POPULATION GENETICS AND EVOLUTION

REVIEW SHEET

A] INTRODUCTION

- **Population** - a group of organisms of the same species living in the same area
    - members within a population are more likely to mate with one another than with members of other populations
    - genes flow among members of a population
- **Darwinian evolution** - in order to occur the following sequence of events must be present
    - production of an overabundance of offspring
    - some genetic-based variability among the offspring
    - differences in survival among the offspring
    - differences in reproduction among the survivors
    - increased frequency of adaptive characteristics in the next generation
- Five characteristics of populations that can affect the process (or rate) of change (evolution)
    - size of population
    - mating pattern
    - selection pressure
    - rate of migration
    - rate of mutation
- The two characteristics that we modeled in lab were:
    - size of population (genetic drift in a small population)
    - selection pressure (certain phenotype results in death or sterility)
- Be able to figure out genotype, phenotype, & allele frequencies (for example, for the population of 3AA, 2Aa, 3aa)
    - **allele frequency** = **gene pool**
    - **genotype frequency** - 3/8 AA; 2/8 Aa; 3/8 aa (fraction of population for each genotype)
    - **phenotype frequency** - 5/8 with yellow teeth; 3/8 with green teeth (fraction of population for each phenotype)
    - **allele frequency** - 8/16 A; 8/16 a (fraction of alleles of each type of allele) *use chart to figure allele frequencies, as demonstrated in lab
- Simulation of a model (stable) population
    - in a stable population evolution is not occuring
    - the genotype and phenotype frequencies may change, but the allele frequency remains constant
    - this situation does not occur in the real world
    - Hardy-Weinberg equilibrium
    - Be able to recognize graph of Hardy-Weinberg equilibrium
- Variation: A Selection Model
    - recessive alleles “hide” in a population in heterozygous individuals

    - therefore, it is very difficult to remove recessive alleles from a population
    - dominant alleles cannot “hide” - the phenotype is always shown
    - dominant alleles are much easier than recessive alleles to remove from a population
    - selection acts on the phenotype, not directly on the genotype
- Variation: a Small Population
    - **genetic drift** - evolution (change) caused by chance alone
    - small populations are more subject to genetic drift than large populations
    - it is difficult to make predictions about what future generations of a small population will look like, due to genetic drift
    - Be able to recognize graph of genetic drift with large, medium and small population size