

CLEP Natural Science Cheat Sheet

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This is a cheat sheet that I developed to help myself and hopefully others pass the CLEP Natural Sciences exam. This is meant to be used with the *REA: CLEP Natural Sciences Exam (Third Edition; ISBN-13: 978-0-7386-1207-2)* exam guide.

1 Passing the CLEP Natural Sciences Exam (Ch. 1)

2 Evolution and Classification (Ch. 2)

- **Homologous** structures are physiological structures that exists between two animals because they share a common ancestry. An example of this would be the forelimbs of a salamander and opossum, they are similar because of a common ancestry.
- **Analogous** structures are physiological structures that have a similar function and are shared between two organisms, but they do not share a common ancestry.
 - Analogous structures are the product of convergent evolution.
- **Convergent Evolution:** TODO Insert Definition
- ***Homo sapien sapien*** refers to the modern human.
 - *Homo sapiens* are thought to have evolved from Africa 100,000 years ago.
 - *Australopithecus Afarenis* (or the "Lucy" skeleton) refers to the first known skeleton belonging to a branch of bipedal primates that gave rise to "the first true hominids" about 4.5 million years ago.

– *Homo Erectus* is considered to be the oldest known fossil of the human genus; it is considered to be about 1.8 million years old.

- **Gene Pool** refers to the entire collection of genes within a given population.
- **Differential Reproduction** is one mechanism of evolution; this is what occurs when some individuals within a population are more suited for survival, given their environmental conditions.
- **Mutation** is another mechanism of evolution; this is a change of the DNA sequence of a gene, which results in a change of a particular trait.
- **Genetic Drift** is the third mechanism of evolution; it refers to a change of allele frequency due to chance fluctuations. In a finite population, the gene pool might not reflect the entire number of genetic possibilities of the larger gene pool of the species.
- **Hardy-Weinberg Theorem** states that given a population with one allele p and another allele q , the sum of the possible allele frequencies is 1:

$$p + q = 1$$

which then follows that the frequency of the alleles of a population can be represented by:

$$p^2 + 2pq + q^2 = 1$$

Here, the dominant allele is p^2 , the heterozygote is $2pq$ and the recessive allele is q^2 , they should all add to 1.

- **Allpatric speciation** occurs when two populations are separated geographically.
- **Sympatric Speciation** occurs when two genetically different members of the same species produce a third new species.
- **Punctuated Equilibrium** is a scientific model that proposes that adaptations of species arise suddenly and rapidly. It states that species undergo a long period of equilibrium, which at some point is upset by environmental forces causing a short period of quick mutation and change.
- **Taxonomy** seeks to organize living things into groups based on morphology and genetics (genetics came more recently)
- **Binomial Nomenclature** is what biologists refer to when naming species with two Latin names.
- **Linnaean Taxonomy** is a classification scheme for living organisms, and it uses the following hierarchical system:
 - **Kingdom:** this is the most general category, it contains four kingdoms: *Kingdom Protista*, *Kingdom Fungi*, *Kingdom Animalia*, *Kingdom Plantae*. See table 2-1 for more about the four kingdoms.
 - **Phylum:**
 - **Class:**
 - **Order:**
 - **Family:**

¹I stole the "Kevin, Please Come Over For Gay Sex" acronym from @KingCrocoduck ;-)
<https://twitter.com/KingCrocoduck/status/883562581901717504>

- **Genus:**
- **Species:** this is the most limited category
- The acronym **Kevin, Please Come Over For Gay Sex** can be used to memorise Linnaean ranks for any upcoming exams.¹
- If you were to focus on *Kingdom Animalia*, then you will come across nine major phyla; they are:
 - **Porifera:** the sponges
 - **Cnidaria:** jellyfish, sea anemones, hydra, etc/
 - **Platyhelminthes:** flat worms
 - **Nematoda:** round worms
 - **Mollusca:** snails, clams, squid, etc.
 - **Annelida:** segmented worms (earthworms, leeches, etc.
 - **Arthropoda:** crabs, spiders, lobster, millipedes, insects
 - **Echinodermata:** sea stars, sand dollars, etc.
 - **Chordata:** fish, amphibians, reptiles, birds, mammals, lampreys
- **Urochordata** are animals with a tail cord
- **Cephalochordata** are animals with a head cord
- Vertebrata is divided into two super-classes:
 - **Aganatha** which are animals with no jaws
 - **Gnathostomata** which are animals with jaws
- The Gnathostomata includes these six major classes with the following characteristics:

- **Chondrichthyes:** fish with a cartilaginous endoskeleton, two-chambered heart, 5-7 gill pairs, no swim bladder or lung, and internal fertilization—such as with sharks, rays, et cetera.
- **Osteichthyes:** fish with a bony skeleton, numerous vertebrae, swim bladder (usually), two-chambered heart, gills with bony gill arches, and external fertilization (herring, carp, tuna).
- **Amphibia:** animals with a bony skeleton, usually with four limbs having webbed feet with four toes, cold-blooded (ectothermic), large mouth with small teeth, three-chambered heart, separate sexes, internal or external fertilization, amniotic egg (like salamander, frogs, et cetera).
- **Reptilia:** horny epidermal scales, usually have paired limbs with five toes (except limbless snakes), bony skeleton, lungs, no gills, most have a three-chambered heart, separate sexes, mostly egg-laying (oviparous), eggs contain extraembryonic membranes (like snakes, lizards, alligators).
- **Aves:** spindle-shaped body (with head neck, trunk, and tail), long neck, paired limbs, most have wings for flying, four-toed foot, feathers, leg scales, bony skeleton, bones with air cavities, beak, no teeth, four-chambered heart, warm blooded (endothermic), lungs with thin air sacs, separate sexes, egg-laying, eggs have hard calcified shell (birds, ducks, sparrows, etc.)
- **Mammalia:** body covered with hair, glands (sweat, scent, sebaceous, mammary), teeth, fleshy ex-

ternal ears, usually four limbs, four-chambered heart, lungs, larynx, highly developed brain, warm-blooded, internal fertilization, live birth (except for the egg-laying monotremes), milk-producing (cows, humans, platypus, apes, et cetera).

- 3 Cellular and Molecular Biology (Ch. 3)**
- 4 Structure and Function of Plants and Animals; Genetics (Ch. 4)**
- 5 Ecology and Population Biology (Ch. 5)**
- 6 Atomic Chemistry (Ch. 6)**
- 7 Chemistry of Reactions (Ch. 7)**
- 8 Physics (Ch. 8)**
- 9 Energy (Ch. 9)**
- 10 The Universe (Ch. 10)**
- 11 Earth (Ch. 11)**

12 Appendix: Tables

12.1 Four Kingdoms of the Eukaryota

Kingdom	No. of Known Phyla/Species	Nutrition	Structure	Included Organisms
<i>Protista</i>	27/250,000+	photosynthesis, some ingestion and absorption	large eukaryotic cells	algae & protozoa
<i>Fungi</i>	5/100,000+	absorption	multicellular (eukaryotic) filaments	mold, mushrooms, yeast, smuts, mildew
<i>Animalia</i>	33/1,000,000+	ingestion	multicellular, specialized eukaryotic motile cells	various worms, sponges, fish, insects, reptiles, amphibians, birds, and mammals
<i>Plantae</i>	10/250,000+	photosynthesis	multicellular, specialized eukaryotic non-motile cells	ferns, mosses, woody and nonwoody flowering plants

13 Acknowledgments

This cheat sheet is heavily based off of the study guide *CLEP Natural Sciences: Earn College Credit with CLEP* (ISBN-13: 978-0-7386-1207-2). No copyright infringement is intended.