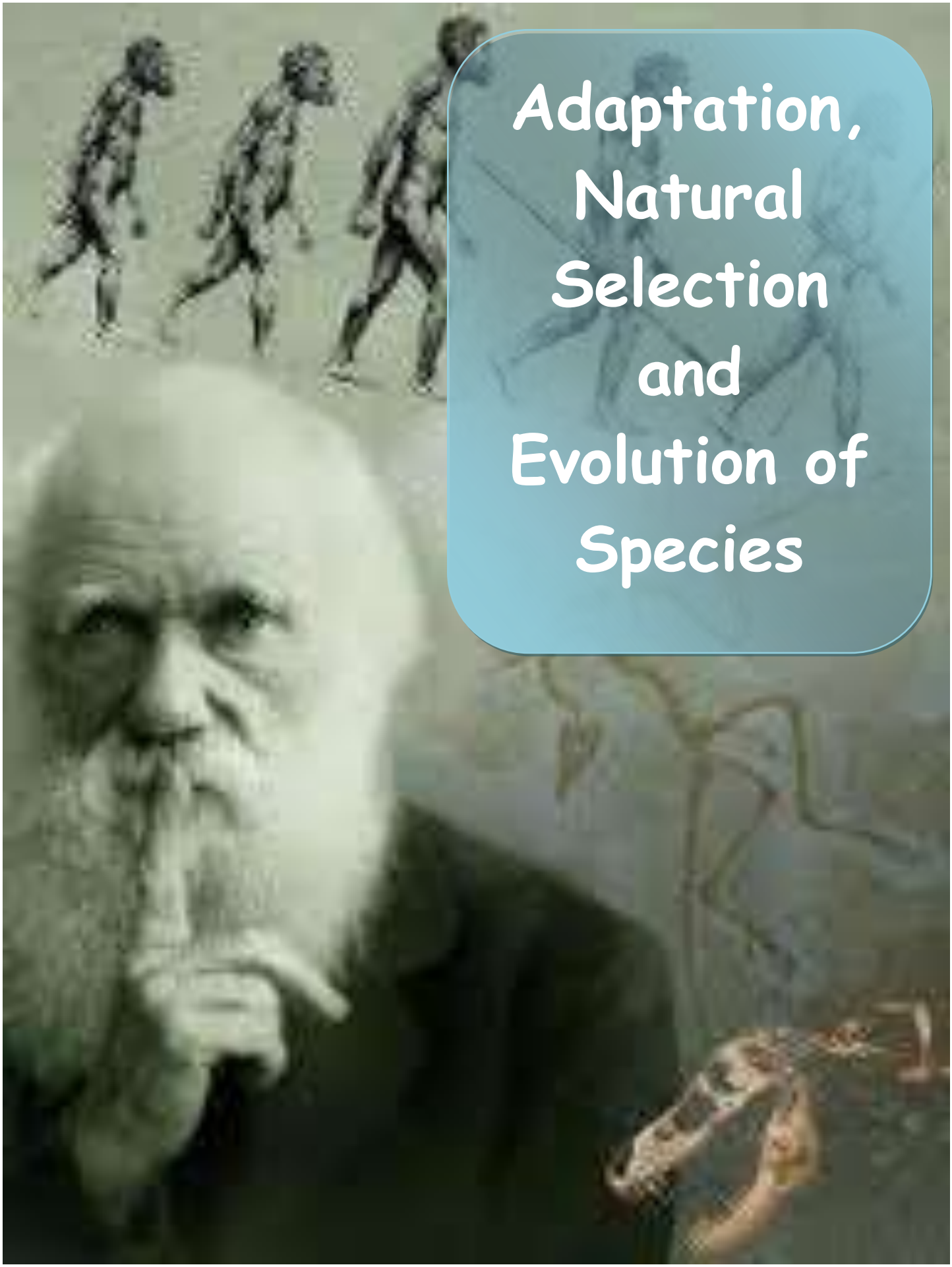

Adaptation, Natural Selection and Evolution of Species

Unit 3 Life on Earth

Sub Topic 2 – Adaptation, Natural Selection and Evolution of Species

A	Mutations
B	Variation & Natural Selection
C	Speciation

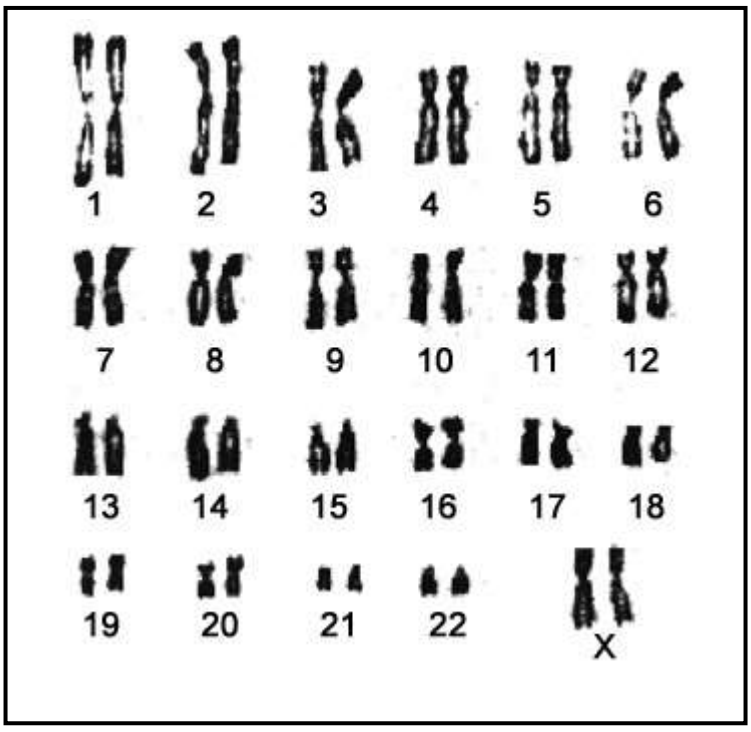
A: Mutations

Learning Outcome

