Name _____ Date _____

Sexual Reproduction and Genetics

Section 10.1 Meiosis

Main Idea — **Details**

Skim *the headings and illustration captions in Section 1 of the chapter. Write three facts you discovered about meiosis as you scanned the section.*

1. Accept all reasonable responses.
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define chromosome.

chromosome — a cellular structure that contains DNA

New Vocabulary

Use the terms in the left margin to complete the paragraph below.

diploid
gamete
gene
haploid
homologous chromosomes
meiosis
fertilization
crossing over

A segment of DNA on a chromosome that controls the production of a protein is called a ___gene___. A ___diploid___ cell contains two copies of each chromosome. A sex cell, or ___gamete___, is ___haploid___, meaning it contains one copy of each chromosome. ___Homologous chromosomes___ are pairs of chromosomes, one from each parent.

Describe three processes that occur during sexual reproduction.

Accept all reasonable responses.

	Meiosis	Fertilization	Crossing Over
What happens?	cell division reduces chromosome number	two haploid sex cells, one from each parent combine	segments of homologous chromosomes break and change places
What is the product?	four haploid cells	a diploid fertilized egg	new combinations of genetic material on chromosomes

Name _____ Date _____

Section 10.1 Meiosis (continued)

Main Idea | **Details**

Chromosomes and Chromosome Numbers

I found this information on page _____.
SE, pp. 270–271
RE, pp. 103–104

Identify *three characteristics that are the same in each member of a pair of homologous chromosomes. Name one thing that is different.*

Same	Different
1. length 2. centromere position 3. position of genes	1. exact version of each gene

Meiosis I, Meiosis II, and The Importance of Meiosis

I found this information on page _____.
SE, pp. 271–276
RE, pp. 105–108

Compare and contrast *the phases of Meiosis I and Meiosis II. Sketch each phase.* Accept all reasonable responses. Sketches should be similar to those in the text.

Meiosis I	Prophase I	Metaphase I	Anaphase I	Telophase I
Description	chromosomes condense and pair up, spindle forms	spindle fiber attaches to centromere, pulls chromosomes to center of cell	chromosomes move apart from each other toward poles of cell	each pole contains one member of a pair of homologous chromosomes, cell divides
Sketch				
Meiosis II	**Prophase II**	**Metaphase II**	**Anaphase II**	**Telophase II**
Description	chromosomes condense and spindle forms	haploid number of chromosomes line up at center of cell	sister chromatids are pulled apart	nuclear membrane and nucleus reforms, cell divides into 4 haploid cells
Sketch				

Analyze *the chart above to determine the phase of meiosis when crossing over can occur. Mark a star on the correct phase.* Students should place a star by Prophase I.

Name _____ Date _____

Section 10.1 Meiosis (continued)

Main Idea

Sexual Reproduction v. Asexual Reproduction

I found this information on page _____

SE, p. 276
RE, p. 108

Details

Compare *meiosis and mitosis by filling in the chart below.*

	Mitosis	Meiosis
Number of DNA replications	1	1
Number of cell divisions	1	2
Number of daughter cells	2	4
Chromosome number of daughter cells	2*n*	*n*

Organize *information on how meiosis produces genetic variation.*

Meiosis produces
- random arrangement of chromosomes at equator
- crossing over

Compare *sexual reproduction and asexual reproduction by completing the paragraph with the terms below.*

- sexual reproduction
- asexual reproduction
- protists
- mammals
- animals
- plants
- genes
- genetic diversity

In asexual reproduction, an organism inherits its genetic material from a single parent. The new organism has the same genes as its parent. In sexual reproduction, an organism inherits genetic material from two different parents. Sexual reproduction increases genetic diversity, whereas asexual reproduction does not. Protists, simple animals, and most plants can reproduce sexually or asexually. Mammals only reproduce sexually.

SUMMARIZE Explain how meiosis and fertilization produce genetic variation during sexual reproduction.

Crossing over and random sorting of chromosomes during meiosis increase genetic variation. Fertilization increases genetic variation further by combining genetic material from two different individuals.

Name _____ Date _____

Sexual Reproduction and Genetics

Section 10.2 Mendelian Genetics

Main Idea — **Details**

Skim *Section 1 of the chapter, and then write two questions that come to mind from reading the headings and illustration captions.*

1. Accept all reasonable responses.

2. _____

Review Vocabulary

segregation

Use your book or dictionary to define segregation.

the separation of alleles that occurs during meiosis

New Vocabulary

allele

genetics

hybrid

law of independent assortment

law of segregation

Use terms in the left margin to complete the paragraph below.

