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1 Learn about the work of Helen Sharman

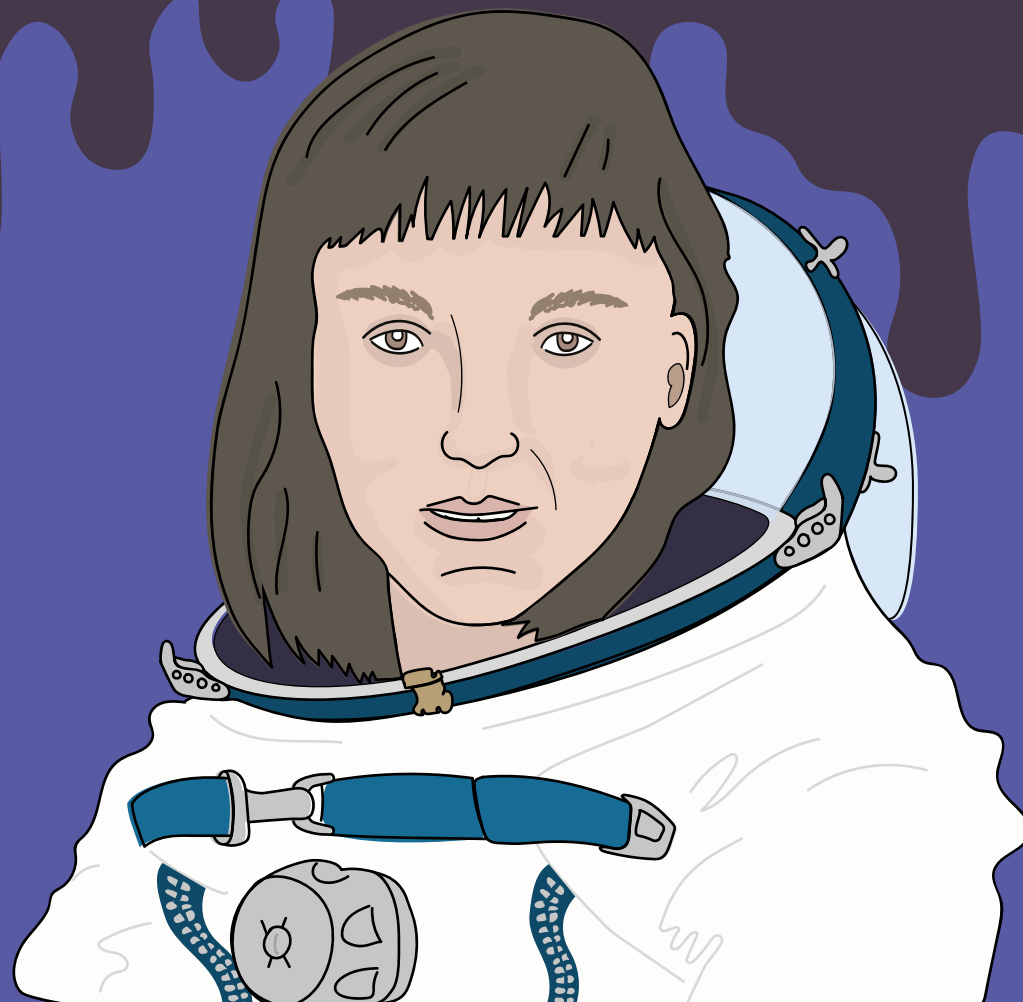
2 Investigate the melting points of different types of chocolate

3 Find out the importance of melting points in making chocolate

STORIES IN CHEMISTRY

MYSTERIOUS MELTING

Illustration: Helen Sharman



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INTRODUCTION

Helen Sharman is a British chemist and astronaut who became the first woman to visit the Mir Space Station in May 1991.

Helen was born near Sheffield. After leaving school, she studied for a chemistry degree and went on to study for a PhD.

