

Chapter 12 Genetics Study Guide

Lesson 1

- Know that Genetics is the science of heredity, and that heredity is the passing of traits from parents to offspring.
- Know the basics of Mendel's experiments, including the organism he chose for his research, and the types of traits he studied.
 - A good organism for breeding experiments
 - reproduces quickly
 - has easily observed traits
 - can have its mate chosen by the researcher
 - Know how Mendel prevented self-pollination, and why it was important to prevent self-pollination.
 - Know why Mendel's experiments required true-breeding individuals.
- Be able to describe the generations in Mendel's experiments
 - P-generation (grandparents) was a cross of true-breeding individuals with different traits
 - F1-generation (parents) were the offspring of the P-generation. These offspring all resembled the parent with the dominant trait.
 - F2-generation were the offspring of the F1-generation. These offspring's traits were dominant:recessive in a 3:1 ratio.

Lesson 2

- Know the definitions of dominant and recessive
- Know the definitions of homozygous and heterozygous
- Be able to distinguish between genotype and phenotype. Know that a genotype is always represented by letters to symbolize genes, and a phenotype is the observable trait.
- An allele is a form of a gene on a chromosome
 - Most eukaryotes inherit their chromosomes in pairs because they have two parents. Therefore alleles almost always come in pairs in the diploid organism, e.g. "Tt" for tall.
 - Gametes, like sperm and eggs, are haploid and only contain one allele for each gene.
- Use a Punnett square to model genetic probabilities for offspring.
 - Be able to identify the phenotypes of the offspring, and to state their ratio as a percentage.
 - Without doing any math, know that $0/4 = 0\%$, $1/4 = 25\%$, $2/4 = 50\%$, $3/4 = 75\%$, and $4/4 = 100\%$.
 - Use ratios to describe the results of cross. For example, 3 purple and 1 white is written as 3:1.

Lesson 3

- Know that chromosomes are made of DNA and proteins.
 - DNA = Deoxyribonucleic Acid
 - DNA is made of four different nucleotides, A, G, C, and T
 - A = adenine
 - G = guanine
 - C = cytosine
 - T = thymine
- Transcription happens in the nucleus of the cell, and makes a mRNA transcript of the DNA.
- Translation happens in the cytoplasm, where ribosomes 'read' the mRNA instructions and use them to made protein.
- Know the three types of RNA and their jobs in transcription and translation

- Messenger RNA (mRNA) carries genetics instructions from the nucleus to the cytoplasm.
 - Ribosomes are made of ribosomal RNA (rRNA) and protein.
 - Transfer RNA (tRNA) molecules carry amino acids to the ribosomes.
- Know the three types of mutations in DNA:
 - Substitution is the changing of one nucleotide to another, e.g. CGTTA becomes CGATA.
 - Deletion is when a nucleotide is missing, e.g. CGTTA becomes CGTA
 - Insertion is when there is an extra nucleotide in the sequence, e.g. CGTTA becomes CGTTTA.
- Know some of the basic mutagens (environmental cause) of mutations in DNA, e.g. UV rays, X-rays, gamma-radiation from radioactive elements.
- The mutation of DNA has far-reaching consequences. It also changes the mRNA transcript, which causes changes in the protein. The altered sequence of amino acids in the protein can cause diseases like cystic fibrosis (a recessive trait) or Huntington's disease (a dominant trait).