Genetics is the branch of biology that studies how traits are inherited. Hybrid offspring result from parents that have different forms of alleles for certain traits. Mendel's law of segregation states that every individual has two alleles of each gene and when gametes are produced, each gamete receives one of these alleles. Mendel's law of independent assortment states that genes for different traits are inherited independently of each other.

dominant

genotype

heterozygous

homozygous

phenotype

recessive

Compare and contrast each pair of terms by defining them and/or noting their differences. Accept all reasonable responses.

dominant trait	recessive trait
an observed trait that masks the recessive form of a trait	trait that can be observed if the dominant trait is not present
genotype	**phenotype**
the allele combination an organism contains	the way an organism looks and behaves
homozygous	**heterozygous**
an organism's genotype when two alleles for a trait are the same	an organism's genotype when two alleles for a trait are different

Name _____ Date _____

Section 10.2 Mendelian Genetics (continued)

Main Idea | **Details**

How Genetics Began

I found this information on page _____
SE, p. 277
RE, p. 109

Describe *how a plant self-pollinates.*

A plant self-pollinates when its male and female gametes come from the same plant.

Infer *why Mendel used cross-pollination to study inheritance.*

Mendel cross-pollinated plants to create offspring that have traits of both plants.

The Inheritance of Traits

I found this information on page _____
SE, pp. 277–280
RE, pp. 109–111

Analyze *Mendel's experiment with green-seed and yellow-seed pea plants by completing this summary paragraph.*

Mendel used only ___true breeding___ lines, which consistently produced the same trait in the offspring. He controlled variables by ___studying one trait at a time___. When he crossed a green-seed plant with a yellow-seed plant, the F_1 offspring were ___100___ percent yellow and ___0___ percent green. He allowed the F_1 plants to ___self-fertilize___ to produce ___F_2___ plants. The F_2 plants were ___75___ percent yellow and ___25___ percent green. Mendel concluded that each trait has two forms, called ___alleles___. Mendel called yellow seed color the ___dominant___ form and green seed color the ___recessive___ form of the trait.

Compare *genotypes and phenotypes for pea plants.*

Genotype	Homozygous or Heterozygous	Phenotype
YY	homozygous	yellow seeds
Yy	heterozygous	yellow seeds
yy	homozygous	green seeds

Name _____ Date _____

Section 10.2 Mendelian Genetics (continued)

Main Idea

I found this information on page _____.
SE, pp. 277–280
RE, pp. 109–111

Punnett Squares and Probability

I found this information on page _____.
SE, pp. 280–282
RE, p. 112

Details

Demonstrate *the law of independent assortment by listing the 4 alleles that are produced when a pea plant with the genotype RrYy produces gametes.*

1. YR 2. Yr 3. yr 4. yR

Complete *the Punnett squares for height in the F_1 and F_2 generations. Tall plants (T) are dominant over short plants (t). Write the expected genotypes and the probability for each.*

F_1

	T	T
t	Tt	Tt
t	Tt	Tt

Tt 100%

F_2

	T	t
T	TT	Tt
t	Tt	tt

TT 25%
Tt 50%
tt 25%

Identify *the genotypes within the Punnett square showing the dihybrid cross of seed color and seed texture. The first row has been done for you. Write the expected phenotypic ratio.*

	YR	yR	Yr	yr
YR	YYRR	YyRR	YYRr	YyRr
yR	YyRR	yyRR	YyRr	yyRr
Yr	YYRr	YyRr	YYrr	Yyrr
yr	YyRr	yyRr	Yyrr	yyrr

Phenotypic ratio: 9 yellow round : 3 green round : 3 yellow wrinkled : 1 green wrinkled

SUMMARIZE Discuss the effects of Mendel's two laws (segregation and independent assortment). Give an example. Accept all reasonable responses.

The law of segregation states that every individual has two alleles of each gene and each gamete receives one of these alleles. The law of independent assortment states that genes for different traits are inherited independently. For example, when a pea plant with the genotype RrYy produces gametes, the alleles R and r will separate from each other and from the alleles Y and y.

Name _____ Date _____

Sexual Reproduction and Genetics

Section 10.3 Gene Linkage and Polyploidy

Main Idea — **Details**

Scan *the headings, boldfaced words, pictures, figures, and captions in Section 3.*

- ☐ Read all section titles.
- ☐ Read all boldfaced words.
- ☐ Look at all pictures and read the captions.
- ☐ Look at all figures.
- ☐ Read all captions.

