

● ○ ○ EASY

6-12

1 - 1 ½ HRS



1 Learn about the work of Dorothy Hodgkins

2 Extract DNA from strawberries

3 Find out about DNA

STORIES IN CHEMISTRY

DISCOVERING DNA

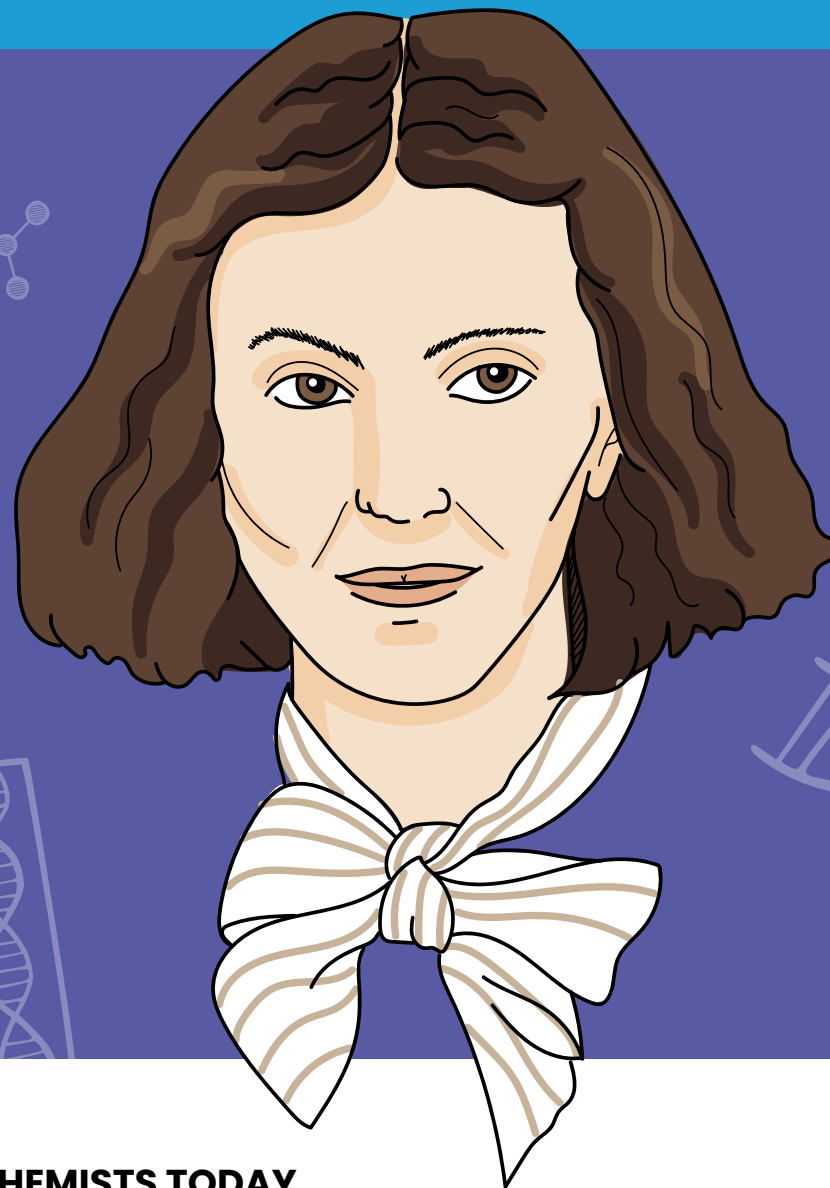


Illustration: Dorothy Hodgkins



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INTRODUCTION

X-ray crystallography involves firing X-rays at a crystal of a chemical and looking at and measuring the patterns that are formed to find out how the atoms are joined together.

Dorothy Hodgkins was a British chemist who used this technique to work out the structures of important molecules within the body. She discovered the structure of many molecules including penicillin, vitamin B12 and insulin.

