

Define *evolution*.

**“Evolution is the cumulative change in the heritable characteristics of a population” (1 p. 37)**

1. Populations tend to produce **more offspring** than the environment can support.
  - a. Explain how the following lead to a *‘struggle for survival’*
    - Competition for food
    - Competition for mates
    - Competition for space
    - Parasitism
    - Disease
    - Predation
  - b. Explain the significance of variation within a species in relation to survival.
  - c. Outline how the following aspects of sexual reproduction contribute to variation within a species:
    - Meiosis
    - Random fertilization

Mutation



- d. State which of the above is the main source of variation within *genes*.
  - e. Explain the term *descent with modification*.
  - f. Describe how the *struggle for survival* lead to natural selection.
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- 2. Antibiotic resistance in bacteria is an example of evolution.
    - a. What is *Staphylococcus aureus*?
    - b. Distinguish between MRSA and MSSA.
    - c. Use the key terms *environmental change, variation, survival, reproduction* to annotate this diagram, explaining how antibiotic resistance has evolved.



Original population:

Source of variation:

Environmental change:

Effect on population: bacteria

Selection for:

Inheritance:



".....can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and procreating their kind? On the other hand, we may feel sure that any variation in the least injurious would be rigidly destroyed. This preservation of favourable variations and the rejection of injurious variations, I call *Natural Selection*' **Darwin C. (1859)** *The Origin of Species*

3. **Explain** one other example of evolution of a species, in response to environmental change.

(Galapagos finches or pepper moths)

4. Another reliable source of evidence to support the theory of evolution by natural selection is the fossil record—paleontologists have been uncovering fossilized remains of species from sedimentary rock deposits and using this information to create timelines of changes in the earth and development of species.

- a. Outline formation of sedimentary rock.
- b. Describe how the position of a fossil in sedimentary rock give a clue to its position in time.
- c. State some other methods used to confirm the age of fossils.



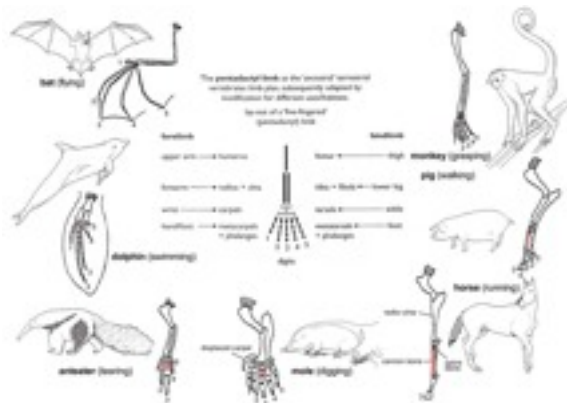
5. Homologous structures

a. Define homologous

b. One of the most obvious examples of homologous structures in animals is the *pentadactyl limb*.

Define *pentadactyl*.

c. Homologous structures has evolved through '*adaptive radiation*'. Explain this term.  
source: [http://en.wikipedia.org/wiki/File:Evolution\\_pl.png](http://en.wikipedia.org/wiki/File:Evolution_pl.png)



Darwin described structures such as these as having a '*unity of type*' - although they look different, on closer inspection they share features. In this case, the bones are the same, though differently shaped.

6. Selective breeding of domesticated animals
  - a. State the purpose of selective breeding
  - b. Describe why selective breeding is also known as *artificial selection*.

Artificial selection, like natural selection, can work in two ways. State examples of each:

- c. Selection *for*
- d. Selection *against*

ToK AoK: "*It's only a theory.*" Explain, using the scientific method, why evolution is described as a *theory* and why this represents a *high level of certainty* in science. What is the *linguistic confusion* that leads some non-scientists to question the validity of evolution as scientific truth?



