**Understandings, Applications and Skills (This is what you may be assessed on)**

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|  | Statement | Guidance |
| 5.1.U1 | Evolution occurs when heritable characteristics of a species change. |  |
| 5.1.U2 | The fossil record provides evidence for evolution. |  |
| 5.1.U3 | Selective breeding of domesticated animals shows that artificial selection can cause evolution. |  |
| 5.1.U4 | Evolution of homologous structures by adaptive radiation explains similarities in structure when there are differences in function. |  |
| 5.1.U5 | Populations of a species can gradually diverge into separate species by evolution. |  |
| 5.1.U6 | Continuous variation across the geographical range of related populations matches the concept of gradual divergence. |  |
| 5.1.A1 | Development of melanistic insects in polluted areas. |  |
| 5.1.A2 | Comparison of the pentadactyl limb of mammals, birds, amphibians and reptiles with different methods of locomotion. |  |

Useful Sources:

5.1 U1: Evolution occurs when heritable characteristics of a species change. (From the Youtube video)

1. What is the definition of a “theory”?

A set of s\_\_\_\_\_\_\_\_\_\_\_\_\_or p\_\_\_\_\_\_\_\_\_\_\_\_\_\_devised to explain a group of facts or phenomena.   
 Most theories that are accepted by scientist have been repeatedly tested by   
 experiments and can be used to make predictions about natural phenomena.

1. What is the definition of “evolution”?

The cumulative change in the heritable characteristics of a population

\* cumulative change =

\* heritable characteristics =

\* population =

1. 3 main pieces of evidence for evolution stem from fossils, selective breeding and homologous structures. Take notes on the following:

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| **Type of Evidence** | **Brief overview** | **Examples** |
| **Evidence from**  **Fossils**  *5.1 U2:*  *The fossil record provides evidence for evolution.*  Additional Link: <http://www.pbs.org/wgbh/nova/evolution/fossil-evidence.html> | * Layers of sedimentary rock are put down, the inorganic components of plants, animals and prokaryotes are preserved. Basically - deeper they are, the older they are. * FOSSIL = * Two types of evidence:   + DIRECT =   + INDIRECT = * FOSSIL RECORD = * DIMENSION OF TIME → * GAP IN FOSSILS   + Special circumstances are required for fossilization   + Only hard parts of organism preserved   + Fossils damaged, only fragments remain * TRANSITIONAL FOSSILS = show links between groups or species by exhibiting traits common to both ancestral group/species and its derived descendant groups/ species. | Screen Shot 2016-09-18 at 5.22.00 PM.png  Equus - genus that includes horses, zebras, etc   * Fossils have been discovered of organisms that no longer exists. (ex trilobites and dinosaurs) * Most cases, no fossils can be found of organisms that do exist today * Suggests that ancestral species evolved into modern species. |
| **Type of Evidence** | **Brief overview** | **Examples** |
| **Evidence from  Selective Breeding**  *5.1 U3:*  *Selective breeding of domesticated animals shows that artificial selection can cause evolution.* | * SELECTIVE BREEDING (artificial selection) * DOMESTIC BREEDS | * BREEDING DOGS → herding (ex: sheepdogs) raciing (Ex: greyhounds) * COWS → bred for milk yield or meat * CROPS → bred for increased yield and/or disease resistance      * CORN (sweet yellow corn) - recessive trait |
| **Type of Evidence** | **Brief overview** | **Examples** |
| **Evidence from  Homologous Structures**  *5.1 U4: Evolution of homologous structures by adaptive radiation explains similarities in structure when there are differences in function.* | HOMOLOGOUS STRUCTURE =   * Structures imply they share a COMMON ANCESTRY * Used in different ways in different species   ADAPTIVE RADIATION = features that stem from the SAME origin but have become different because they perform different functions.  CONVERGENT EVOLUTION = an evolutionary interpretations that certain features have different origins but have become similar because they perform the same or similar function.   * ANALOGOUS STRUCTURES: features that seem similar but when studied closely are very different.   *“Rudimentary organs”:* | Example:  Pentadactyl Limb (continue next page) |

*5.1 A3: Comparison of the pentadactyl limb of mammals, birds, amphibians and reptiles with different methods of locomotion.*

