

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Class: \_\_\_\_\_

---

# IB Environmental Systems and Societies

## 3.2 Origins of Biodiversity

### Significant ideas:

Evolution is a gradual change in the genetic character of populations over many generations achieved largely through the mechanism of natural selection.

Environmental change gives new challenges to species, which drives evolution diversity.

There have been major mass extinction events in the geological past.



## Natural Selection

### 1. Define Speciation

Speciation is the formation of new species when populations of a species become isolated and evolve differently.

Speciation is a gradual change, humans can speed up speciation by artificial selection of plants and animals by genetic engineering. Separation may have geographical or reproductive causes.

### 2. Using the table, summarise the mechanism of natural selection. p157

	Details
Variation	Species show variation (in appearance or behaviour). Variation is caused by genetic diversity: changes in the gene pool of a species arise through mutation + sexual reproduction.
Fitness	Resources such as food and space are limited and there are not enough for all offspring. There is competition for resources. Certain individuals will be fitter - better adapted to the environment.
Reproductive success	Fitter individuals will be able to outcompete others for resources and so will be at an advantage. They will reproduce more successfully than those who are less fit.
Inheritance	The individuals that survive and reproduce contain genes that give them an adaptive advantage. These genes are inherited by the offspring and passed on to the next generation. Over time change in gene pool results in speciation.



## Isolation of Populations

1. List three physical barriers that might separate populations. (mountains, oceans, climate)

Barriers may also be;

Geographical barriers eg mountain building, rise in sea level

Behavioural differences (reproductive isolation)

Environmental gradients

2. Outline the factors which might provide different selection pressures on populations that have been split and separated.

competition, disease, predation, parasitism, environmental pressures

3. Using modern nations/continents as a reference, outline the structure of the ancient continent, "Gondwana".

Gondwana contained India, Africa, Australia, Antarctica and South America

4. With reference to plate tectonics, explain how Gondwana was transformed into the structure of continents we currently have on Earth. [livescience.com](http://livescience.com)

Plate tectonics (movement) began about 180 million years ago.

Africa and South America broke apart from Gondwana. About 140mya

South America and Africa split opening up South Atlantic Ocean.

Madagascar moved away from India as both moved from Australia + Antarctic. 45mya Antarctica + Australia split with Australia drifted northward

5. Explain how land bridges may influence the evolution of species.

sea level changes caused by climate change have led to higher

altitude areas becoming isolated (as sea level rises) or have provided

land bridges for migration of species to new areas.

This allows different species to develop with changing

environment conditions.



## Mass Extinctions

1.

a) Outline what is meant by the term "background extinction rate".

The natural extinction rate of all species

One species per million species per year so between 10 and 100 species per year

b) State the estimated background extinction rate, including the units.

Between 10-100 species per year

2.

a) Outline what is meant by the term "mass extinction".

Periods in Earth's history when very large number of species die out simultaneously or within a very short period.

b) How many mass extinctions have occurred through geological history (not including the influence of humans)?

5

3. Outline three factors that may have resulted in mass extinctions in the past.

\* Drop in sea level - first mass extinction at the end of the Ordovician period (about 430 mya). Sea level dropped as glaciers formed.

\* Asteroid or volcano at the end of the Permian era (250 mya) huge release of carbon dioxide and oxygen levels in the sea were reduced.

\* Undersea volcanic eruption at the end of Triassic period (200 mya) flood-like lava escaping from a volcanic in the Atlantic ocean

\* Asteroid or comet impact in the Cretaceous-Tertiary mass extinction about 65 mya caused most large land animals



4. Complete the table showing the details of mass extinctions through geological history

	Time (Millions of years ago)	Geological time period	Proportion of families lost
Forward in time	439	Ordovician	25%
	364	Devonian	19%
	251	Permian-Triassic	54%
	199-214	End Triassic	23%
	65	Cretaceous-Tertiary	17% (all dinosaurs)

Note: In biology a "family" is a type of group of species. A family contains anywhere up to a thousand species.