- A mutation is a spontaneous and random change in genetic material and can give rise to new alleles.
- Mutations can be - advantageous, disadvantageous or neutral.
- Environmental factors can increase the mutation rate.

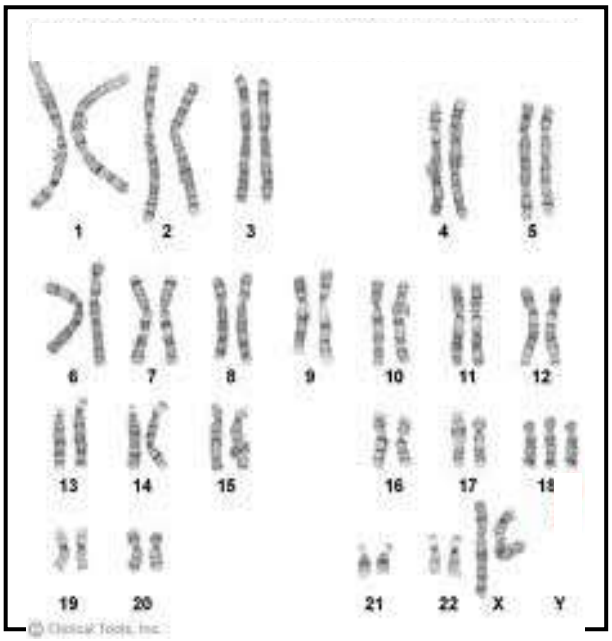
Activity 1 – What is a mutation?

Below is a set of chromosomes which is complete.

