

Study Guide Quiz 1

What is Charles Darwin famous for; define evolution

- Charles Darwin is famous for the theory of evolution and natural selection
- **Evolution:** Changes over time and current forms are explainable by natural events (i.e. inherited change over time)
 - Survival of the fittest, offspring with traits best suitable for the current environment (fit) will survive

Who are Wallace and Lamarck; what are they known for?

- **Alfred Wallace:** helped develop the theory of natural selection alongside Darwin
- **Jean Lamarck:** theory of inheritance of acquired characteristics

What is creationism

- **Creationism:** specifies a deity
- Creationism comes in many levels, for example:
 - theistic evolution, which views evolutionary process as evidence of the work of a supreme being
- Intelligent design does not specify a specific deity, could be a flying spaghetti monster

Evolution occurs through the mechanism of natural selection, what are the four underlying principles

1. Variation in offspring
2. Not all offspring survive
3. Survival of fittest offspring
4. Traits are inherited

What is the Synthetic Theory of Evolution and who are responsible for it

- merges the concept of Darwinian evolution with Mendelian genetics, resulting in a unified theory of evolution
 - key figures responsible for developing this theory include Theodosius Dobzhansky, Ernst Mayr, George Gaylord Simpson, Julian Huxley, Sewall Wright, and J.B.S

Define gradualism (phyletic gradualism) and punctuated equilibrium

- **Gradualism:** refers to the theory that evolution occurs slowly and steadily over long periods of time
- **Punctuated equilibrium:** Evolution occurs in spurts instead of following the slow path Darwin suggested

Who is Gregor Mendel and why is he important

- However, Darwin didn't know how **inheritance** worked, this came later, in 1866 with **Gregor Mendel**
- Mendel discovered **Particulate inheritance**:
 - a genetic model that explains how phenotypic traits are passed down through generations via genes
- Genes code for proteins (the building blocks of bodies)

Define dominant, recessive, homozygous, and heterozygous when discussing traits

Chromosomes: 46 in humans, half for gametes. They fuse to form a zygote (half from each parent), so can have two versions:

- **gene-homozygous:** AA or aa
- **heterozygous:** Aa
- **dominant:** A
- **recessive:** a

What is a genotype and phenotype; what are some examples in the reading and lecture

- **Genotype:** DNA - blueprint to develop an organism, the particles in Mendel's particulate inheritance
- **Phenotype:** what an individual looks or behaves like
 - Eye color, if a person has the genotype Bb, their phenotype would be brown eyes because brown is dominant over blue
 - despite carrying the gene for blue eyes (genotype)

Define gene, locus, chromosome, gamete, zygote, diploid, haploid

- **Genes:** DNA sequences that code for something like a protein to make something like hemoglobin or regulatory genes
- **Locus (many loci):** a place on a chromosome for a gene
- **Gametes** (sex cells, eggs and sperm) are haploid:
 - contains half the genes of the parent
 - There are genes in other parts of the cell
 - mostly only female non-nuclear DNA gets passed on
 - Two parents with 23 pairs of chromosomes can make over 70 trillion genetically unique offspring
- **Chromosomes:** 46 in humans, half for gametes. They fuse to form a zygote (half from each parent), so can have two versions:
 - **gene-homozygous:** AA or aa
 - **heterozygous:** Aa
 - **dominant:** A
 - **recessive:** a
- **Zygote:** The cell formed when a sperm fertilizes an egg
- **Diploid:** Having two complete sets of chromosomes in a cell, one set from each parent
- **Haploid:** Having only one set of chromosomes in a cell, typically found in gametes

What are mitosis and meiosis; what are the differences; what is produced via each process

- **Meiosis:** produces non-identical sex cells:
 - The start of variation among offspring
 - each chromosome doubles but then matched pairs separate into two cells which are not identical
 - Sperm cells and egg cells (gametes)
- **Mitosis:** makes identical cells
 - each chromosome doubles and puts identical halves into each new, identical cell**
 - New body cells like skin cells, muscle cells, and blood cells.

