted by the cellular machinary of the cells to produce the "outward, physical manifestation", or **Phenotype** of the organism.

TERMS TO KNOW

- Homozygous
  - Having two of the same alleles for a specific trait (true breeding)
- Heterozygous
  - Having two different alleles for a specific trait
- Parental Generation
  - The first set of parents crossed in which their genotype is the basis for predicting the genotype of their offspring, which in turn may be crossed.
- F1 and F2 Generations
  - F1 is the first cross of the parental generation, F2 is a cross of the F1 generation
- Dominant
  - Allele that is always expressed if present
- Recessive
  - Allele that is only expressed if homozygous for that allele
- Test Cross
  - Dominant phenotype of unknown genotype being crossed with recessive phenotype to determine genotype
- Haploid
  - Having a single set of chromosomes (n)
- Diploid
  - Having two sets of chromosomes (2n)

TERMS TO KNOW

- Complete dominance
  - One allele is completely dominant over the other, and is always expressed if present
- Co-dominance
  - Both alleles are completely expressed, i.e. AB blood type
- Incomplete dominance
  - Both alleles are expressed, i.e. pink flowers being a cross of red and white
- Multiple alleles
  - More than one allele exists, i.e. ABO blood types
- Monohybrid cross and dihybrid cross
  - Monohybrid cross: Crossing of alleles for one trait
  - Dihybrid cross: Crossing of alleles for two traits
- Dependent assortment (like linked genes) vs. independent assortment
  - Dependent assortment: Theory that alleles on the same chromosome are crossed together
  - Independent assortment: Theory that alleles on the same chromosome are crossed separately
- Pleiotropy
  - More than two alleles develop as a result of mutation
- Polygenic
  - Phenotype is determined by multiple genes

