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Biology 2 (Quickstudy: Academic)

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Featuring: Evolution/origins, molecular biology, cancer biology, human aging and immunology

Evolution

A. Definitions

1. Concept that all organisms are related by common ancestry
2. Foundational paradigm of biology

B. Natural selection The mechanism for how evolution occurs

1. Species have high potential for rapid reproduction
2. Population sizes eventually level off and remain fairly constant over time
3. There is **competition** for reproduction and survival of offspring
4. Variations (from random mutations and shuffling of genes via **meiosis**) exist in behavior, physiology, structure, etc.
5. Nature selects individuals (i.e., the **fittest** or just fortunate) for survival and reproduction to pass these heritable characteristics (**adaptations**) via their genes to their offspring.
6. Over time, natural selection "weeds" out less favorable changes in populations - i.e., **evolution**

7. Microevolution: Small-scale changes

8. Macroevolution: Large-scale changes; can lead to evolution of new species and groups

Cellular/Molecular Evidence for Evolution

A. Cell Theory

1. The cell is the basic unit of life
2. Every life form, from bacteria to humans, is made of cells from this basic structure

B. Organic Molecules


1. 99% of all life consists of carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur
2. Evolutionary relatedness explains organisms' common usage of a small subset of over 90 available elements

C. DNA

1. Genetic, informational molecule in every organism, including viruses (which appear to be molecular fragments of DNA/RNA capable of "living" in host cells)
2. DNA "language" (**genetic code**) is essentially universal (slightly different dialects exist in some single-celled organisms and in some mitochondrial/chloroplast genomes)
3. A common genetic language allows for such phenomena as the insertion of human genes into bacteria, which can then produce "human" proteins (see **Molecular Biology**)

D. ATP (Adenosine triphosphate): The primary energy currency molecule used by every organism

DNA Double Helix




Evidence for Evolution via Natural Selection

A. Artificial selection

1. Human controlled breeding of species strongly supports the idea that, over time, nature could also influence changes in populations
2. Humans have selected for traits to increase the attractiveness (or use) of the offspring (e.g., "oh" dogs, chickens that produce many eggs, wheat that yields numerous, plump grains)
3. Domesticated species often do poorly in the wild, as traits (i.e., variations) selected by humans would not necessarily be advantageous in nature

Artificial Selection For Crop Production



B. Biogeography Geographic distribution of species can show organisms are related

1. Flightless birds, such as African ostriches, Australian emus, and South American rheas are found (naturally) only in the southern hemisphere; on separate continents
2. Either flightlessness in these birds evolved independently three times (possible, but improbable) or they arose from a common, flightless ancestor
3. If the latter explanation is correct, and they could not fly, how then could they get to these disparate southern continents while being excluded from the northern hemisphere?
4. Geological evidence indicates the continents were once one large land mass that subsequently broke up into pieces (**plate tectonics**) that moved (**continental drift**) first into northern and southern portions, and later into the present day continents
5. This geological concept also explains why **marsupial mammals** (e.g., kangaroo) developed only on Australia, as this continent was geographically isolated from areas where **placental mammals** evolved

C. Fossils

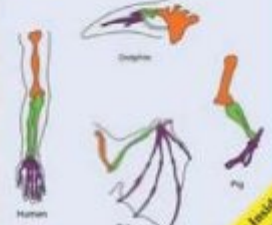
1. Preserved remnants of dead organisms
2. Darwin termed evolution "descent with modification"
3. Although the fossil record has gaps (some structures/organisms do not fossilize well), fossils provide valuable information about evolutionary changes or modifications in organisms (including transitional forms, e.g., horses with toes, whales with hind limbs, fish with wings) that have taken place over many generations
4. Determining the age of fossils involves looking at their physical positions in sedimentary rocks (**stratigraphy**) and radiometric dating techniques

D. Molecular clocks look at changes in portions of genomes of organisms; also used to help determine the age of evolutionary events

E. Homologies

1. Anatomical similarities of related life forms
2. Provide strong evolutionary evidence of relatedness
3. Example: Forelimbs of vertebrates are composed of the same basic bones in disparate groups, but differ based on adaptations necessary for the specific environmental niches (i.e., walking, swimming, flying)
4. **Vestigial structures**
 - a. These present are usually in a rudimentary, non-functional form
 - b. Show anatomically-related structures that are likely to disappear completely in future generations
 - c. Example: The vestiges of pelvic bones within the body in some modern-day baleen whales

Homologous Forelimb Bones: Evidence for Vertebrate Evolution



More Inside!



Synopsis

Includes topics that could not be crammed into our first biology guide.

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Customer Reviews

I have bought other items from the Quick Reference Guide before, and I was not impressed with this one. This Biology 2 sheet held information on the evidence of evolution, mostly from a primary school level as well as modern uses for DNA technology...but very limited, maybe a sentence here and there. Most other sheets have data needed to memorize or for quick reference, this particular one didn't. It could be useful if this is the first time you heard of Darwin's Theory of Evolution or that Dolly the Sheep was cloned, other than that save the two bucks.

Purchased for my son's first year college Biology class. I am a firm believer in every little bit helps. This fits well in his binder and covers the basics for a nice quick glance/refresher. In the world of Smart phones and tech gadgets this may seem a little old school. It's a great item to have. The guide is laminated, holds up to wear and tear, and is a nice price. I have purchased several of the BarCharts for my medical coding classes, medical terminology, anatomy & physiology, and my son's classes. Great references.

I need more time to put in long term memory and this does the trick. Review the summaries over

and over and refreshes the details too. Much information packed into small space. Easy to pack and carry.

this is a great learning tool! it will be very helpful during classes and I think it is a great reference source. thank you!!

Very helpful. It's tri-fold if you didn't know so there is plenty of information on it that can help you through classes or just to brush up on your knowledge.

Good quality. no complaints. it is laminated so I expect it to hold up for a long time.

I'm a science teacher, I find this invaluable for quick reference and refresher.

Small print is hard to read

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