

Let's take a CLOSER look at Bio-technology



Q How do scientists use biotechnology to modify plants?

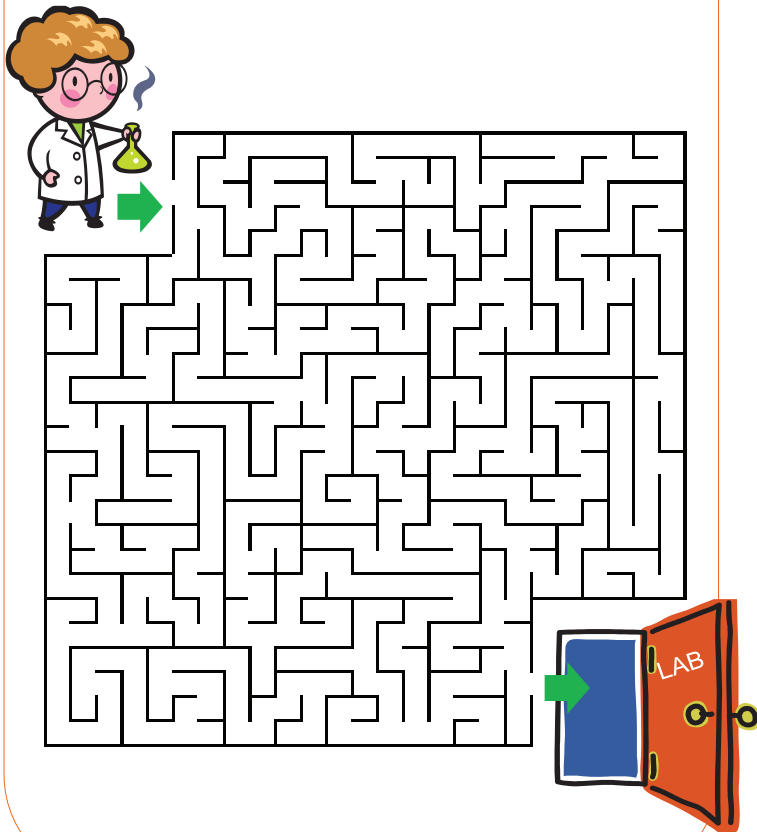
A Remember that plants have traits, and these are determined by the plants' genes? Scientists use biotechnology to modify the plants' genes which modifies the way they grow.

For example, the plants can be modified to:

- Fight off pests
- Withstand herbicides
- Contain more nutrients

Acti vi ty ti me!

Scientist Sally has lost her way! Help her find her way back to the laboratory so she can continue her work on plant genes.



Modifying plants' genes

The genes of plants can be modified to change their traits.

These plants are then called GENETICALLY MODIFIED plants, or GM plants.

There are many GM plants all over the world.

Acti vi ty ti me!

GM crop plants are grown in many countries. Can you help Farmer John find out which countries* he can grow his GM crops in?



Farmer John

U S K A Y O W O Q N I X I
 A R Z R N N L M V N P B Y
 D U U S A L O I I E C P U
 S G Y U G U V E Z Q G D X
 N M C F X R S A G A F N O
 J C H Q G J B T D P R M K
 Y Q I I S C M F R F I B N
 Y Z N X U Y E A P A V B J
 E J A T P Z J J A P L M Z
 K B F C H R Q I E E D I H
 V C S W I B D Q B H Z A A
 N H P Y L N Y O U A X R K
 X V A J I G P B M Z K G K
 Q C I L P Y U U S E R E J
 E V N L P I B C D I J N A
 U U K P I U L V I F C T D
 U N W E N W C D S N Q I A
 I K M O E F E H W L N N N
 E G Q J S C J Y G Y T A A
 S H Y F C G S X G Y I X C
 S X M A F D Z M H P D M X
 G W I F I S O I W W I Q F

- | | | |
|-----------|-------------|--------|
| ARGENTINA | CHINA | USA |
| AUSTRALIA | INDIA | SPAIN |
| BRAZIL | PHILIPPINES | CANADA |

* There are many others not included in this list

Of GM Crops/Plants

GM crops or plants can be used as food or feed.

