Study Guide - Make sure to have a solid understanding of the concepts outlined below. Also, review the homework, lecture slides, your notes from lecture, and the textbook. Make sure you can do the in-class worksheet up to problem number 14.

You can reference a single 3x5 note card with notes on the front and back of the card.   
Bring a scantron for multiple choice questions. The exam will have a short answer/fill in the blank section as well.

* Scientific method –
  1. What are the steps? Observe, question, hypothesis with expectations, test, do results support hypothesis?
  2. Hypothesis is a possible explanation for an observation or question…
* Ch3. Mendelian Inheritance
  1. Monohybrid cross –
     + What are the steps in a Monohybrid Cross
     + Cross between two individuals that differ in a single characteristic—more specifically, a cross between individuals that are homozygous for different alleles at the same locus (AA × aa); also refers to a cross between two individuals that are both heterozygous for two alleles at a single locus (Aa × Aa).
     + What are the expected phenotypes? 3:1
     + What are the expected genotypes? 1:2:1
  2. Principle of segregation (Mendel’s first law) - Principle of heredity discovered by Mendel that states that each diploid individual possesses two alleles at a locus and that these two alleles separate when gametes are formed, one allele going into each gamete.
  3. Independent assortment – two genes on different chromosomes will assort into gametes independently of each other.
  4. Concept of dominance - Principle of heredity discovered by Mendel stating that when two different alleles are present in a genotype, only one allele may be expressed in the phenotype. The dominant allele is the allele that is expressed, and the recessive allele is the allele that is not expressed."
  5. Probability –
  6. Punnett squares – know how to do them - a way to organize the genotypes and phenotypes of offspring produced in a genetic cross.
  7. What is a dihybrid cross?
     + Two characters are considered during a crossing study
     + What gametes will be produced if an organism is a double heterozygotes? example RrYy - RY, Ry, rY, ry
     + You will only need to understand the gametes
     + You do not need to do the actual cross and get number of offspring.
  8. What is a test cross?
     + Be able to do a test cross problem
  9. Pedigrees… - symbols, male, female, carrier, affected individual,
     + What does consanguine mean? – blood relative, when cousins or closer marry…
  10. Sutton discovered that alleles area on chromosome, not Mendel!
  11. What does pure breeding mean?

Ch. 4 Beyond Mendelian Inheritance

* 1. Introduction – Cuenot’s Example
     + Work the ratio and show that lethality changes ratios
     + Beyond Mendel – refers to reasons why crosses deviate from Mendel’s expected ratios.
  2. Sex Determination
     + Review – why is sex important. It is the basis for genetic variation for evolution to act upon…
     + How is sex determined in humans?
     + What is the difference between an autosome and a sex chromosome?
     + How many do humans have? 22 sets of autosomes, one set of sex chromosomes.
  3. Sex linked Genes – What are they
     + Most sex-linked genes are on the X-chromosome.
     + Why is that? Because the Y-chromosome only has 200 genes on it. Most have been lost…
     + Are x and y chromosomes homologous?
       1. No, because they don’t code for the same genes.
       2. They have pseudo-autosomal regions that can cross over during meiosis
  4. X-linked traits
     + Problems solving with x-linked
     + Fly eyes, hemophilia, color-blindness
     + Why are flies a good genetic model?
     + Make sure you can do the problem on **page 83** in your book about color blindness.
     + X-linked pedigree – hemophilia example –
       1. Expression skips generations
       2. Female carriers
       3. Males sons of female carriers with the disease
  5. Y-linked
     + SRY – what does it do?
     + What chromosome is it on?
     + DNA from Y-chromosome can be used to understand paternity
  6. Types of Dominance –
     + Complete – one allele masks the other
     + Incomplete – blending, the heterozygote is intermediate between homozygotes –
       1. Example – red, pink, white flowers
     + Codominance – both alleles are expressed fully.
       1. Example – MN-red blood cell antigens.
  7. Dosage compensation –
     + One chromosome is inactivated early in development so the products of genes encoded on the x – chromosome are the same in males and females.
     + Example – female cat with tortoise-shell coat
  8. Lethal Alleles
     + One of the genotypes does not make it to development, so the genotype/phenotype ratios are obscured.
     + Example Cuenot’s Mice –
     + The pure-breeding homozygous dominant (YY) mice die, so the ratios are 2:1 (2/3 yellow - Yy to 1/3 gray - yy)
  9. Penetrance – Extra credit question
     + Polydactyly (an extra digit) is caused by a dominant allele. The wild-type alleles produce five digits per limb. However, people who have the polydactyly allele sometimes do not have more than 5 digits per limb.
     + This is called incomplete penetrance.
     + Penetrance describes the degree to which the allele produces the expected phenotype. 38 out of 42 people who have the allele have an extra digit. (=90% penetrance)
  10. Text Covered –
      + All of Ch3 – with the exceptions below
        1. Dihybrid – Know what gametes look like (see review ppt), no actual Dihybrid cross, you do not need to do apply probabilities to branch diagrams
        2. Skip 3.4 – no Chi-squared
      + Ch 4 up to Lethal Alleles
        1. Pgs. 73 to 76
        2. Pgs. 78 to 90