PENTADACTYL LIMB: In vertebrates is an example of Homologous structure

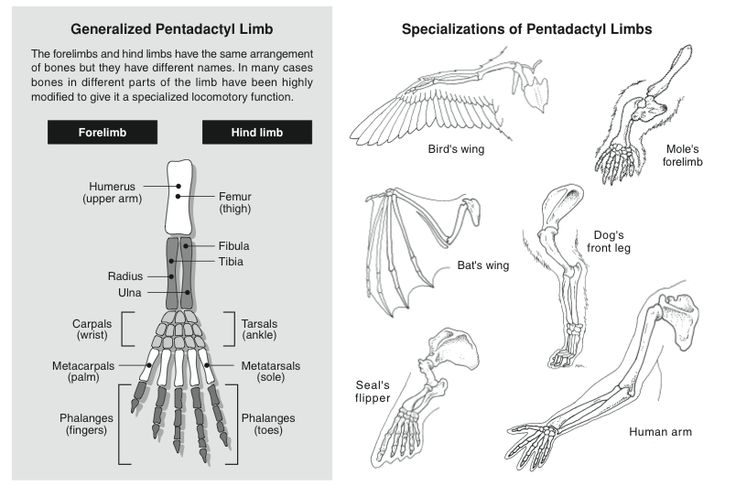
* It is adapted to different mode of locomotion in particular environment

Examples:

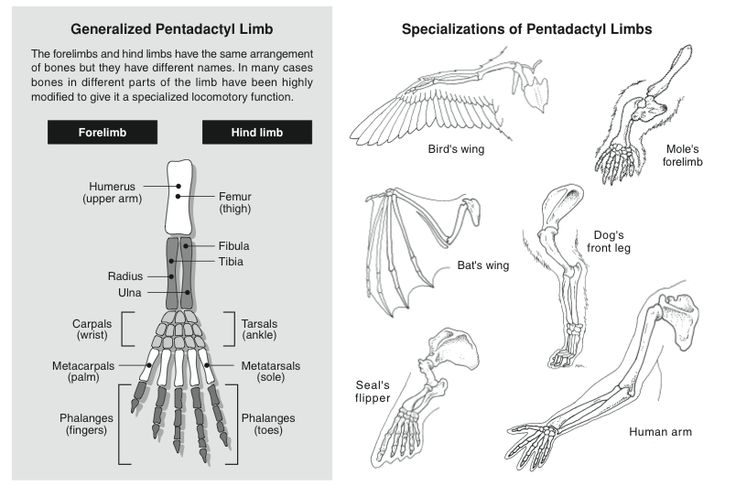
* + Dolphin fin → s\_\_\_\_\_\_\_\_\_\_\_
  + Bat wing → f\_\_\_\_\_\_\_\_\_\_\_
  + Monkey hand →g\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Horse hoof → g\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What are some OTHER EXAMPLES:

* NOS: despite obvious differences, all organisms share the same bones.
  + May vary in size and shape
  + All vertebrates have five fingered ‘hands’ at the end of each limb



**PRACTICE: Choose a colour code for the types of bones in a pentadactyl limb and colour the diagrams.**



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| *5.1 U5: Populations of a species can gradually diverge into separate species by evolution.* | 1. SEPARATION: If organisms are separated, will likely experience **d\_\_\_\_\_\_\_\_\_\_   e\_\_\_\_\_\_\_\_\_\_\_\_\_\_ c\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 2. DIVERGE: over many generations, shape may change, food preference, mating rituals, etc will diverge as a result of natural selection. 3. IF MIGRATE BACK: will not easily mate with mainland flies    1. Mating rituals are different    2. Genetic differences result in offspring infertility. 4. GENES CANNOT FLOW BETWEEN POPULATIONS: said to evolve into separate species.   **THIS ENTIRE PROCESS IS CALLED: Speciation** |  |

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| *5.1 U6: Continuous variation across the geographical range of related populations matches the concept of gradual divergence.* | The **GREATER** the **GEOLOGICAL SEPARATION** and the longer the populations have been separated, the **GREATER** the **DIVERGENCE**. | EXAMPLE: Red grouse of Britain and willow ptarmigan of Norway (*Lagopus lagopus)*       * Sometimes classified as the same species, sometimes as separate * Species can gradually diverge over long periods of time and between |

5.1 A1: Development of melanistic insects in polluted areas.



MELANISTIC: Dark varieties of typically light coloured insects.

EXAMPLE: The peppered moth (*Biston betularia*)

Industrial melanism followed the industrial revolution, look at the link below and run the simulation to find out more about industrial melanism

Activity: <https://www.biologycorner.com/worksheets/pepperedmoth.html>

**HOMEWORK:**

1. **Complete the Peppered Moth Simulation, answer Questions #1-12**
2. **DATA-BASED questions on pg 248-249**