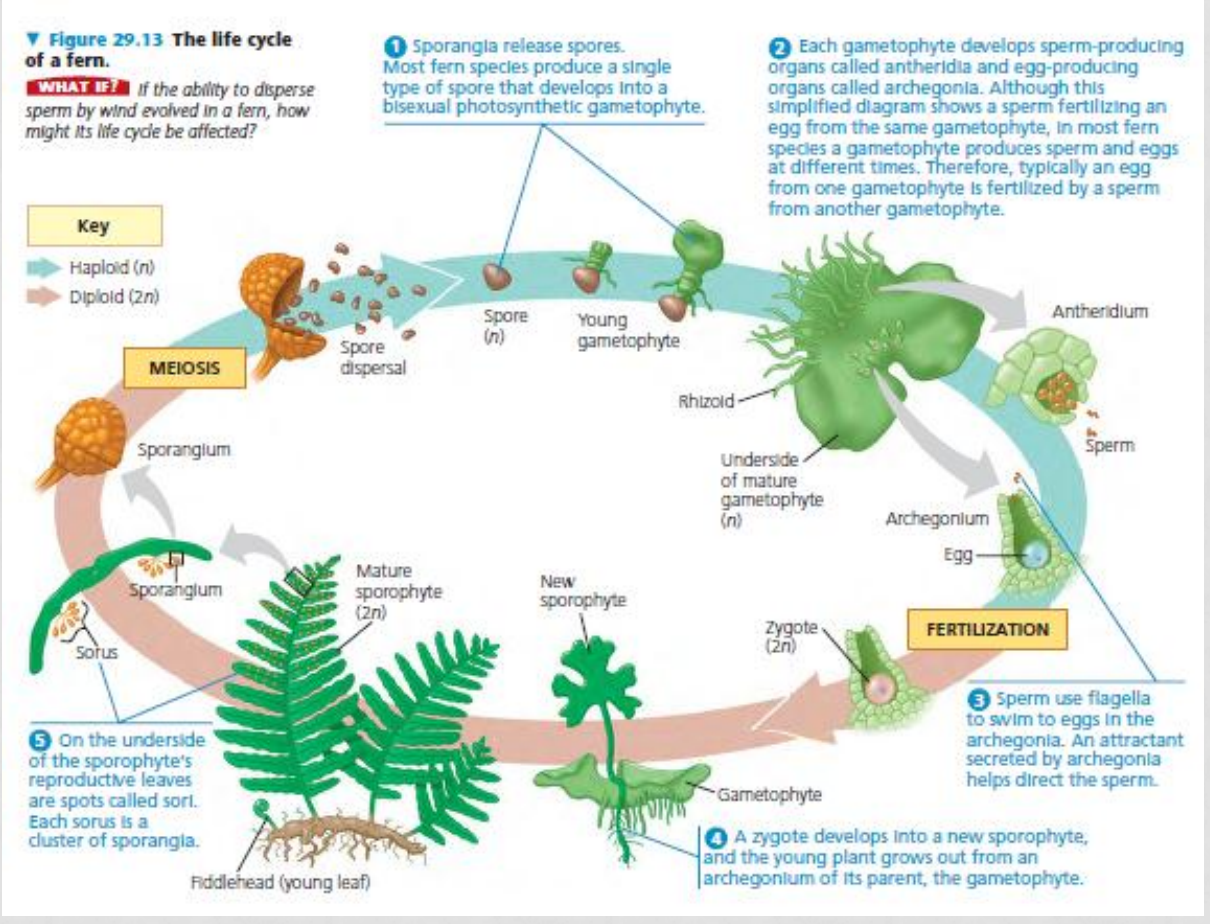
CONCEPT QUESTIONS

- MITOSIS: Be able to identify pictorial/symbolic representations of mitosis.
  - Chromosomes condense during ___Pro___ phase; chromosomes are located in the equator during ___Meta___ phase, chromatids separate during ___Ana___ phase, chromosomes relax during ___Telo___ phase?
  - Centrioles move to the poles during ___Pro___ phase of mitosis?
  - The nuclear membrane disassembles during ___Pro___ phase, and reassembles during ___Telo___ phase and is absent in-between phases.
  - How do spindle fibers move chromosomes during anaphase?
    - In anaphase, spindle fibers pull sister chromatids toward the spindle poles. Spindle fibers not connected to chromatids lengthen and elongate the cell.
  - Cytokinesis in plants is by ___Forming a cell plate___ and cytokinesis in animals is by ___Forming a cleavage furrow___. Centrioles are found in ___Animals___ but not ___higher level Plants___?
  - If a cell had 10 chromatids in metaphase of mitosis, how many chromosomes are in each resulting nucleus?
    - 5

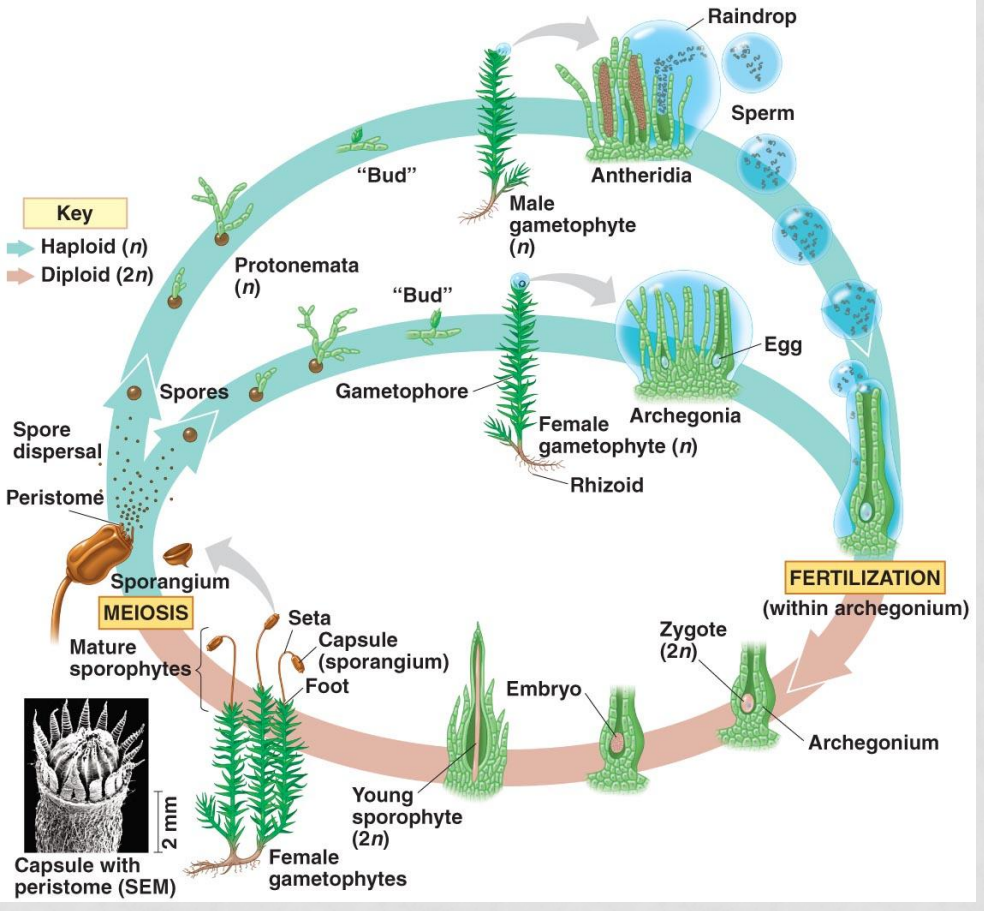
CONCEPT QUESTIONS

- What is the life cycle of animals?
  - Diploid with an extremely reduced haploid stage
- What is the life cycle (alternation of generation) of plants?
  - Alternating haploid and diploid generations, sporophyte and gametophyte
- What are the differences between meiosis and mitosis?
  - Meiosis forms haploid cells, Mitosis forms diploid cells
  - Meiosis involves crossing over and shuffling of genes, mitosis makes two exact replicas
  - Meiosis is a two stage process Meiosis 1 and Meiosis 2.
- What are the similarities between meiosis and mitosis?
  - Both Meiosis and Mitosis go through the four phases; prophase, metaphase, anaphase, and telophase.

