U7 Test – More Practice!

1) Sickle cell is an inherited disease caused by an autosomal recessive allele. If one individual is a carrier for sickle cell disease and the other parent has the disease, what are the chances of them having a phenotypically normal child? Give your answer as a fraction or decimal.

2) In a certain species of cactus, a single gene controls the expression of flower color. The gene has two alleles: a dominant allele (P) associated with purple flowers and a recessive allele (p) for white flowers. A scientist of 1200 cacti in a population, a scientist observes that 451 have white flowers.

Predict the number of cacti in the population that would be expected to have the Pp genotypes if the population were in Hardy-Weinberg equilibrium?

3) In one species of corn, kernel color is controlled by a single gene with 2 alleles. Purple corn kernels are dominant to yellow kernels. A corn cob can have hundreds of kernels, each with as a result of a different fertilization event.   Predict the frequency of purple kernels that would result from a cross between two heterozygous plants. Record your answer as a decimal to the nearest hundredth.

4) A certain species of fruit has four unlinked genetic loci: Q, R, S, and T. Each genetic locus has one dominant allele and one recessive allele. A plant has the genotype QqRrSsTt. What is the probability that this plant will produce a haploid gamete with the genotype of QRst? Give your answer as a fraction or as a value between 0 and 1, to four decimal places.

5) In fruit flies, the allele for vestigial wings is recessive to the allele for wild-type wings, and the allele for white wyes is recessive to the allele for red eyes. The gene controlling wing type is carried on an autosome, whereas the gene for eye color is carried on the X chromosome.

   a. What does "wild type" mean?

   b. Make a phenotype/genotype key before continuing.

   A true-breeding female with vestigial wings and red eyes is crossed with a male with wild-type wings and white eyes. What proportion o the offspring are expected to be females with wild-type wings and white eyes? Give your answer as a fraction or a decimal point value from 0 to 1.

6) In purple-people-eaters, the gene for hair color (H), lip size (L), and body color (B) are all found on the same chromosome. The following crossover frequencies for these genes were determined by experiments.

Genes	Crossover Frequency
H & B	16%
H and L	8.5%
B & L	24.5%

   What is the correct sequence of the genes H, L, and B on the chromosome?

7) **Pedigree Puzzles** – Identify the inheritance pattern in each pedigree below. Choose among Autosomal Dominant, Autosomal Recessive, or Sex-Linked Recessive


a.

b.

d.

e.
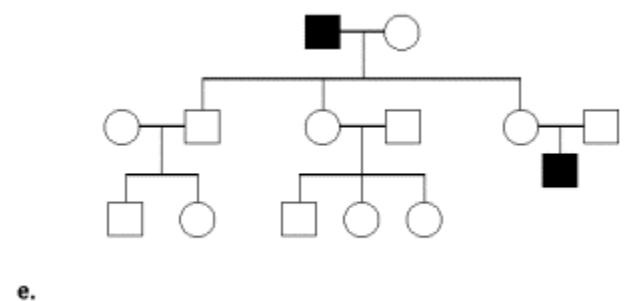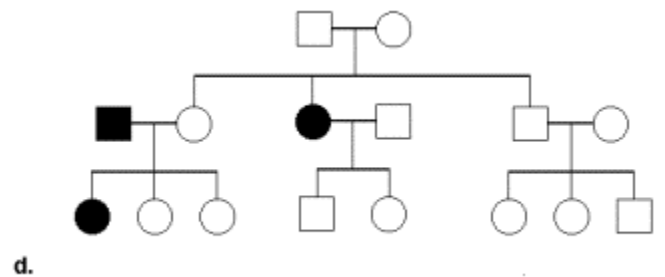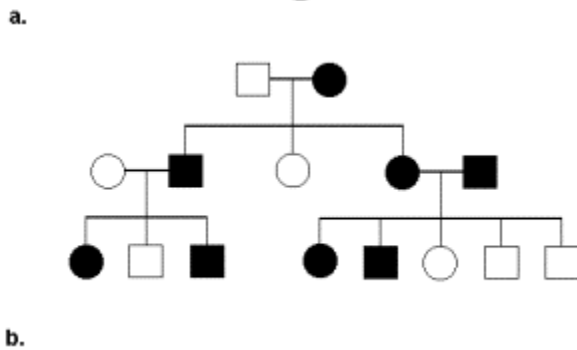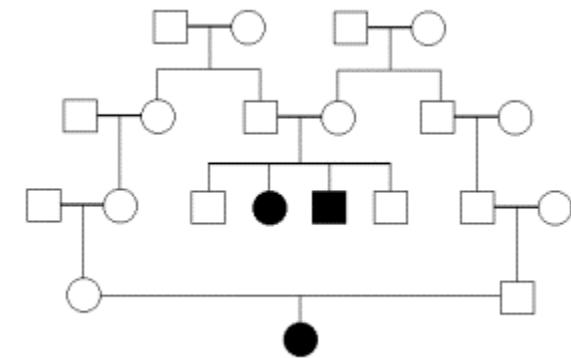
8) **Gene Linkage**:
   a) How can you tell if two genes are autosomal linked or sex-linked?