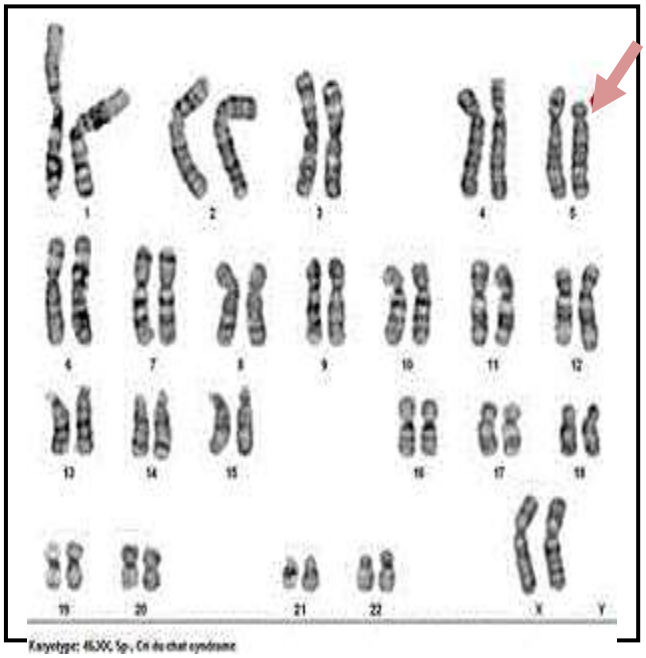


Examine the 3 following sets of chromosomes and discuss the differences between these sets and the complete set above.

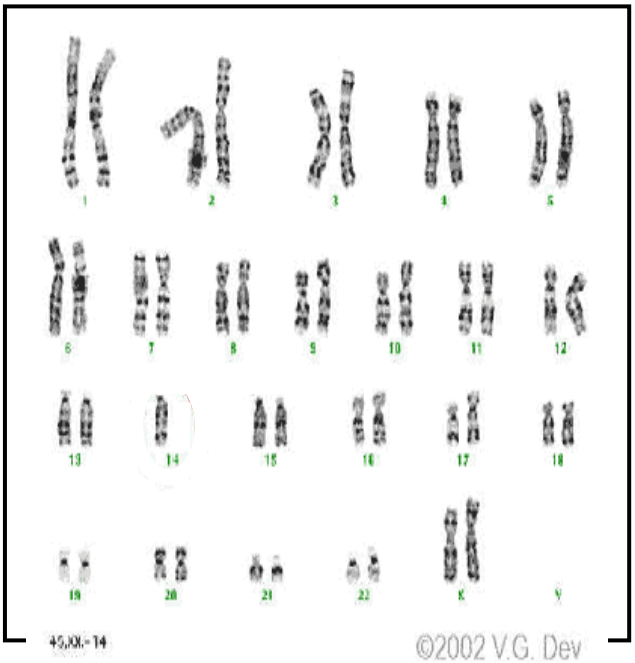
Set 1:



Set 2:



Set 3:



Your teacher will go over the answers and discuss each mutation in more detail

Copy and complete

A m_____ is a sudden random change in the _____ or structure of an organisms chromosomes (_____).

Mutations are usually r_____, spontaneous and occur very _____.

Activity 2 – Disadvantageous Mutations

Copy:

Most mutations are unfortunately harmful as they disrupt the proper working of cells.

1. Name 2 mutations that are caused by an extra copy of a chromosome?

Activity 3 – Neutral Mutations

Copy:

