**Unit 5: Meiosis and Inheritance**

**Unit 5 References: Textbook Ch. 6**

**Quiz Dates: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Test Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A: Meiosis and Karyotyping**

1. Watch the video at: [https://www.youtube.com/watch?v=toWK0fIyFlY&index=12&list=PLwL0Myd7Dk1F0iQPGrjehze3eDpco1eVz](https://www.youtube.com/watch?v=toWK0fIyFlY&index=12&list=PLwL0Myd7Dk1F0iQPGrjehze3eDpco1eVz%20)  
 This is the Amoeba Sisters video on Meiosis. As you watch, answer the following:  
 a. What is reduction division?  
 b. How is meiosis different from mitosis? Give at least 3 differences  
 c. What does Meiosis produce? Why is reduction division necessary for the cells produced by meiosis?  
 d. Why are there 2 divisions in meiosis?  
 e. Describe what happens to the DNA of the cell at each step of meiosis.  
 f. What is non-disjunction? What does it cause?

2. Define, in your own words:  
 a. karyotype  
 b. homologous chromosomes  
 c. autosome  
 d. sex chromosome  
 e. trisomy  
 f. monosomy

3. Watch the animation at: <https://www.dnalc.org/view/15520-DNA-is-organized-into-46-chromosomes-including-sex-chromosomes-3D-animation.html>  
Answer the following as you watch:  
 a. How many chromosomes do humans have?   
 b. What is the 23rd pair of chromosomes for? What 2 patterns are possible in this pair?  
 (if you need a hint, check out the following images: <https://www.dnalc.org/view/16243-Gallery-8-Human-female-karyotype.html> and <https://www.dnalc.org/view/15564-Karyotype-male-black-and-white-.html>)  
 c. how/why are chromosomes arranged as you see them on a karyotype (if you need to see a karyotype, use the links from the hint in b)?  
 d. Challenge question: if non-disjunction occurred in a sperm cell, which then fertilized an egg, what would you see in a karyotype from one of the cells in the resulting zygote?

**B. Monohybrid crosses**

Watch the video at: <https://www.youtube.com/watch?v=i-0rSv6oxSY> on monohybrid crosses.   
1. Define the following in your own words:  
 a. dominant  
 b. recessive  
 c. homozygous  
 d. heterozygous  
 e. genotype  
 f. phenotype  
 g. cross  
 h. offspring  
 i. P generation  
 j. F1 generation   
 k. F2 generation

2. Complete the following genetics practice problems. Show your work!!!!!!  
 a. In summer squash, white fruit color is dominant and yellow is recessive. A squash plant that is homozygous for white is crossed with a homozygous yellow one. Predict the appearance of (i.) the F1 g eneration (ii.) the offspring of a cross between an F1 individual and a heterozygous white individual.

b. In sheep, white coat is dominant and black is recessive. Occasionally a black sheep appears in a flock. Black wool is worthless. How could a farmer eliminate the genes for black coat from the flock?

c. In garden peas, tall vine is dominant and short vine is recessive. If a homozygous tall plant is crossed with a homozygous short plant, what genotypes are possible in the F1 generation?

d. A child of two normal parents has albinism a recessive trait, (i) what is the chance that a second child will be born an albino? (ii) What is the probability of the second child being a carrier? (iii) What is the probability that the second child born normal will be a carrier?

**C. Non-Mendelian Inheritance**

The following videos will be helpful to you as you complete these practice problems:  
Sex-linked traits: <https://www.youtube.com/watch?v=h2xufrHWG3E>  
Multiple Alleles: <https://www.youtube.com/watch?v=9O5JQqlngFY>  
Non-Mendelian Inheritance: <https://www.youtube.com/watch?v=YJHGfbW55l0>

1. In northeast Kansas there is a creature know as a wildcat. It comes in three colors, blue, red, and purple. This trait is controlled by a single [locus](http://www.ksu.edu/biology/pob/genetics/defin.htm#loc) gene with incomplete dominance. A [homozygous](http://www.ksu.edu/biology/pob/genetics/defin.htm#hom) (BB) individual is blue, a homozygous (B’B’) individual is red, and a [heterozygous](http://www.ksu.edu/biology/pob/genetics/defin.htm#het) (BB’) individual is purple. What would be the [genotypes](http://www.ksu.edu/biology/pob/genetics/defin.htm#gen) and [phenotypes](http://www.ksu.edu/biology/pob/genetics/defin.htm#phen) of the offspring if a blue wildcat were crossed with a red one?
2. A common phenotype used in questions about codominance is roan fur in cattle.  Cattle can be red (RR = all red hairs), white (R’R’ = all white hairs), or roan (RR’ = red & white hairs together).  A good example of codominance.  What would be the phenotypic ratio of a cross between a roan cow and a red cow?
3. Hemophilia is a disease that is a recessive X-linked disorder. If the father is healthy and the mother is heterozygous for the trait, what is the possibility that the children will be carriers? Are the carriers male or female? Is this always the case?
4. Color blindness is a recessive X-linked disorder. What would be the phenotypic ratio of the F1 be from the cross of a regular sighted male and a heterozygous female?
5. Predict the blood types of the offspring from a man with type AB blood and a woman with type O.
6. A couple has a child with type AB blood. List the possible genotype combinations of the parents. Use punnett squares to demonstrate these combinations.

**D. Pedigrees, Gene expression, and Genetic Disorders**

1. Fill in the chart below:

|  |  |  |
| --- | --- | --- |
| Disorder | Dominant, Recessive or Sex-Linked? | Effects on the body |
| Cystic Fibrosis |  |  |
| Sickle Cell |  |  |
| Huntington's Disease |  |  |
| Color-Blindness |  |  |
| Hemophilia |  |  |
| Marfan Syndrome |  |  |

2. Hydrangeas have genes that control their color. In basic soil they produce blue flowers. In acidic soil they produce pink flowers.   
 a. What does this example tell you about genetic and environment interactions?   
 b. Using the hydrangea example, explain the environmental/genetic connection for the disorder PKU and skin cancer.

3. Use the animation at: <https://www.dnalc.org/view/15990-Making-a-pedigree.>html to fill out the chart below:

|  |  |
| --- | --- |
|  | Symbol on a Pedigree (draw or describe) |
| Male |  |
| Female |  |
| Mating Pair |  |
| Offspring from Mating pair |  |
| Carrier of a trait |  |
| Individual that has the trait  Individual who has died |  |

4. Challenge question: What would you predict to see on a pedigree for. . .   
 a. a recessive trait?  
 b. a dominant trait?  
 c. a sex-linked trait?