Helen worked as a chemist for the Mars confectionery company investigating how the chemical properties of chocolate alter the flavour. After hearing a radio advertisement looking for an astronaut to join a space expedition, she applied, and to her surprise she was given the job! Before flying, Sharman spent 18 months in intensive flight training. Helen was aboard the Soyuz TM-12 space mission which launched on 18 May 1991 and spent eight days in space, mostly at the Mir Space Station.

Sharman's tasks included medical and agricultural tests, photographing Britain from space and participating in radio conversations with British schoolchildren. After her trip into space, the newspapers reported her as being 'The Girl from Mars'.



DID YOU KNOW?

Chocolate is made in different ways depending upon the climate of country of where it is going to be sold.

In the UK, chocolate melts at low temperatures meaning it will melt in your hand.



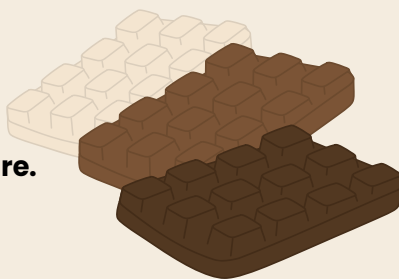
SAFETY

- **Avoid any known food allergens – 'free from' chocolate also works in this experiment.**
- **Ask an adult to heat the water and add it to the bowl – take care with boiling water and keep it out of the way of young children / pets.**
- **Wash your hands before and after this experiment.**
- **This activity should be supervised at all times.**

ACTIVITY

INVESTIGATE THE MELTING POINTS OF DIFFERENT TYPES OF CHOCOLATE

To commemorate the work of Helen Sharman, the experiment below will show you how the fat content of different types of chocolate affects the melting temperature.



INSTRUCTIONS

1. Break off one small piece of each of the three different types of chocolate. Try to ensure that the pieces are all the same size to make it a fair test.
2. Place each piece of chocolate in a separate cake case, ensuring they are lying flat on the bottom.
3. Ask an adult to boil water in a kettle.
4. Place the large sturdy heatproof bowl on a tea towel in an area away from younger children/pets. Then ask an adult to fill the bowl 2/3 full with hot water and to help you float the cake cases in the hot water and immediately start the timer.
5. Watch carefully. Write down the time at which each of the different types of chocolate starts to melt. Which chocolate melts first, and which melts last. Why do you think this is happening?

6. Ask an adult to tidy away the hot water and cake cases.

CHALLENGE

Try repeating the experiment above with different chocolates that contain similar percentages of cocoa butter. Do they all melt at roughly the same time?



DID YOU KNOW

Chocolatiers can make chocolate bars that can withstand hot climates and will not melt in a warm shop by changing the relative amounts of the different ingredients in the bar. Vegetable fats (such as shea butter) can be used instead of cocoa butter as they have higher melting points. Adding extra sugar also increases the melting point as the percentage of cocoa butter in the bar is lower.

YOU WILL NEED

- 3 different bars of chocolate – white, milk and dark work best (try to look at the packaging to get bars with differing fat contents)
- 3 small foil cake cases
- Large sturdy heatproof bowl
- Tea towel
- Access to a kettle
- Timer
- Pen and paper



WHAT'S HAPPENING?

When a substance changes from a solid to a liquid, chemists call this melting. The exact temperature at which this happens is the melting point. Some chemicals melt at very high temperatures (diamonds melt at 4,027°C), while some melt at much lower temperatures (ice melts at 0°C).

Chocolate is mainly a mixture of cocoa butter (a type of fat) and cocoa solids (dried cocoa powder from the cocoa bean). White chocolate is almost entirely cocoa butter. Milk chocolate is a mixture of cocoa solids and cocoa butter. Dark chocolate has more cocoa solids and less cocoa butter. Pure cocoa butter melts at between 34°C and 38°C. Chocolate with more cocoa solids and less cocoa butter will have higher melting points (white chocolate melts at approximately 37°C, whilst dark chocolate has an average melting point of 46°C). This explains why the white chocolate usually melts first, followed by the milk chocolate, and the dark chocolate is usually the last to melt.