

Grade 12 Life Sciences: Evolution Study Guide

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Free Study Resources for South African Matric Learners

1. Darwinian Evolution

Key Concepts

- Variation: individuals in a population differ from each other
- Overproduction: more offspring are produced than can survive
- Competition: organisms compete for limited resources (food, space, mates)
- Natural selection: individuals best adapted to environment survive and reproduce
- Inheritance: successful traits passed to offspring
- Adaptation: traits that increase survival/reproduction fitness

2. Evidence for Evolution

- Fossil record: shows progression of organisms through time; transitional fossils
- Comparative anatomy: homologous structures (same origin, different function) e.g. human arm, whale flipper
- Analogous structures (different origin, same function) -> convergent evolution
- Vestigial structures: remnants of structures once useful (e.g. human appendix, whale pelvis)
- Comparative embryology: embryos of different species look similar in early stages
- Molecular biology: DNA and protein similarities between species
- Biogeography: distribution of species supports common ancestors

3. Types of Natural Selection

- Directional selection: one extreme phenotype is favoured -> shifts population mean
- Stabilising selection: intermediate phenotype is favoured; extremes eliminated
- Disruptive selection: both extremes favoured; intermediate eliminated -> may lead to speciation

4. Speciation

Allopatric Speciation

Geographic isolation -> populations cannot interbreed -> accumulate different mutations -> eventually become reproductively isolated -> new species.

Example: Galapagos finches isolated on different islands.

Sympatric Speciation

New species arise without geographic isolation (e.g. polyploidy in plants).

5. Human Evolution

- Hominids: upright-walking primates; our lineage
- Key trend: increase in brain size (cranial capacity), reduction of jaw and brow ridges
- Bipedalism: walking on two legs, freeing hands for tool use
- Australopithecus: early hominid (3-4 Mya); small brain; bipedal
- Homo habilis: first stone tools; larger brain (~600 cc)
- Homo erectus: used fire; migrated out of Africa; larger brain (~900 cc)
- Homo sapiens: modern human; largest brain; complex language and culture
- Out of Africa hypothesis: modern humans originated in Africa ~200 000 years ago

TIP In exams: Darwin = natural selection. Lamarck = acquired characteristics (incorrect theory). Always link evidence to the correct theory and explain the mechanism.