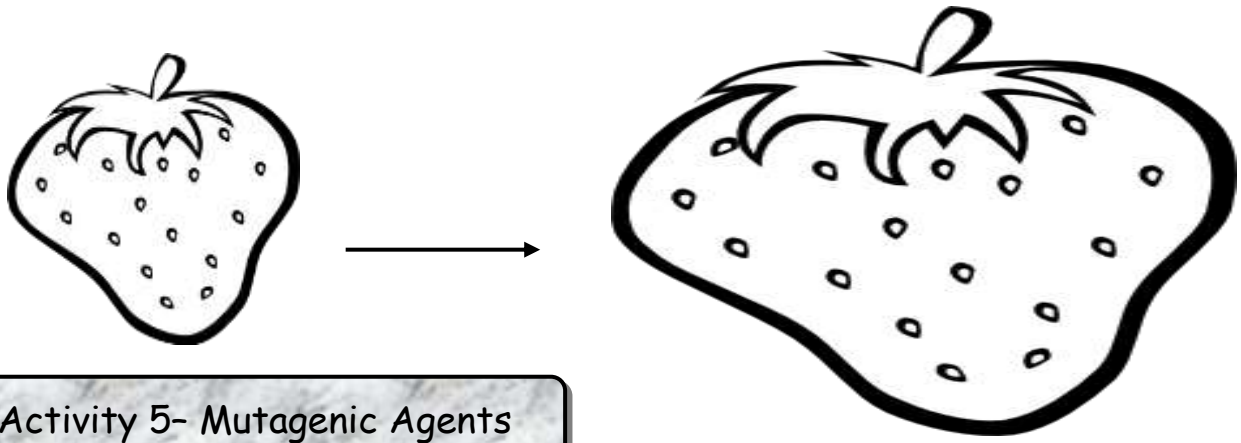
Some mutations seem to be neutral- they don't seem to confer an advantage or a disadvantage on the organisms in which they occur.

Activity 4 – Advantageous Mutations

Copy:

A very few mutations are beneficial and improve survival chances.

1. What name has been given to plants which are larger in size as a result of genetic mutations?



Activity 5– Mutagenic Agents

Copy and complete:

The rate of mutation can be increased by I_____ such as :-

1. _____;
2. _____;
3. _____.

The rate of mutation can also be increased by chemicals such as:-

1. _____;
2. _____;
3. _____.

B: Variation within a species and Natural Selection

Learning Outcomes

- Variation within a population makes it possible for a population to evolve over time in response to changing environmental conditions.
- Natural selection (survival of the fittest) occurs when more offspring are produced than the environment can support. Only the best adapted individuals survive to reproduce, passing on the genes that give them a selective advantage.

Activity 1- Natural Selection

1. Copy heading and learning outcomes into your jotter.
2. Go through the PowerPoint and copy the slides highlighted.

Activity 2- Natural selection simulation

You will become members of a bird population called Carrickbeaks on an imaginary place called Carrick Island.

Carrickbeaks are simple creatures, they can't fly and live on three species of bean that are found on the island.

You will gather food and compete with one another over four seasons of breeding on the island. The 'food' provided are 3 different types of bean which have different energy values.

As in nature, these birds will need a certain amount of energy to survive, but a greater amount of energy is needed to both survive and reproduce.

At the end of each 'season' you must calculate the amount of energy you have gained. This will tell you if you have died, survived, or survived and reproduced.

1. Split into groups of 4 and collect instruction cards
2. Collect apparatus and enjoy.
3. Copy and complete the following conclusion.

Conclusion:

In the Natural Selection simulation, some beak types died out because they were unable to collect enough _____. Other types of beaks survived because they were b_____ a_____ to collecting the different types of food found in their _____. They had the s_____ a_____.

Copy - Summary of Natural Selection

- Organisms produce more offspring than environment can support
- A struggle for existence exists (some die)

  → overcrowding

  → competition

  → lack of food

  → inability to escape predators

  → lack of resistance to disease

  - Members of same species show variation

- Some of the different variations are better suited to the environment and have more chance of surviving to reproductive age and passing on their genes. Others less suited to the environment will die.

Speciation

Learning Outcomes

- Speciation occurs after a population becomes isolated and natural selection follows a different path due to different conditions/ selection pressures.