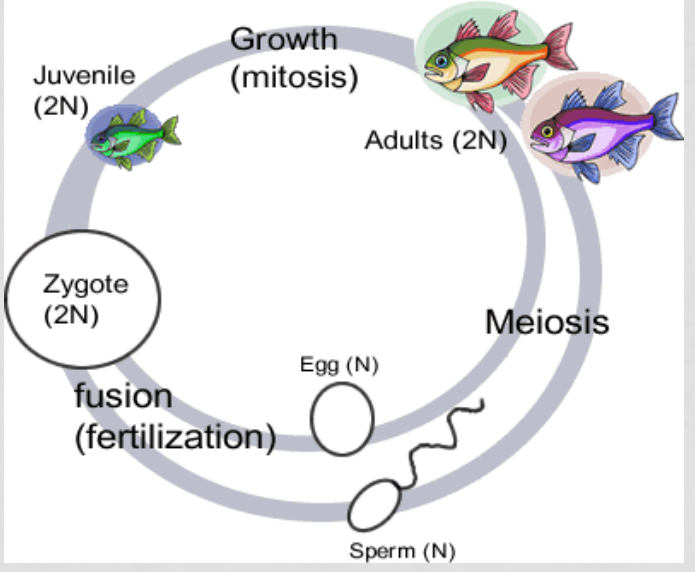
LIFE CYCLE OF A FERN EXAMPLE OF ALTERNATION OF GENERATIONS



LIFE CYCLE OF A MOSS EXAMPLE OF ALTERNATION OF GENERATIONS



LIFE CYCLE OF AN ANIMAL



CONCEPT QUESTIONS

- If there are 100 chromosomes before meiosis, how many are there after meiosis?
  - 50
- If there are 100 chromosomes before mitosis, how many are there after mitosis?
  - 100
- If a cell has two pair of homologous chromosomes before mitosis (after S phase), then how many chromatids does it have?
  - 4
- If a cell has two pair of homologous chromosomes before meiosis (after S phase), then how many chromatids does it have?
  - 4

PUNNETT SQUARES

	P	p
P		
p		

PUNNETT SQUARES

	P	p
P	PP	Pp
p	Pp	pp

PUNNETT SQUARES

	I^A	I^B
i		
i		

PUNNETT SQUARES

	I^A	I^B
i	I^Ai	I^Bi
i	I^Ai	I^Bi

Dihybrid Cross:

a cross that shows the possible offspring for <u>two</u> traits

Fur Color:
- B: Black
- b: White

Coat Texture:
- R: Rough
- r: Smooth

In this example, we will cross a heterozygous individual with another heterozygous individual. Their genotypes will be:

BbRr x BbRr

Dihybrid Cross

BbRr x BbRr

First, you must find ALL possible gametes that can be made from each parent.

Remember, each gamete must have one B and one R.

Dihybrid Cross

BbRr x BbRr

Possible gametes:

BR

Br

bR

br

Next, arrange all possible gametes for one parent along the top of your Punnett Square, and all possible gametes for the other parent down the side of your Punnett Square…

Dihybrid Crosses:

a cross that shows the possible offspring for two traits

BbRr x BbRr

Fur Color:
- B: Black
- b: White

Coat Texture:
- R: Rough
- r: Smooth

Then, find the possible genotypes of the offspring

	BR	Br	bR	br
BR				
Br				
bR				
br				

Dihybrid Crosses:

a cross that shows the possible offspring for two traits

BbRr x BbRr

Fur Color:
- B: Black
- b: White

Coat Texture:
- R: Rough
- r: Smooth

	BR	Br	bR	br
BR	BBRR	BBRr	BbRR	BbRr
Br	BBRr	BBrr	BbRr	Bbrr
bR	BbRR	BbRr	bbRR	bbRr
br	BbRr	Bbrr	bbRr	bbrr

How many of the offspring would have a black, rough coat?

How many of the offspring would have a black, smooth coat?

How many of the offspring would have a white, rough coat?

How many of the offspring would have a white, smooth coat?

	BR	Br	bR	br
BR	BBRR	BBRr	BbRR	BbRr
Br	BBRr	BBrr	BbRr	Bbrr
bR	BbRR	BbRr	bbRR	bbRr
br	BbRr	Bbrr	bbRr	bbrr

Fur Color:
B: Black
b: White

Coat Texture:
R: Rough
r: Smooth

How many of the offspring would have black, rough coat?

How many of the offspring would have a black, smooth coat?

How many of the offspring would have a white, rough coat?

How many of the offspring would have a white, smooth coat?

	BR	Br	bR	br
BR	BBRR	BBRr	BbRR	BbRr
Br	BBRr	BBrr	BbRr	Bbrr
bR	BbRR	BbRr	bbRR	bbRr
br	BbRr	Bbrr	bbRr	bbrr

Phenotypic Ratio

9:3:3:1

Fur Color:
B: Black
b: White

Coat Texture:
R: Rough
r: Smooth

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Questions

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