Predict three things that you think will be discussed.

1. Accept all reasonable responses.
2. _____
3. _____

Review Vocabulary

protein — *Use your book or dictionary to define* protein.
the total nitrogenous material in plant and animal tissues

New Vocabulary

Use your book or dictionary to define each term.

genetic recombination — new combinations of genes that result from crossing over and independent assortment

polyploidy — the occurrence of one or more extra sets of all chromosomes in an organism

Name _____ Date _____

Section 10.3 Gene Linkage and Polyploidy (continued)

Main Idea | Details

Genetic Recombination

I found this information on page _____.
SE, p. 283
RE, p. 113

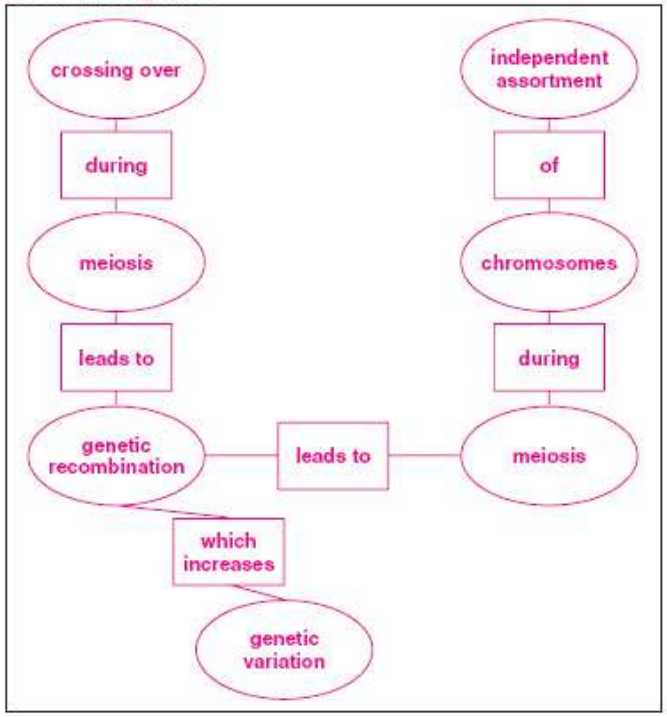
Calculate *the number of chromosome combinations due to independent assortment by filling in the chart. Use the formula* 2^n. *The first one has been done for you.*

Species	Chromosome Number (*n*)	Possible Combinations
Pea	7	$2^7 = 128$
Housefly	6	$2^6 = 64$
Cabbage	9	$2^9 = 512$
Fruit fly	4	$2^4 = 16$
Frog	13	$2^{13} = 8192$

Gene Linkage and Chromosome Maps

I found this information on page _____.
SE, pp. 283–285
RE, p. 114

Summarize *at least five pieces of information about genetic recombination by creating a concept map below.* Accept all reasonable responses.



Name _____ Date _____

Section 10.3 Gene Linkage and Polyploidy (continued)

Main Idea — **Details**

I found this information on page _____.
SE, pp. 283–285
RE, p. 114

Complete *the paragraph about gene linkage.*

- chromosomes
- farther
- inherited
- sequence
- crossing over
- individual genes
- linked

Genes close together on the same chromosome are linked. Linked genes are usually inherited together. Chromosomes, not individual genes, follow Mendel's law of independent assortment. Linked genes might become separated, as a result of crossing over. Crossing over is more likely to happen if genes are farther apart on a chromosome.

Analyze *whether the gene linkage is an exception to, or an example of, Mendel's law of independent assortment. Use an example from your book.*

Gene linkage is an exception because genes that are located close to each other on the same chromosome usually travel together. Scientists studied the fruit fly to confirm this exception.

Polyploidy

I found this information on page _____.
SE, p. 285
RE, p. 114

Identify *four species that show polyploidy.*

1. earthworms
2. goldfish
3. wheat
4. sugar cane

SUMMARIZE

Compare and contrast gene linkage to polyploidy and how they do not follow all of Mendel's laws of inheritance.

Gene Linkage	Polyploidy
• Genes close together on the chromosome do not sort independently. • Each trait is controlled by two alleles.	• Polyploid organisms have more than two sets of chromosomes. • They have more than two alleles for each trait.