How many chromosomes do humans have?

- 23 pairs, or 46 in total

What is DNA; name the bases and how they pair

- **DNA:** deoxyribonucleic acid:
 - Enormous molecule
 - Double helix or twisted ladder where rungs are bases:
 - **A**denine
 - **C**ytosine
 - **G**uanine
 - **T**hymine
 - Bases pair: A with T, C with G
 - Three bases = one amino acid (makes proteins), one amino acid can be coded for by more than one sequence
 - Some code for stops and stars

Define Adaptation

- **Adaptation:** the process where a beneficial trait within a species becomes more prevalent over time due to natural selection

What is genetic recombination and explain the two causes (hint: segregation and crossing-over)

- **Genetic recombination:** the process where genetic material is exchanged between chromosomes resulting in new combinations of alleles
 - **Genetic segregation:** sorting of which chromosome goes into the egg or sperm gamete
 - Results in a shuffling of combinations of male and female genes
 - Crossing-over and other ways of swapping genetic material produce new combinations on a chromosome

What is a sex-linked trait

- **Sex-linked trait:** a characteristic that's influenced by genes on the sex chromosomes
- The advantages of sex are that the offspring always differ from the parent
- Independent assortment at the chromosome level, linkage within the chromosome level
- **Sex chromosomes:**
 - XX female (in mammals)
 - XY male (in mammals)

Define mutation; can they be harmful, beneficial or neutral or all three

- **Individual Variation:** Mutations or mistakes that are not corrected during copying:
 - Mutations can be harmful, beneficial, or neutral
 - Mutation varies and rates effected by environmental factors (UV light, heat, etc)
 - **Neutral mutations:** no effect or lot of DNA codes for nothing

What is genetic drift

- **Genetic Drift:** random process that causes the frequency of alleles in a population to change over time

Define gene flow; does gene flow increase or decrease differences in a population

- **Gene Flow:** the movement of genetic material (alleles) from one population to another
- Generally leads to a decrease in genetic differences

Define species as used in the reading and lecture; what is speciation and what are some possible causes

- **Species:** a group of organisms that can interbreed and produce fertile offspring under natural conditions
- **Speciation:** evolutionary process where a new species arises from an existing one, typically occurring when populations become geographically separated and evolve distinct characteristics, preventing them from interbreeding with the original population

Describe sociobiology

- **Sociobiology:** a field of study that attempts to explain social behaviors in animals and humans through the lens of evolutionary biology

What are the differences between group selection and individual selection

- **Individual Selection:** process where natural selection acts on individual organisms within a population, favoring traits that enhance their personal survival and reproduction
- **Group Selection:** selection can also operate at the level of groups meaning traits that benefit the group as a whole, can be favored through competition between different groups

What are the advantages of sexual reproduction as opposed to asexual

- it creates genetic diversity within a population, allowing organisms to adapt better to changing environments, increasing the chances of survival

What are proximate and ultimate functions; what are some examples from the lecture

- When we think about behavior, we have the added complication of levels, **conscious** versus **unconscious**:
 1. Proximate = cues: what we observe/measure (how a behavior occurs)
 2. Ultimate = evolution and genes: what we are interested in for this class (why a behavior occurs)

What is fitness in an evolutionary context

- It is how well an offspring with certain traits "fits" into its current environment
- This is the idea of survival of the "fittest", it is not always the biggest, strongest, and fastest that win

What is the scientific method and describe the steps

1. Observation
 1. Scientists begin observing something in the natural world
2. Question
 1. They formulate specific questions about what they observe
3. Hypothesis
 1. They develop a testable explanation or prediction based on observations and research
4. Prediction
 1. They predict what the outcome of the experiment will be based on their hypothesis
5. Experiment
 1. They conduct an experiment to support or refute their hypothesis
6. Analysis
 1. Analyze experiment results
7. Conclusion
 1. Conclude whether their hypothesis was supported or not