



SILVER AWARD

FABRICS FOR COLD WEATHER CLOTHING



Typically 30 hours of project work
Recommended for 14-16 year olds



Practical
project

Investigate the thermal properties of different fabrics used in cold weather clothing.

#chemistry

#materials

#heat



HOW TO RUN CREST USING THIS ACTIVITY

Entering your project without a teacher or facilitator? No problem! You can enter your work yourself by following this link: www.crestawards.org/sign-in

Looking for some support? Find a mentor by contacting your local STEM Ambassador hub: <https://www.stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs>

To use their project to achieve a CREST Silver Award your students will need to:

- **Develop and lead the project**
- **Complete a minimum of 30 hours of project work**
- **Consider the broader impact of their project and demonstrate an innovative approach**
- **Write a project report or portfolio of evidence**
- **Reflect on their work during the project using a student profile form**

Preparation

Ready to get going with CREST? Sign up for a CREST account here: www.crestawards.org/sign-in

Create a new Silver Award project with the name(s) of the student(s) and the title of the project. If you don't have the details yet, you can fill these in later!

Run the project

We have some super handy workbooks and profiles for your students to use when running a CREST Award. You can download these when you create your CREST account by following the link above.

Encourage your students to use the Silver student guide to plan and carry out their project. Each student involved in the project should complete their own profile form.

You don't want all their good work to go to waste, so be sure they keep a record of all their amazing progress. Keeping a regular project diary will save them precious time when writing their final project report.

Make sure you consider safety and risks!

Reflection

So, your students have been hard at work and completed their CREST project, but don't let this be the end of their learning. At the end of the project, each student should complete a Gold profile form and communicate their project. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Students working in a group can either submit a joint report or separate reports, but they must each complete a profile form.

Use the CREST criteria on the profile form to help the students check that they have included everything in their report.

Enter your project for a CREST Gold Award

Hard work deserves a reward! Celebrate and certify your student's achievements by entering their project for a CREST Silver Award. Simply:

Log in to your CREST account at www.crestawards.org/sign-in

Select your project and upload the profile form per student, project report and other evidence, such as pictures and diagrams.

Finally, complete the delivery and payment details for assessment and to order your snazzy certificates.

Congratulations on submitting for CREST Silver!

What next?

Is university on the horizon for your students? They can use their project to help demonstrate their newly found STEM skills and knowledge in UCAS personal statements.

The scientific discovery doesn't need to end here. Students can have a go at the next level up - CREST Gold.

Don't keep all the fun to yourselves, encourage others to take part in CREST projects and share the wonder of science. For free ideas on how to get started, see www.crestawards.org

STUDENT BRIEF

**SILVER
AWARD**

Fabrics for cold weather clothing

In this project, you will investigate the thermal properties of different fabrics used in cold weather clothing or other thermal insulation applications such as sleeping bags or duvets. You will also look at the effect that quilting fabric has on thermal insulation.

Getting Started

You should start this project with some research. Find out about the design of fabrics with good thermal insulation properties and their use in cold weather clothing. You could also research other thermal insulation applications such as sleeping bag and duvets. Try to find out a little about how the thermal insulation of fabrics is measured and compared. At the same time, try to obtain samples of fabrics for your own tests.

Designing experiments: Design your own experiments to measure and compare the thermal properties of different fabrics. You could start by devising a test procedure that involves wrapping a layer of fabric around a 250 ml beaker of hot water and measuring with a thermometer and stop-clock how long the hot water takes to cool down.

Do this for each fabric but make sure your tests are fair and allow a comparison of the thermal properties of your sample fabrics. Consider whether or not you need a lid on the beaker and how you are going to measure the rate of cooling.

More than one layer ... Most thermal insulation applications involve more than one layer. Often the fabric is quilted. Devise your own tests to measure the effect of having more than one layer of fabric and then investigate the effect of quilting the fabrics together.

Things to think about

If you have time you could investigate the effect of different sizes of quilting pattern. You may be able to use your tests to investigate other techniques used by manufacturers to improve thermal insulation. You will need to decide how you are going to present your results and how you are going to relate them to what you found out about the way manufacturers construct their products to give maximum thermal insulation.

Useful Resources

Some examples of fabrics that you could test include: fleece, down, wool, cotton and silk.



STUDENT BRIEF

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Health and Safety

Science project work is both dynamic and exciting but can also carry some risk. To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- find out if any of the materials, equipment or methods are hazardous;
- assess the risks (think about what could go wrong and how serious it might be);
- decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- make sure your teacher agrees with your plan and risk assessment.

Beware of the hazards of certain materials such as fibre glass and some mineral fibres. If you use these, think about the strategies needed to reduce the risk.

Remember!

Science isn't just about data. The most successful projects will demonstrate good communication skills and show original ideas that address a real-world problem.

Look at the world around you and consider all the innovative ways that you could address the challenge. Even if things go wrong, use this to show what you have learned. Don't forget to use the student profile form to help structure your project.