Activity 1

Watch twig video "Evolutionary theory 2 Mechanism of evolution" & "Evolutionary theory 3 Origin of the species"

Copy & Complete using the words below:

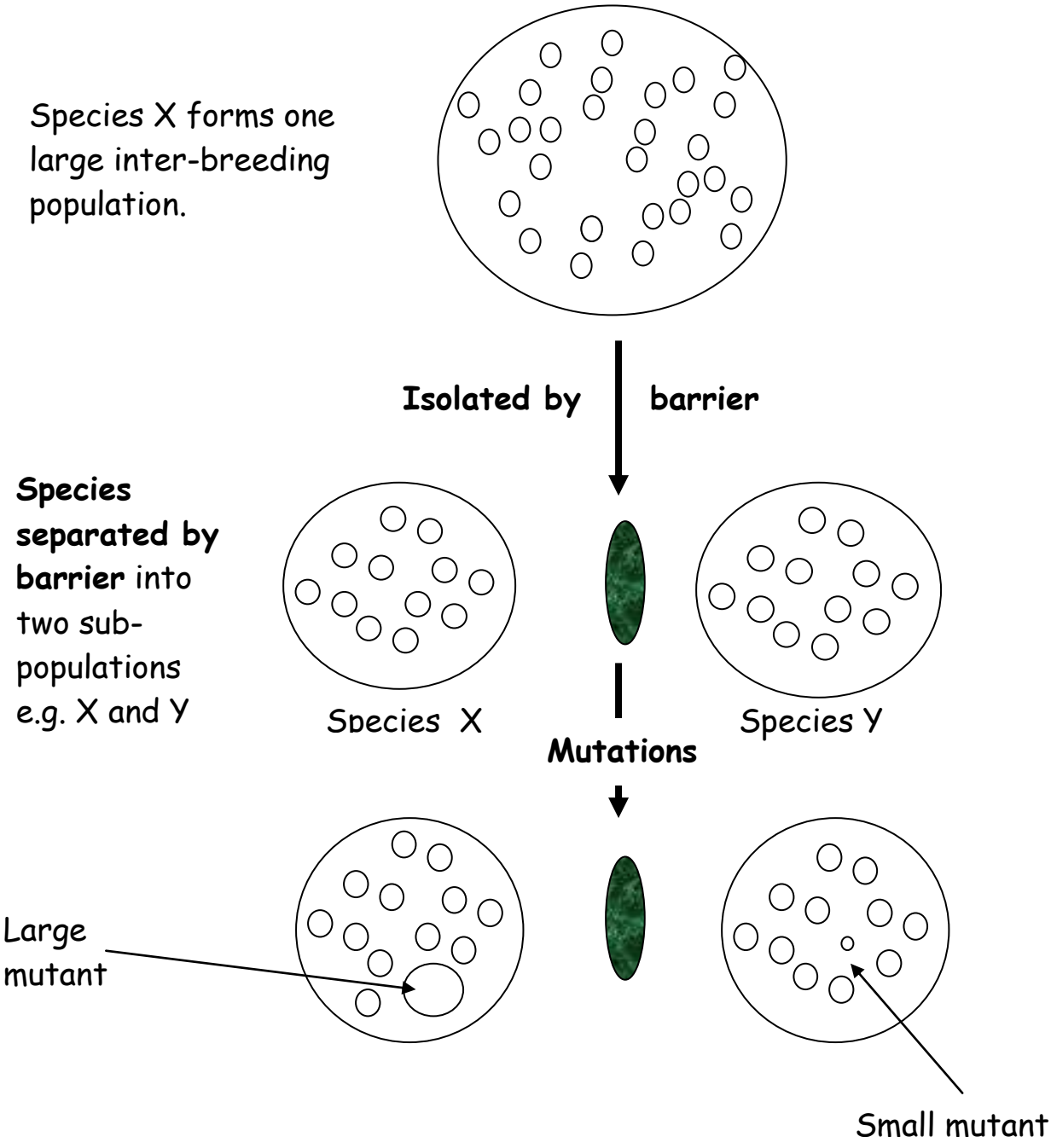
A species is a _____ of organisms that can i_____ and produce _____ offspring.

