

Marshmallow DNA

LESSON PLAN

RECOMMENDED FOR YEARS 4 - 6

Lesson summary

In this lesson, students learn about the basic structures of DNA by creating a model using marshmallows and toothpicks. By the end of this lesson, students will be better at describing a DNA molecule using scientific vocabulary and explaining the complementary base pairing rule.

Learning objectives

Students can use correct scientific vocabulary to label and describe DNA.
Students can apply the complementary base pairing rule to create a DNA model.

Possible Australian Curriculum links

Science Understanding / Biological sciences
Science as a Human Endeavour / Use and influence of science



STARTER

1. Ask students what they know about DNA. You could record their responses and questions on the KWL chart as a whole class, or have students complete their charts individually, to identify any misconceptions and prior knowledge (What do you KNOW about DNA? What WOULD you like to know?). The final section (What have we LEARNT about DNA?) is to be revisited at the end of the lesson.
2. Have students pair up with a partner. Set a timer to 2 minutes and have students record on a piece of paper as many differences as they can visually identify between themselves and their partners (For example, "I have brown hair and my partner has black hair. I have longer arms than my partner. My earlobes are attached and my partner's earlobes are detached..."). Encourage students to pay close attention to their physical features and challenge them to record as many differences as they can within the time limit.
3. Explain to students that our bodies (and all living things) are made of trillions of cells and within those cells is something called DNA. Based on the pattern of our DNA, it determines all kinds of traits about our bodies, from our hair colour to the shape of our ears. DNA determines our appearance and why we all look so different from one another. You can't see DNA molecules with the naked eye - scientists use special microscopes in a lab to be able to see the DNA strands.

Resources

- Timer
- Paper
- Marshmallows in 4 different colours, dried out overnight so they are less sticky to handle (If you can't find different coloured marshmallows at the supermarket, you can easily dye plain marshmallows using food colouring. Alternatively, any soft lollies in 4 different colours will also do the trick!)
- Toothpicks
- Liquorice twists or snake lollies
- Cards with the letters A, T, G, C on them
- Whistle

BODY

1. Explain to students that we are going to create a DNA model using marshmallows, toothpicks, and some lollies. You might like to show students images of what DNA actually looks like. Ask students to describe what they can see to a partner and introduce scientific vocabulary such as **double helix**, **molecule** and **nucleotides**. Students can complete the first part of the activity sheet by labelling the parts of the DNA with the key words on the page.
2. Explain to students the DNA molecules in our cells are made up of four chemicals called bases: Adenine (A), Thymine (T), Guanine (G) and Cytosine (C). Assign a coloured marshmallow to each chemical (for example, the pink marshmallows are Adenine, the white ones are Thymine, the orange ones are Guanine and the yellow ones are Cytosine).

You could adapt this activity to make it non-edible (and less sticky!) by using coloured playdough or modelling clay.

Health and safety

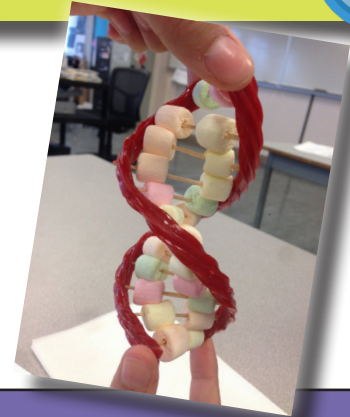
Ensure students take care when using toothpicks to pierce through the marshmallows, as toothpicks can be sharp.



3. Have students work in pairs or small groups. Give each pair or group a specific sequence of DNA to map out (or you could let them choose their own sequence). The sequence needs to be composed of the four letters A, T, G and C (for example, A T G C T G C A). Have students write their sequence on a piece of paper to plan their model. Explain that this pattern of chemicals makes up one side of their DNA model. On top of each letter, have students lay the marshmallows in the colours assigned to each base.
4. Now explain that each chemical in our DNA (A, T, G, C) pairs up with each other using a special base pairing rule. Adenine bonds with Thymine, and Guanine bonds with Cytosine. Bases that bond together are known as complementary. On the piece of paper, have students write the corresponding letter for each chemical beside the ones they have written for their gene sequence. So, every A needs a T next to it, and every T needs an A. Have students repeat the same process for C and G.
5. Explain to students that the second part of their DNA sequence is going to form the other side of their DNA molecule. Have students lay the corresponding coloured marshmallow for each letter. Using toothpicks, have students stick the marshmallows together, remembering to keep them in the correct order and ensuring each pair is complementary.
6. Finally, at the ends of the toothpicks, have students use liquorice or similar lollies to form each side of the double helix that is DNA. You can extend students' learning by asking them to sketch their DNA model on a piece of paper and label their diagram using the scientific vocabulary they have learnt.
7. Have students complete the second part of the DNA activity sheet, which tests their knowledge of the complementary base pairing rule.

Question prompts

- What do you know about DNA?
- What does DNA do for our bodies?
- What are the complementary base patterns in DNA?
- Why do you think the complementary base pairing rule is important for DNA?
- Why might scientists study human DNA?



PLENARY

Find some space outside or a clear space in the classroom and have students play a DNA pairing game. Hand out cards with the letters A, T, G and C on them to each student. Have students run or move in a special way (tiptoe, hop, skip, walk backwards, etc) around the space until you blow a whistle, on which students will need to find their complementary partner, using the DNA base pairing rule (A and T, G and C), and sit down. This plenary activity has possible cross-curricular links to outcomes in Health and Physical Education / Movement and Physical Activity / Moving our body.

