

**BIOL 260 GENETICS**  
**LEARNING OBJECTIVES FOR UNIT ONE**

1. Be able to list some of the distinguishing features of prokaryotes versus eukaryotes.
2. Describe the stages of the cell cycle, of mitosis, and of meiosis. Describe the major function of each step in each cycle, specifically with regards to the chromosomes (have they doubled? are they pairing with homologs? are they joined via a kinetochore or by chiasmata? are they separating? when does “crossing over” occur?)
3. Given the number of chromosomes in a diploid organism, be able to determine (or at least know the formula for) how many different combinations of chromosomes could be found in the gametes simply due to independent assortment.
4. Be able to perform problems similar to those we've done in class, in Problem Set 1, and those at the end of each chapter covered. In summary,
  - (a) be able to predict the phenotypic classes and their ratios from a monohybrid cross involving dominant and recessive alleles;
  - (b) be able to predict the phenotypic classes and their ratios from a cross involving co-dominant or incompletely dominant alleles;
  - (c) be able to predict the ratio of a specific genotype and/or phenotype from a cross involving multiple independently assorting genes (with each gene exhibiting only dominant and recessive alleles);
  - (d) be able to recognize when two interacting genes are influencing the expression of each other (e.g. epistatically), which will be reflected in the numbers and ratios of phenotypic classes of the F2 progeny resulting from a dihybrid cross (alterations of a 9:3:3:1 ratio);
  - (e) given the phenotypes of parents and the phenotypes and ratios of F1 and/or F2 progeny, be able to distinguish between a trait that is determined by two alleles at one gene manifesting incomplete dominance versus two genes interacting with each other epistatically;
5. Be able to list features of an organism that could make it a good genetic model. Be able to cite features of peas and flies that make them ideal organisms in which to study many aspects of genetics.
6. Be able to perform and interpret the results of a Chi Square analysis. (You will not be asked to perform an analysis on an exam, but you will be asked to interpret a test that I show you.)
7. Be able to distinguish between maternal effect, sex-linked, and cytoplasmic modes of inheritance.
8. Be able to look at a pedigree chart and discern the most likely mode of inheritance.

9. Be able to explain and provide examples of how continuous traits are “quantitative traits” and that phenotypic variation may be due to genetic variation within a population and/or environmental variation experienced by individuals within a population. Explain the polygenic theory of genetic variance and the nature of additive alleles, and the assumptions that accompany these ideas. Be able to provide competing hypotheses that explain a distribution data set of phenotypes.
10. Be able to summarize the history of eugenics in the United States and defend an informed opinion on the role of genetic testing in promoting “neo-eugenics.”