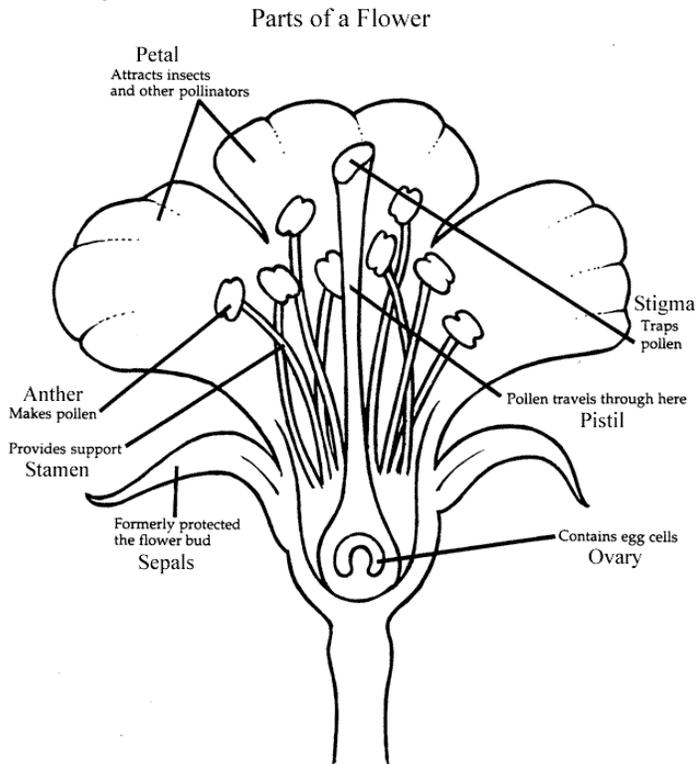


## Adv Biology Genetics Study Guide

This is a general list of the material that will be covered on the test. Please make sure that you study all the notes from class (the ones I gave you and the ones that you took yourself); study the labs and you read the textbook and are able to do the questions in the textbook.

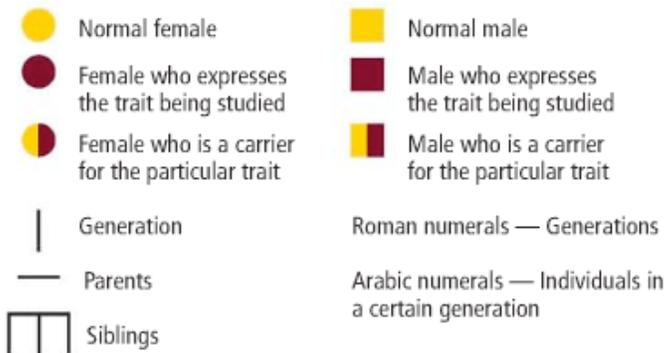
- Chapters 10.2-10.3 and Chapter 11
- Know the Vocabulary
- Know about Mendel and his experiments
  - Explained how a dominant allele can mask the presence of a recessive allele
  - Mendel began the study of genetics – his experiments with garden pea plants gave insight into the inheritance of traits.
  - Mendel developed the law of segregation and the law of independent assortment
- P generations, F1 and F2 generations
  - What does the P and F stand for?
    - P – Parent Generation: Green-seed plant and yellow-seed plant
    - F – Filial (1<sup>st</sup> and 2<sup>nd</sup>):
      - F1 – All yellow seeds
      - F2 – 3:1 ratio of yellow to green seeds
- Know the parts of the flower



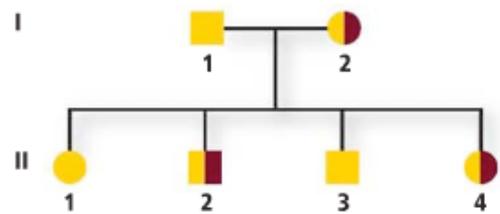
- Know how to do monohybrid and dihybrid crosses and how they are different
  - **Monohybrid** – a cross that involves hybrids for a single trait
  - **Dihybrid** – heterozygous for both traits (two or more traits in the same plant)
  - Phenotypic and genotypic ratios
    - **Larger number is first for phenotypic, for genotypic it is homozygous dom., heterozygous dom, and homozygous recessive.**
  - Law of independent assortment is best seen through a dihybrid cross
- Know the law of segregation and the law of independent assortment and how they are different
  - Law of segregation – states that the two alleles for each trait separate during meiosis. During fertilization, two alleles for that trait unite.
  - Law of independent assortment – states that a random distribution of alleles occurs during gamete formation. **Genes on separate chromosomes sort independently during meiosis.**
- Know the difference between a phenotype and genotype
  - **Genotype** – the organisms allele pairs (Yellow seeds YY or Yy)
  - **Phenotype** – the outward expression of an allele pair (Genotype yy will have phenotype of green seeds)
- Know how to do punnett squares and probability questions: testcross (between unknown and recessive), dihybrid, monohybrid, etc...