Interbreed	fertile	group

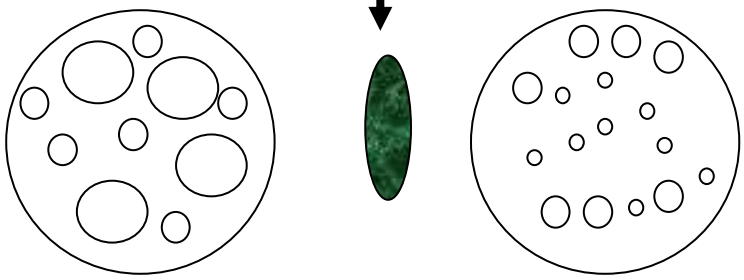
Activity 2

1. Collect the 'Speciation' diagram and stick this into your jotter
2. Your teacher will talk you through the main points that lead to the evolution of a new species.

3. Using the diagram below to help, fill in the missing sections on your diagram



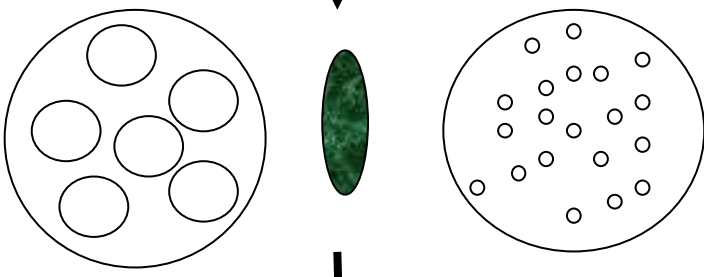
Natural Selection



Large size enjoys <u>selective advantage</u> e.g. in a cold climate

Eventually two species formed

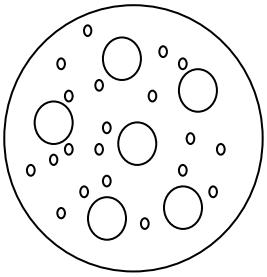
Small size enjoys <u>selective advantage</u> e.g. in a warm climate



Species X

Species Y

Barrier removed



Species X and Y **cannot inter-breed and new species has formed**

Activity 3

You are going to recreate the steps leading to the evolution of a new species using the apparatus below:

Apparatus

- 1 x sheet of poster paper
- 2 x tubs of play-do (different colours)
- Scissors
- Coloured card to make your barrier
- Cue cards to write what is happening in the picture

Your teacher will show you an example that has been done previous.

Copy: Summary of speciation

1. Large interbreeding population of one species
2. Original population becomes isolated by a barrier e.g. ocean
3. Population split into two isolated populations
4. Mutations happen at random
5. The two groups become genetically distinct and isolated
6. If the barrier is removed and the two populations mix they can no longer interbreed and produce fertile young
7. Two different species have evolved
8. Speciation has occurred.

Quick Quiz – True or False

SMB Activity

1. The structures in the nucleus in which mutations may occur are called chromosomes.

2. All genetic mutations are advantageous.

3. Cri du chat is an example of a mutation that is classed as being disadvantageous.

4. Two factors that can increase the rate of mutation are UV light and mustard gas.

5. Variation within a population means it is unlikely for a population to evolve over time in response to changing environmental conditions.

6. Natural selection occurs when more offspring are produced than the environment can support.

7. Survival of the fittest means the weakest of the population will survive and reproduce.

8. The peppered moth is an example of natural selection.

9. Two examples of selection pressures that may affect an animal are grazing by herbivores and lack of light.

10. Two examples of selection pressures that may affect an animal are predation and lack of food

11. A species is a group of organisms that are able to interbreed and produce fertile offspring.

12. A mule is infertile because a horse and a donkey are members of the same species.

11. A population can be separated by barriers like a mountain range, desert and river or by continental drift.