

GENERAL BIOLOGY Lecture 18 - Genetics

- I. Genetics - the science dealing with heredity**
- A. Terms associated with genetics**
1. **Gene:** (a section of DNA which) provides instructions for producing or influencing a specific trait in offspring
 2. **Allele:** a various molecular form of a gene
 - a) Example - dominant = "free" ear lobe; recessive = fused ear lobe
 - b) Designate "A" as being free and "a" as being fused
 - c) AA = free; aa = fused; Aa = free
 3. **Homozygous dominant:** has two dominant alleles (AA - free)
 4. **Homozygous recessive:** has two recessive alleles (aa - fused)
 5. **Heterozygous:** has one of each allele (Aa - free)
 6. **Genotype:** the sum total of an individual's genes
 7. **Phenotype:** observable aspects (genotype X environment interaction)
- II. Patterns of inheritance**
- A. Segregation**
1. Diploid organisms inherit a pair of genes for each trait - one gene from each parent
 2. The two genes segregate during meiosis so that each gamete formed will end up with one or the other gene, but not both
- B. Predicting the outcome of crosses**
1. Father AA X Mother aa:
 2. Result is all Aa
 3. What is the result of Aa X Aa?
 - Sperm A meets egg A - 1/4 AA offspring
 - Sperm A meets egg a - 1/4 Aa offspring
 - Sperm a meets egg A - 1/4 Aa offspring
 - Sperm a meets egg a - 1/4 aa offspring
- III. Variations of patterns of inheritance**
- A. Incomplete dominance - dominant allele partially masks the recessive - Example: red X white flowers = pink flowers**
- B. Codominance - expression of one allele does not mask the other - Example: blood type**
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|------------------------------------|--------------------------------|
| I^A - "A"; I^B - "B"; ii - "O" | $I^A I^A$ or $I^A i$ "A" blood |
| | $I^B I^B$ or $I^B i$ "B" blood |
| | $I^A I^B$ "AB" blood |
| | ii "O" blood |
- C. Epistasis - one gene pair masks expression of another and some phenotypes do not appear - Example: albinism (gene disables coloration)**
- D. Pleiotropy - single gene exerts effects on some unrelated phenotypic trait - Example: sickle-cell anemia (modified oxygen transport by hemoglobin but with problems)**
- E. Environment - different climates cause different effects - Example: Siamese cats have light colored body fur and dark colored extremity fur.**
- IV. Population genetics - the study of inherited variation and its modulation in time and space**
- A. Main concept: individuals do NOT evolve; populations do**
- B. Factors bringing about a change**
1. **Mutation - heritable change in kind, structure, sequence, or number of component parts of DNA**
 2. **Genetic drift - random fluctuation in allele frequencies as a result of random chance**
 3. **Gene flow - change in allele frequencies: immigration (come) and emigration (go)**
 4. **Natural selection - differential survival and reproduction within a population**
- C. Evolution of a species**
1. **Process by which species originate - speciation - HOW???????**
 - a) **Reproductive isolating mechanism - mechanical, gamete isolation, time isolation, behavioral isolation, and hybrid inviability**
 2. **Modes of speciation - allopatric (isolated location), parapatric (transition location), and sympatric (ecological, behavioral, or genetic behaviors WITHIN boundaries)**