

## Key Area 6—Evolution of a Species

### (a) Mutations

A mutation is a **random change to genetic material**.

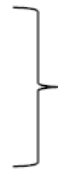
Mutations may be **neutral** (no effect), confer an **advantage to survival** or confer a **disadvantage to survival**.

Mutations are spontaneous and are the only **source of new alleles**. This means that mutations are **important in evolution** since they **provide variation**.

Environmental factors such as

**Radiation** (e.g. UV light, X-rays, gamma rays)

**Chemicals** (e.g. Mustard gas)



**can increase**

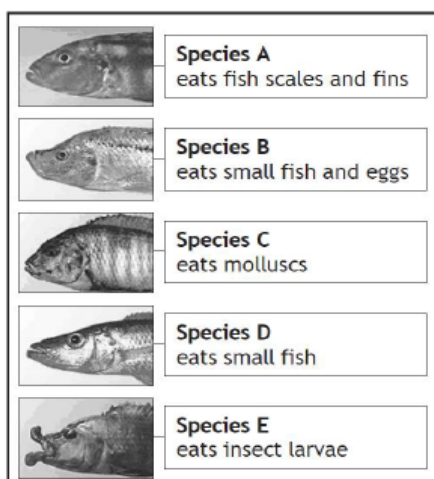
**the rate of mutation.**

### (b) Adaptation

**New alleles** produced by mutation can result in plants and animals becoming **better adapted** in their environment. **Variation** within a population makes it possible for a population to **evolve** over time in response to **changing environmental conditions**.

An adaptation is an inherited characteristic that makes an organism well suited to survival in its environment/niche.

Cichlid fish are all found in Lake Malawi in Africa.



In this example, variation in the **shape and size** of the **mouth** is an adaptation which will allow the fish to feed on different food sources.

### (c) Natural Selection

Species produce more offspring than the environment can sustain.

**Natural selection** or '**survival of the fittest**' occurs when there are selection pressures ( e.g. predator introduced, change in environmental conditions such as increased/decreased temperature or light intensity etc).

The **best adapted** individuals in a population **survive to reproduce, passing on the favourable alleles** that confer the selective advantage. These alleles **increase in frequency** within the population.

### (d) Speciation

- i. Speciation occurs after **part of a population becomes isolated** by an **isolation barrier**.

An isolation barrier can be:

**Geographical** (e.g. mountain range, sea, ocean, desert)

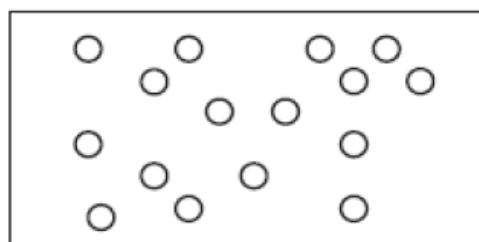
**Ecological** (e.g. pH, salinity, different habitats)

**Behavioural**

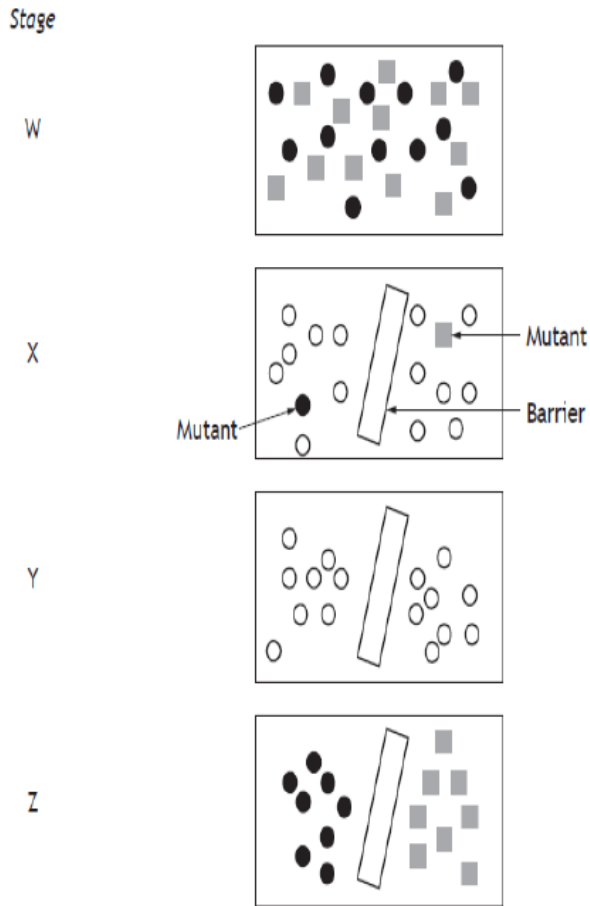
- ii. **Different mutations** occur in each sub-population.
- iii. **Natural selection** selects for different mutations in each group, due to different selection pressures.
- iv. Each sub-population **evolves** until they become so **genetically different** that they **are 2 different species**.

Example 1:

The diagram represents a population of animals.



The following diagrams show the stages of speciation occurring from this population.



In this example, the correct order of stages is:

Y, X, Z, W

The correct order of the stages of speciation is

### Example 2:

Decide if each of the following statements about evolution is **True** or **False** and tick (✓) the appropriate box.

If the statement is **False**, write the correct word in the **Correction** box to replace the word underlined in the statement.

Statement	True	False	Correction
Genetic variation within a population allows the population to <u>adapt</u> in a changing environment.			
Isolation barriers can be geographical, <u>environmental</u> or reproductive.			
Sub-populations evolve until they become genetically <u>identical</u> .			

In this example,

Statement 1 is TRUE

Statement 2 is FALSE, correction is ECOLOGICAL

Statement 3 is FALSE, correction is DIFFERENT.