TN Biology I: Standard 4 – Heredity *(Includes coverage of Ch. 6 – 9 in textbook)*

Chapter 6: Meiosis and Mendel
- Somatic cells = body cells; gametes = sex cells
- Homologous chromosomes are 2 chromosomes (1 from mom and 1 from dad) that have the same length / appearance and copies of genes. Humans have 23 homologous pairs of chromosomes.
- Autosomes are chromosomes that contain genes for characteristics NOT related to an individual's sex
- Sex chromosomes directly control the development of sexual characteristics
- Sexual reproduction involves the fusion of 2 gametes. Fertilization is the fusion of an egg and sperm cell.
- Diploid means a cell has 2 copies of each chromosome; haploid means a cell has only 1 copy of each
- Meiosis divides a diploid cell into 4 haploid cells in 2 stages – Meiosis I and Meiosis II. It takes place only at certain times and occurs only in reproductive organs/germ cells.
- Anaphase I separates homologous chromosomes; anaphase II separates sister chromatids
- Gametogenesis is the production of gametes. Male gametes = sperm; female gametes = eggs
- Traits are distinguishing, inheritable characteristics. Genetics is the study of inheritance patterns.
- Mendel worked with pea plants and his data demonstrated that (1) traits are inherited as discrete units, (2) organisms inherit 2 copies of each gene, 1 from each parent, and (3) organisms donate only 1 copy of each gene in their gametes.
- Genes code for proteins. Alleles are alternative forms of genes.
- Homozygous – 2 alleles that are the same (ex. AA or aa); heterozygous – 2 different alleles (ex. Aa)
- A genotype is the genetic makeup of an individual; a phenotype is the physical appearance
- Dominant alleles are expressed if at least 1 is present; recessive alleles are expressed only when both alleles are recessive (no dominant alleles present)
- Sexual reproduction creates unique gene combinations
- Crossing over is the exchange of chromosomal material between homologs in meiosis I (metaphase I)
- Genes located close together are inherited together (called linked genes)

Chapter 7: Extending Mendelian Genetics
- Carriers do not show disease symptoms, but carry 1 copy of a disease-causing recessive allele.
- Females can be affected by X chromosome inactivation (ex. calico cats)
- Incomplete dominance – heterozygous phenotype is an intermediate between the homozygous phenotypes (ex. red x white flowers → pink flowers)
- Codominance – both alleles of a gene are expressed completely; neither is dominant nor recessive (ex. blood type in humans, red x white flowers → spotted flowers)
- Polygenic traits are produced by 2 or more genes acting on 1 trait (ex. eye and skin color in humans)
- Epistasis occurs when 1 gene masks the effects of another gene (ex. coat color in Labrador retrievers)
- Males are more affected by sex- (or X-) linked recessive disorders, such as color blindness
- A karyotype is a picture of all of the chromosomes in a cell

Chapter 8: From DNA to Proteins
- Griffith, Avery, Hershey and Chase worked to identify DNA as the genetic material
- Nucleotides are the monomers that make up nucleic acid polymers (DNA, RNA)
- Nucleotides have 3 parts – (1) a phosphate group, (2) a deoxyribose sugar (in DNA), and (3) a nitrogen containing base (adenine, guanine, cytosine, or thymine)
- T and C are pyrimidines (1 ring); A and G are purines (2 rings). T pairs with A and C pairs with G!
- Franklin, Watson and Crick put together the first 3-D model of DNA – the double helix
- DNA is copied during replication, which occurs in the S phase of the cell cycle
- Helicase unwinds the helix, DNA polymerase synthesizes a complementary strand, and ligase (the glue) seals any gaps or breaks. DNA polymerase also has a proofreading function that corrects errors
- The central dogma states – DNA → RNA → protein (DNA → RNA is transcription; RNA → protein is translation
- There are 3 types of RNA – mRNA, rRNA, tRNA
- RNA polymerases synthesize mRNA from a DNA template.
- Transcription takes place in the nucleus; translation in the cytoplasm on the ribosomes
- Codons are in mRNA; anticodons are in tRNA
- Introns are "interfering" segments of DNA found in the middle of genes; exons code for proteins
- Know the difference between the different types of DNA mutations (Section 8.7 in textbook)

Chapter 9: Frontiers of Biotechnology
- Be familiar with the biotechnologies and vocabulary presented in this chapter