   b) What are linked genes?

   c) Do linked genes experience crossing over? If no, why not? If yes, how often and under what circumstances?

   d) If genes A and B are linked on the same chromosome, draw how they might be distanced from each other on the line below.

   e) According to the gene map below:
      a. Which 2 genes are *least* likely to experience crossing over, and thus are *most* likely to be linked? WHY?

      b. Which 2 genes are *most* likely to experience crossing over and assort independently, and thus are *least* likely to be linked? WHY?
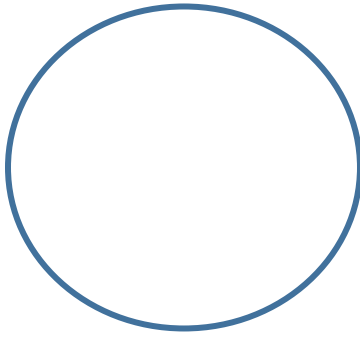
   M   R   S   V
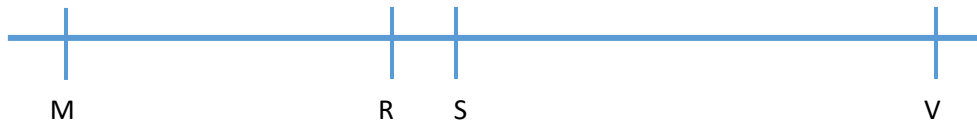
9) **Meiosis Mastery:**
   a. Draw 2 pairs of homologous chromosomes:

   b. Draw 2 pairs of duplicated homologous chromosomes:

   c. Draw 2 pairs of duplicated homologous chromosomes in a tetrad. Show and label 3 chiasmata.
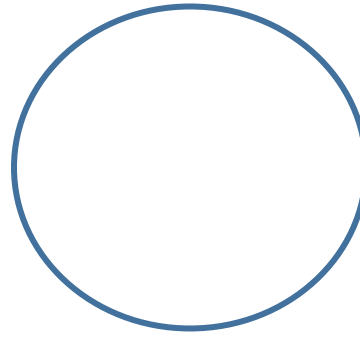
   d. Show how the gametes might appear after meiosis:

f) If 2n = 6, draw how the chromosomes would look in...
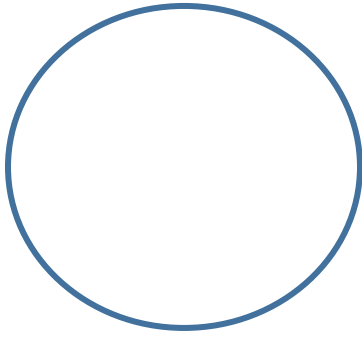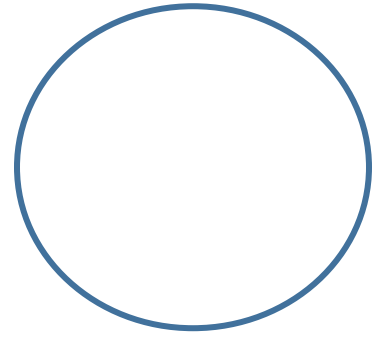
◯	◯	◯	◯
Metaphase 1	Anaphase 1	Metaphase 2	Anaphase 2

10) **Karyotypes** – Identify the sex and determine if there is a non-disjunction error. Describe the mutation if it exists.