- Know how to read and interpret a pedigree – **Male square, female circle**

### Key to Symbols



### Example Pedigree



- Dominant- nothing
- Carrier – half and half
- Recessive - shaded
- Sex-linked – circle in center
- (Blood types -)
- **Incomplete dominance** – what is it? Know how to figure out problems
  - **Heterozygous phenotypes is an intermediate phenotype between two homozygous phenotypes**

- Problems have three things such as Red, pink, and white
- **Codominance** – sickle cell is an example
  - **Both alleles are expressed in the heterozygous condition.**
  - Why is being heterozygous for sickle cell a benefit? - Having sickle-cell disease would be advantageous to a person living in central Africa. Scientists have discovered that those who are heterozygous for the sickle-cell trait also have a **higher resistance to malaria**. **The death rate due to malaria is lower where the sickle-cell trait is higher. Because less malaria exists in those areas, more people live to pass on the sickle-cell to offspring. Consequently, sickle-cell disease continues to increase in Africa.**
- Multiple alleles – blood types is an example
  - Forms of inheritance determined by more than 2 alleles
- Sex-linked traits and how to determine sex
  - Sex chrom. – X and y – XX is fem. AND XY male.
  - Sex-linked traits – traits controlled by genes located on the X chromosome
  - Color blindness- x chrom
- Polygenic inheritance – eye color, hair color and skin color are examples
  - Polygenic traits – the interaction of multiple pairs of genes
- Know about environmental influences on gene expression and epistasis
  - Epistasis – 1 allele hiding effect of another allele
  - Twin studies help to differentiate the effect of genetic and environmental influences. Identical twins are genetically the same. If a trait is inherited, both identical twins will have the same trait. Scientists conclude that traits that appear frequently in identical twins are at least partially controlled by heredity. Also, scientists presume that traits expressed differently in identical twins are strongly influenced by the environment. The percentage of twins who both express a given trait is called a concordance rate. A large difference between fraternal twins and identical twins shows a strong genetic influence.
- Know about human blood types and how to do blood typing problems and pedigrees
- Know how to read a karyotype: determine the sex of a person and if they have a chromosomal disorder
  - A micrograph with homologous chromosomes arranged in decreasing size
  - Sex – if says XX=female, XY=male.
  - Chromosomal disorder – extra copies of chromosomes or missing parts
- Know what nondisjunction is, how it can occur and how you can tell that it has occurred
  - Cell division during which sister chromatids fail to sep. properly.
  - It can occur in both autosomes and sex chroms.
  - It can occur in Meiosis I and II
  - You can tell b/c the resulting gametes will not have the correct # of chromosomes.
- Know the difference between homozygous and heterozygous
  - Homozygous – an organism w/ 2 of the same alleles for a particular trait. (Yellow seed plants are YY and green seed plants are yy)

- Heterozygous – an organism w/ 2 different alleles for a particular trait (Yy) When alleles are present in the heterozygous state, the dominant trait will be observed.
- Know what a carrier is – an individual who is heterozygous for a recessive disorder.
- What are autosomes? – 22 pairs of chromosomes not X and Y, not sex chromosomes
- Define: alleles, dominant/recessive, fertilization, gamete, genetics, heredity, hybrid, pollination, trait, egg, sperm and zygote
- Gene linkage and polyploidy – the linkage of genes on a chromosome results in an exception to Mendel’s law of independent assortment b/c linked genes usually do not segregate independently. **Linked genes can separate during crossing over.**
  - **Polyplody** – occurrence of 1 or more extra sets of all chromosomes in an organism
- Fetal testing

**Interactive Table** To explore more about fetal testing, visit [biologygmh.com](http://biologygmh.com).

<b>Table 11.5 Fetal Tests</b>		
Test	Benefit	Risk
Amniocentesis	<ul style="list-style-type: none"> <li>• Diagnosis of chromosome abnormalities</li> <li>• Diagnosis of other defects</li> </ul>	<ul style="list-style-type: none"> <li>• Discomfort for expectant mother</li> <li>• Slight risk of infection</li> <li>• Risk of miscarriage</li> </ul>
Chorionic villus sampling	<ul style="list-style-type: none"> <li>• Diagnosis of chromosome abnormality</li> <li>• Diagnosis of certain genetic defects</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of miscarriage</li> <li>• Risk of infection</li> <li>• Risk of newborn limb defects</li> </ul>
Fetal blood sampling	<ul style="list-style-type: none"> <li>• Diagnosis of genetic or chromosome abnormality</li> <li>• Checks for fetal blood problems and oxygen levels</li> <li>• Medications can be given to the fetus before birth</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of bleeding from sample site</li> <li>• Risk of infection</li> <li>• Amniotic fluid might leak</li> <li>• Risk of fetal death</li> </ul>

The **benefits** of fetal testing might be that the parents find out whether they are carriers of a genetic disorder. Also, they could find out the chromosomal status of their developing baby, known as the fetus, and whether there are chromosome or genetic abnormalities. There could be a diagnosis of certain genetic defects or other defects. Also, it checks for fetal blood problems and oxygen levels, and medications can be given to the fetus before birth. The **risks** might be that there is discomfort for the expectant mother, a risk of infection, a risk of miscarriage, a risk of newborn limb defects, a risk of bleeding from the sample site, amniotic fluid might leak, and a risk of fetal death.

**Connection to Health** Many fetal tests can provide important information to the parents and the physician. **Table 11.5** describes the risks and benefits of some of the fetal tests that are available. Physicians must consider many factors when advising such examinations. At least a small degree of risk usually is possible in any test or procedure. The physician would not want to advise tests that would endanger the mother or the fetus; therefore, when considering whether to recommend fetal testing, the physician would need to consider previous health problems of the mother and also the health of the fetus. If the physician and parents determine that any fetal test is needed, the health of both the mother and the fetus need to be closely monitored throughout the testing.