Food:

✓ For people to consume



Feed:

✓ For animal livestock to consume



Q GM crops can be processed and used as ingredients in other foods. Can these foods be found in Singapore?

A Singapore buys foods from many countries. Since some of these countries plant GM crops, some foods we buy may contain ingredients from GM plant crops.

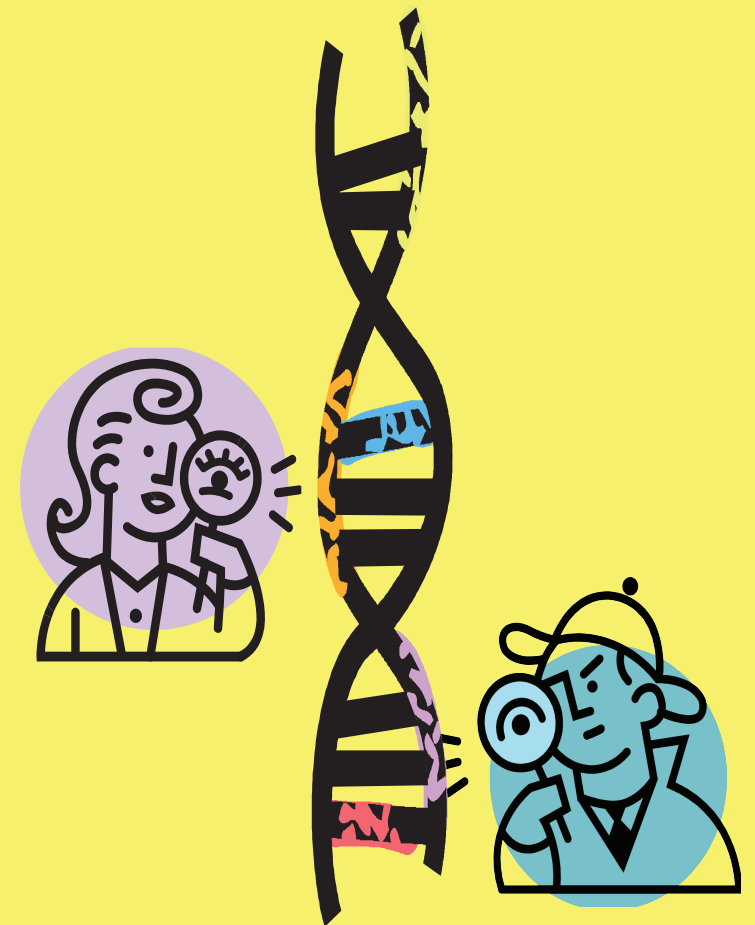
Acti vi ty ti me!

We now know that many countries plant GM crops. The flags below belong to the top 5 countries that plant the most GM crops in 2012. Try to identify them!

- | | | |
|--|---|-------|
| | 1 | _____ |
| | 2 | _____ |
| | 3 | _____ |
| | 4 | _____ |
| | 5 | _____ |

Decode the mystery of GENES

(Get your pencils ready!)

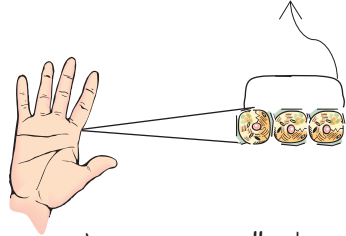


The Genetic Modification Advisory Committee (GMAC) is a multi-agency national committee established in 1999 under the purview of the Ministry of Trade and Industry. Do visit our website at www.gmac.gov.sg or email us at info@gmac.gov.sg for more information.

Of cells, DNA & genes

Living things you see around you — animals, plants, your friends — are made up of tiny building blocks which you cannot see with your naked eyes.

These building blocks are called CELLS.



Q Ever wondered how your cells know what to do?

