**Genetics**

**Study Guide Ch 2 and Chapter 4**

**Terms to know:** wildtype, dominant, recessive, heterozygous, homozygous, true-breeding, hybrid, P1, F1, F2, incomplete penetrance, testcross, backcross, overdominance

Wildtype: The allele that is the highest number in a population: usually dominant

Dominant: A variant that is always expressed when present

Recessive: A variant that is masked by the presence of a dominant trait

Heterozygous: When an individual has 2 different copies of a gene

Homozygous: When an individual has 2 identical copies of a gene

True-breeding: A variety that continues to produce the same trait after several generations of self-fertilization

Hybrid: Offspring of a cross

P1: True breeding organisms that differ in a single character

F1: Offspring from a P cross

F2: Usually are allowed to self fertilize (or fertilize with in F2), the offspring of F1

Incomplete penetrance

Testcross

Backcross

Reciprocal Cross: A second cross in which the sexes and phenotypes are reversed

Overdominance: the heterozygous is more vigorous than both homozygous- more reproductive success

Chapter 2

* Define and distinguish between Segregation and Independent Assortment

Law of Independent Assortment: During gamete formation, the segregation of any pair of hereditary determinants is independent of the segregation of other pairs

Random Segregation: At random the allele can be either A or or. It does not matter what happens before chance of A and a is the same.

* Learn about the probability involved with mutually exclusive possibilities **– the sum or addition rule** AND the probability involved with independent possibilities **– the product or multiplication rule.** Know when to use each.

Probability = number of times an event is observed/number of total possible cases

Product Rule: Independent events: When occurrence of one event is independent of another event (what is the probability you pick a heart AND a spade) – decreases probability

Sum Rule: Mutually exclusive: Used when events are mutually exclusive (what is the possibility of a picking either a heart OR a spade), increases the probability

* Review how to complete a chi-square goodness of fit test

Statistical method to determine the goodness of fit

1 Write down the genotypes of the parents

2. Write down the possible gametes of each parent

3 Create an empty punnutt square

4 Fill in possible genotypes of offspring

5 Determine proportions

Degrees of freedom: # of outcomes - 1

X^2 = Sum(O-E)^2/E O- Observed, E- expected

* Know the genotypic and phenotypic ratios for F2 generations for monohybrid and dihybrid crosses
* Be able to use a Punnett square or Branched Line to complete the following types of monohybrid and dihybrid crosses:
  + Complete dominance (chapter 2)
  + Incomplete dominance (chapter 4)
  + Codominance (chapter 4)
  + Multiple Alleles. (chapter 4)
  + Lethal Alleles (chapter 4)
  + Gene Interaction and Epistasis (chapter 4)
  + X-linked, Y-linked, Sex-influenced, Sex-limited (chapter 4)

Chapter 4

* Understand the difference between incomplete dominance and epistasis

Incomplete dominance: The phenotype is intermediate between the corresponding homozygous individual- red + white = pink

Form of gene interaction – 2 genes working together to create 1 phenotype: will have the 9:3:3:1 ratio.

* Know the difference between incomplete dominance and codominance and how the terms are applied in traditional Mendelian genetics.

Co dominance: The phenomenon in which two alleles are both expressed in the heterozygous individual

* Understand the immunology and genetics of blood type and be able to complete genetic crosses of ABO blood groups. (Figure 4.9)

**Chapter 2 Problems:** Review Solved Problems S1, S3, S5 and practice C16, E4, E10

**Chapter 5 Problems:** Review Solved Problems S2,S4, S6 and practice C12, C18, C21,E10, E12

X linked inheritance: when a gene is located on the X chromosome

Sex Influenced: An allele is dominant in one sex but recessive in the opposite sex

Sex Limited inheritance: A trait occurs only in one of the 2 sexes