Her grammar school did not normally allow girls to study chemistry, but she was interested in the subject and requested special permission (she was one of only 2 girls at the school allowed to study chemistry). She went to Oxford University to study Chemistry and later went on to study for a PhD at Cambridge. She developed rheumatoid arthritis at age 24, which affected her hands and feet and spent some of her later years in a wheelchair, whilst still conducting research. Dorothy Hodgkins was awarded the Nobel Prize for Chemistry in 1964.

X ray crystallography was famously used to discover the structure of DNA. To commemorate the work of Dorothy Hodgkins, the experiment below will show you how to extract DNA.



DID YOU KNOW?

Every human shares 99.9% of their DNA with other humans, and has 98.7% in common with a chimpanzee, 85% in common with a mouse, and 60% in common with a strawberry!

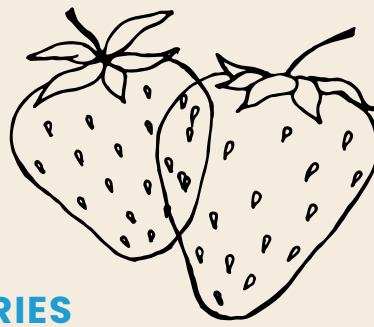
All the biological information within DNA is coded using only four chemicals called adenine, guanine, thymine, and cytosine.



SAFETY

- Strawberry juice may stain – keep away from fabrics!
- Use alcohol hand sanitiser/gel only in a well-ventilated space and away from naked flames.
- Avoid known food allergens – a medium sized onion can be used instead.
- This activity should be supervised at all times.

ACTIVITY



EXTRACTING DNA FROM STRAWBERRIES INSTRUCTIONS

1. Place the alcohol hand sanitiser into a freezer for at least 30 minutes before starting.
2. In a large bowl, use a potato masher to mash the strawberries.
3. Add 1 teaspoon of washing up liquid and 1 teaspoon of salt to 100ml tap water and stir slowly and gently until dissolved (try to avoid making bubbles).
4. Add the liquid from step 3 to the mashed-up strawberry from step 2 and continue to mash with the potato masher until the mixture is very runny.
5. Half fill the washing up bowl with hot tap water.
6. Cover the mashed strawberry mixture from step 4 with cling film and then place into the washing up bowl of hot water and leave to stand for 15 minutes.
7. Place a tea strainer (or sieve) over the neck of a 250ml jam jar. Remove the bowl from the hot tap water and pour the mixture slowly through the tea strainer to filter off any large lumps of material. The pink liquid in the jam jar contains the strawberry DNA.
8. Carefully pour the ice cold alcohol hand sanitiser down the side of the jam jar – it will form a clear layer on top of the strawberry mixture.
9. Where the alcohol meets the strawberry mixture, a white jelly like substance will form – this is the DNA! Use a fork to lift out some of the strawberry DNA – can you see the stringy appearance?

YOU WILL NEED

- 100ml bottle of alcohol hand sanitiser
- 200g strawberries
- Potato masher
- Washing up liquid
- Table salt
- Measuring jug
- Teaspoon
- Large baking bowl
- Cling film
- Washing up bowl
- Tea strainer or fine sieve
- Large jam jar
- Fork
- Timer
- Access to a freezer

WHAT'S HAPPENING?

All living things are made up of cells, which contains a complete copy of the genetic code for that organism – DNA (Deoxyribonucleic acid). DNA can be extracted from any living material.

DNA is contained within the nucleus of every cell – this is the “control centre” for the cell. Mashing the strawberries releases the individual cells into a “soup” of cells. Incubating the cells at a high temperature with the washing up liquid breaks down the cells and allows the contents of the cell including the nucleus to be released. The salt makes the DNA clump together. As DNA cannot dissolve in alcohol, it starts to clump together into a white, stringy, jelly like substance which can be seen in large quantities.