THE SCIENCE BEHIND THE ACTIVITY

DNA stands for deoxyribonucleic acid and is the carrier of genetic information within a cell. A molecule of DNA consists of two chains that are wrapped around each other, forming a double helix in shape. Each chain is made up of repeating subunits called nucleotides (the rungs of the DNA ladder) that are held together by chemical bonds. A nucleotide is composed of 3 parts – a nitrogenous base, five-sided sugar (ribose or deoxyribose) and a phosphate group.

The sugar and phosphate group make the backbone of the DNA double helix, while the bases are connected in the middle. There are four types of bases in DNA, which are Adenine (A), Thymine (T), Guanine (G) and Cytosine (C). Each base on one side of the chain or DNA strand is chemically bonded to a base on the other side, using a special base pairing rule that determines which bases can bond with each other (A and T; G and C). Complementary base pairing is important in DNA replication as it allows the base pairs to be replicated in the most energetically favourable way. Basically, when you know the sequence of one strand, you can use the base pairing rule to replicate the other strand accurately and efficiently.

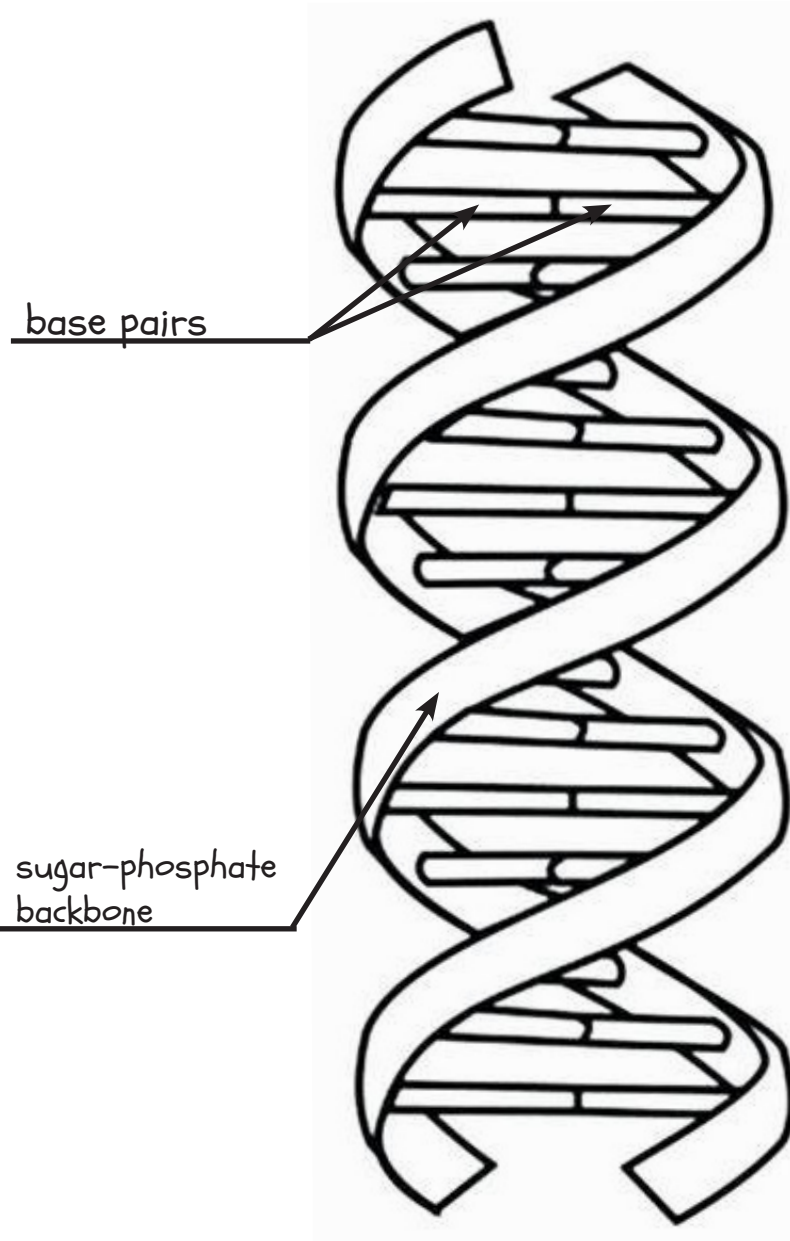
Our scientists at the Telethon Kids Institute study DNA to learn more about health and different diseases. For example, DNA from twins is extra special as identical twins have the same DNA. This helps our scientists find out if the causes of health and disease are related to genetics or the environment. By studying DNA closely, our scientists can work towards finding out about the causes of disease and hunt for cures.

Have you checked out the **Telethon Kids Discovery Centre**? Enrich this lesson with an excursion to our interactive Discovery Centre, full of fun games designed to get kids excited about science, health and research. Check out [our website](#) or [send us an email](#) for more information and to book your next school visit!

DNA Activity Sheet

Name: _____ Date: _____

Use the words in the box to label the diagram.



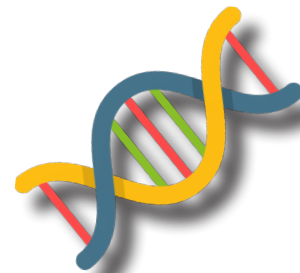
molecule

double helix

base pairs

sugar-phosphate
backbone

A DNA molecule
twists in the shape of a
double helix.



Write the other side of this DNA strand using the base pairing rule. Remember, G always pairs with C and A always pairs with T. Fill in the boxes with the correct letters.

G	T	A	A	T	C	C	C	G	T	T	A	T
C	A	T	T	A	G	G	G	C	A	A	T	A



DNA KWL Chart

Name: _____

Date: _____

<p>K What do you KNOW about DNA?</p>	<p>W What WOULD you like to know about DNA?</p>	<p>L What have you LEARNT about DNA?</p>