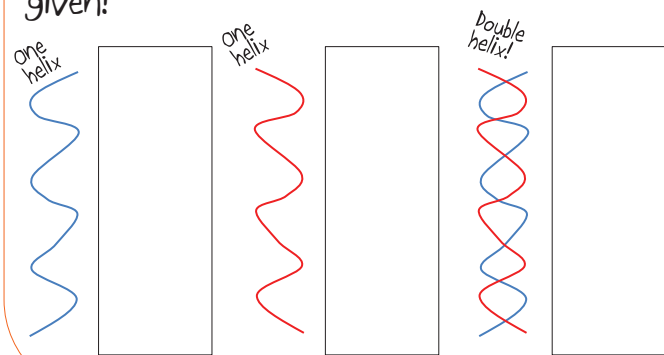
A They receive instructions from their DNA, which is found inside each cell.

Q What is DNA? How does it look like?

A DNA is a substance that contains instructions. It is shaped in a double helix.

Acti vi ty ti me!

Try to copy the shape of DNA in the boxes given!



Q How is DNA arranged?

A It is arranged into GENES. Genes are passed to you from your parents.

That means in every cell, you have genes passed from your mother and father!



Let's talk about traits

TRAITS are features that belong to a person which make him or her different from others.

Can you imagine a world where everyone looks the same? It wouldn't be very interesting would it!

Traits such as hair colour, eye colour and tongue-rolling make people unique and result in an interesting world.

Acti vi ty ti me!

Draw a line to match the pictures to the right hair colour.



•Red



•Brunette



•Raven



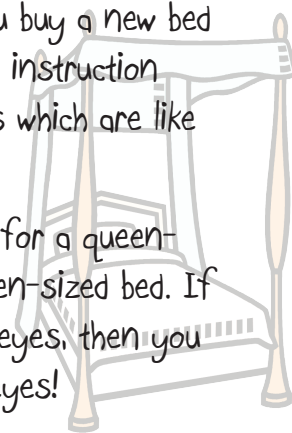
•Blonde

Q How are traits and genes related?

A Your genes determine what traits you have.

This is sort of like when you buy a new bed and want to assemble it. The instruction manual contains instructions which are like your genes.

If the instruction manual is for a queen-sized bed, you will get a queen-sized bed. If your genes code for green eyes, then you will have the trait of green eyes!



Plants have traits too

Just like you, plants have traits too.

Flower colour and plant height are example of plant traits. Like you, plant traits are determined by genes.

Some traits can be useful, such as the ability for a plant to fight pests.



Q Is your DNA made of the same substance as plant DNA?

A Yes. Your DNA and plant DNA are made of the same substance.

Acti vi ty ti me!

Imagine yourself as a farmer. You grow crop plants as food to feed people.



Tick which traits you would want your crop plants to have.

Safe

Nutritious

Delicious

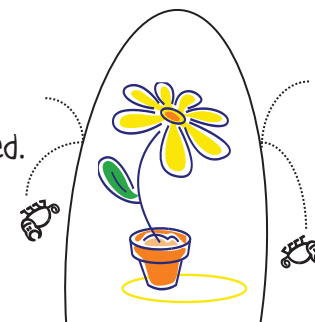
Strong

Q Are there plants which are stronger than others?

A Yes. Some plants are able to fight off pests so they can grow properly. They do so by producing chemicals that ward them off or kill them.

Q What about other plants that are not as strong?

A Plants which cannot fight off pests can be helped. This takes some effort from BIOTECHNOLOGY.



Let's take a look at Bio-techno-logy

Biotechnology can be explained as such:

= "Bios" + "teuchos" + "logos"

= "life" + "tool" + "study of"



Biotechnology is the study of living tools. It involves using living things to make useful things.

Scientists can use biotechnology to help make crop plants stronger.

Q Which crop plants have been modified with biotechnology?

A Some examples include corn, soybean and cotton. These crop plants can also be processed and used as ingredients in other foods.

For example, the sweet corn syrup from corn can be used in your breakfast cereal.

Acti vi ty ti me!

The crop plants below have been modified with biotechnology. Try to figure out what they are.

