Name _____ Period _____ Date _____

Genetics & Probability Worksheet 3

There are a variety of question types on this worksheet. Read each question carefully. Remember to:

- Use proper symbols for all traits dependent on inheritance patterns
- Separate traits into their own Punnett Squares for probability models
- Use the multiplication and addition rules to solve for probability models

1. Mendel collected data on one of his crosses for height of pea plants. After counting all of the offspring, Mendel found 1841 plants were tall; 608 plants were dwarf. Use these results to determine the phenotypic ratio of the offspring produced in this cross. Use this ratio and a Punnett square to determine the genotypes of the two parental pea plants. Finally, provide the genotypic ratio of any possible offspring.

Phenotypic Ratio _____

Genotypes of Parents _____

_____

Genotypic Ratio _____

2. A dog breeder is trying to have a litter of yellow lab puppies. She has a female black lab, and is unsure whether it will be possible. Other breeders in her area only have male black labs. Although two genes go into determining coat color, only the gene at location E is necessary to determine whether pups are black or yellow. Presence of the dominant allele (E) results in a black coat. The recessive allele (e) results in the yellow phenotype. Determine the necessary genotypes of both the breeder's dog, and the donor's dog to ensure at least some of the puppies are yellow labs.

Genotype – Breeder _____

Genotype – Donor _____

Phenotypic % _____

Phenotypic Ratio _____

Name _____ Period _____ Date _____

3. Shorthorn cattle show ***codominance*** for pigmentation of hair. A rancher wants to breed a white-haired male to a roan female. Determine the genotypic & phenotypic ratios.

Genotypic % _____

Genotypic Ratio _____

Phenotypic % _____

Phenotypic Ratio _____

4. A father is curious to see if one if his children is actually his. He really does not want to go through genetic testing, so he tries a simpler method by looking at blood types. When the father brings his child in for a physical, he learns the boy has type-A blood. The father knows his own blood type is AB. He knows his wife has blood type B. Determine the genotypes of both the father & mother. Is it possible for this man to be the father of this boy? What is the probability these two parents had a son who has type-A blood?

Genotype of Father _____

Genotype of Mother _____

Is this man the father? _____

Probability of type-A _____

5. Duchenne muscular dystrophy is an ***X-linked recessive*** disorder. It is characterized by a rapid progression of muscle degeneration, leading to a loss of skeletal muscle control. Eventually, it leads to respiratory failure and death. If a female carrier wants to have children with a normal male, what is the probability of one of their sons could have DMD? One of their daughters have DMD? One of their daughters be a carrier? In addition, determine the genotypes of the two parents.

Genotype of Mother _____

Genotype of Father _____

DMD Son _____

DMD Daughter _____

Carrier Daughter _____

Name _____ Period _____ Date _____

6. Sickle cell anemia is a disease in which the hemoglobin protein is incorrectly produced, resulting in red blood cells that are misshapen. The sickle cell alleles are known to exhibit ***incomplete dominance***. The homozygous condition for normal hemoglobin (H^N) produces red blood cells that are shaped and function properly. The homozygous condition (*anemia*) for incorrect hemoglobin (H^S) results in red blood cells that are shaped like a sickle, fail to function well during gas exchange, and often result in circulation issues. A heterozygous individual (*sickle cell trait*) will produce some sickle cells, but produces primarily normal functioning hemoglobin/cells. Heterozygous individuals do not produce the symptoms of an individual with anemia, but do have an advantage in tropical climates as they are resistant to malaria. If two parents that have *sickle cell trait* have children, determine the genotypic & phenotypic ratios of those possible children.

Genotypic % _____

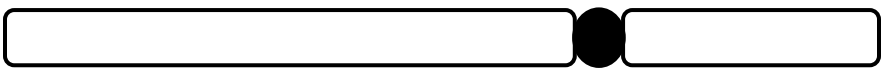
Genotypic Ratio _____

Phenotypic % _____

Phenotypic Ratio _____

7. A team of *Drosophila* researchers have collected data from a variety of genetic crosses for linked genes on chromosome 3. They are in the process of analyzing the data to place the various genes in order. With the recombination data listed below, place and label the five different genes in the correct relative order on the chromosome provided.

Genes	Recombination Frequency
sepia eyes (se) - curled wings (cu)	24%
stubble bristles (Sb) - ebony body (e)	13%
sepia eyes (se) - hairy body (h)	1%
hairy body (h) - ebony body (e)	45%
stubble bristles (Sb) - sepia eyes (se)	32%
curled wings (cu) - hairy body (h)	23%
ebony body (e) - curled wings (cu)	21%



Name _____ Period _____ Date _____

Pea plants are crossed to demonstrate independent assortment. The traits tested are listed below. The capital letter indicates the dominant allele.

Seed Color (Yellow vs. green)
Seed Shape (Round vs. wrinkled)
Flower Color (Purple vs. white)
Plant Height (Tall vs. dwarf)
Pod Shape (Inflated vs. constricted)

Use the information provided above and in each question to determine the correct answers.

Use the following for questions 8-11
A plant heterozygous for all five traits is allowed to self-pollenate.
Draw out Punnett Squares in the space below.

8. Determine the probability of having an offspring that has a round, green seed.

9. Determine the probability of having an offspring that has round, yellow seeds in a constricted pod. The plants these pods are taken from must be tall with purple flowers.

10. Determine the probability of having an offspring that shows exactly four recessive traits.

11. Determine the probability of having an offspring that expresses all five dominant phenotypes.