Guided Reading Questions

Chapter 9
Patterns of Inheritance

(intro) Define genetics. Why are purebreds (aka true-breeders) important to genetics. What is selective breeding and how does it work? How is shyness in humans affected by genes and affected by the environment?

(9.1) What are pangenes and what was wrong with the idea? Can somatic cells pass traits on to offspring? What was wrong with the "blending" hypothesis?

(9.2) What monk discovered the principles of genetics? On what plant did he work? How did his "heritable factors" differ from pangenes and blending? What are some reasons that Mendel chose peas? Define self-fertilization and cross-fertilization. What are true-breeding varieties? Define hybrid and cross. What are the P, F_1 and F_2 generations?

(9.3) **This is an extremely important section.** Define monohybrid cross. What were the results of a cross between pure-breeding purple-flowered pea plant and a pure-breeding white-flowered pea? How did this disprove the blending hypothesis? Was the white trait lost? What was the ratio of purple-flowered to white-flowered plants in the second (F_2) generation? What were Mendel's conclusions regarding the heritable factor for white flower color? What are Mendel's four hypotheses? Define allele, homozygous, heterozygous, dominant allele, and recessive allele. How are the dominant and recessive alleles differentiated in fig. 9.3B? Define genotype and phenotype. What are the phenotypic and genotypic ratios in the second (F_2) generation? State the principle of segregation.

(9.4) Define loci (sing. locus). Note that alleles of a gene reside at the same locus on homologous chromosomes.

(9.5) What is a dihybrid cross? Based on fig. 9.5A, what are the predicted results of the dependent assortment and independent assortment hypotheses? Which hypothesis was supported by the data? What does the principle of independent assortment state?

(9.6) How do you know the genotype of a chocolate Labrador retriever? What are the possible genotypes of a black Labrador retriever? What is a test cross and how is it performed? What is the genotype of the black parent if all the offspring are black? What is the black parent's genotype is ½ of the offspring are black and ½ are brown?

(9.7) What are the minimum and maximum probabilities of an event occurring? What is the probability of a certain event? What is the probability of an impossible event? What is the probability of all possible outcomes? What is an independent event and what is a compound event. What are the rules of multiplication and of addition and when does each apply?

(9.8) Is the dominant genetic trait defined as the most common trait? Define pedigree and carrier.

(9.9) Are most human genetic disorders dominant or recessive? What percentage of children will be deaf from two carrier parents? What percentage of the hearing children from this cross will be carriers? What is the most common lethal genetic disease in the United States? Define inbreeding. What happens to an individual that is homozygous dominant for achondroplasia? Why are dominant alleles that are lethal less common than recessive alleles? At what stage of life do the symptoms of Huntington's disease express themselves?

(9.10) What is extracted during an amniocentesis and a chorionic villus sample? What are the

risks of complication from these two procedures? How does ultrasound imaging work?

(9.12) What is incomplete dominance? Why does this not fit the blending hypothesis?

(9.13) Define multiple alleles. What are the three alleles for the ABO blood group? What are the four blood types (phenotypes) and the six genotypes? Define codominance.

(9.14) Define pleiotropy. What are the bad effects of sickle cell anemia? What are the beneficial effects of sickle cell anemia against malaria?

(9.15) Note that Mendel studied discrete (i.e., either-or) characteristics. This was one of the secrets to his success. Define a polygenic trait. Additive effects are those in which each allele adds the same amount to the total result, e.g., with skin color, each "dark-skin" allele adds the same amount of pigment to the skin. That is why an AaBbCc individual has the same skin color as an AABbcc individual and an aaBbCC individual. Note that incomplete dominance, codominance, pleiotropy and polygenic inheritance all fit Mendel's model of particulate inheritance.

(9.16) What environmental factors affect the shade of skin color? Is the phenotype of an trait the product of the genotype, the environment, or both? Which type of variation is inherited – genetic or environmental?

(9.17) Define genetic testing and predictive testing. Remember, genes are not fate, and that the relationship between phenotype and genotype is complicated.

(9.18) What is the chromosome theory of inheritance? Do chromosomes undergo segregation and independent assortment?

(9.19) How were the results of Bateson and Punnett's experiment not consistent with Mendelian principles? Define linked genes.

(9.20) How did crossing over create the new phenotypes in the F_2 generation that were not seen in the P generation? Why are fruit flies a good research organism? Define recombination frequency. How is recombination frequency calculated?

(9.21) What was Sturtevant's reasoning behind his mapping technique? How did Sturtevant map gene loci?

(9.22) How is a human offspring's sex determined? Define autosome. What gene on the Y chromosome triggers maleness in humans? How is sex determination different in fruit flies compared to humans? How is sex determined in grasshoppers and in fish, butterflies and birds? How is sex determined in bees?

(9.23) What is a sex-linked gene? Where are most sex-linked genes found? Why do human males get only one copy of a sex-linked gene? How are sex-linked genes represented symbolically? What are the two possible male genotypes and three possible female genotypes? Figure 9.22C shows why white eyes are more common in male fruit flies than in female fruit flies.

(9.24) Name three human sex-linked conditions.