CREST AWARDS

GOLD AWARD

MONITORING LEAD POLLUTION

70H

Typically 70 hours of project work
Recommended for 16-18 year olds

Practical project

Research and apply methods of detecting lead pollution.

#chemistry
#environment
#pollution

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: **www.stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs**

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

- **Develop and lead the project**
- **Complete a minimum of 70 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 Gold Award project with the name(s) of the student(s) and the title of their project. If you don't have all these details, you can fill them in later!

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.

Run the project

Encourage your students to use the Gold 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.

The students should spend at least 70 hours on the project in total.

Remember to 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 Gold 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 Gold!

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.

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

GOLD AWARD

Monitoring lead pollution

In this project, you will research ways of detecting low concentrations of lead and apply these to test samples from the environment. The objective is to investigate whether lead from petrol still persists at the roadside in order to determine whether there is a lurking legacy of lead.

Getting started

Lead compounds were used in petrol as 'anti-knock' additives. Find out what this means, and how they improved the petrol. The additives used were tetraethyl lead (TEL) and/or tetramethyl lead (TML), but after combustion the exhaust gases contained other lead compounds. Find out what these were and what happened to them when they came out into the air – i.e. where, and in what chemical form, the lead is likely to have ended up.

Detecting & measuring lead:

You need to be able to test whether the samples you collect contain any lead, and if so how much. Try out various reagents to find one that will detect as low as possible concentrations of lead ions, Pb^{2+}. It must also distinguish lead from other metals that might be present in environmental samples.

Test known solutions to decide the lowest concentration of lead ions that you can detect. If you detect lead in a sample, you will need to determine the amount. Research various methods of quantitative analysis for lead ions. Choose one which you can use yourself and determine the lowest amount that you can measure.

Environmental sampling:

Now plan your sampling. Choose sites on verges alongside roads with different amounts of daily traffic and sites unaffected by car exhaust fumes.

Analysis:

Devise procedures to extract any lead from your soil and plant samples. Using methods researched above, perform qualitative analysis on each extract, and quantitative analysis on those that show positive for lead. Express your results in terms of the quantity of lead in each original sample.

The results:

Display your results in a meaningful way, which clearly addresses the objective stated in the introduction. This could be in the form of a poster display, such as would be shown at a scientific conference.

Things to think about

Look up environmental data to find out the level of lead pollution that you are likely to find. Use this data, and your minimum measurable amounts, to decide how big your samples need to be. From each site, take samples of soil, and of plants. They may have absorbed lead compounds from the soil.

Useful resources

Find out how professional environmentalists monitor lead levels. Try to arrange a visit to a laboratory which undertakes such analyses. It may be possible to have some of your own samples analysed by way of demonstration.

STUDENT BRIEF

GOLD AWARD

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.

Remember lead is toxic and other chemicals used in the tests may also be hazardous.

When choosing sampling sites, consider matters of safety and bear in mind that most land is private.

Lead extraction may involve solvents which are hazardous.

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.