



BRONZE AWARD

FRAUD DETECTION – TESTING METALS



Typically 10 hours of project work
Recommended for 11-14 year olds



**Practical
project**

Use Archimedes' principle to
investigate the composition
of metal items.

#chemistry

#materials

#crime



HOW TO RUN CREST USING THIS ACTIVITY

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 Bronze CREST Award your students will need to:

- **Complete a minimum of 10 hours of project work**
- **Consider the broader impact of their project and demonstrate an innovative approach**
- **Complete the project workbook or short report in another medium**
- **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 Bronze Award project with the name(s) of the student(s) and the title of their project. If you don't have all the details, 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 workbook or profile to plan and carry out their project, keeping a record of all their amazing progress.

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. They should now fill in any remaining sections of their workbook. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Enter your project for a Bronze CREST Award

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

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

Select the project and upload a sample of the students' workbooks or other project evidence.

Check the participating students have met each of the criteria on the teacher assessment page.

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

Congratulations on completing CREST Bronze!

What next?

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

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

BRONZE AWARD

Fraud detection – testing metals

In this project you will use a modern version of Archimedes' method to investigate the composition of copper, silver and gold items.

Getting started

When Archimedes stepped into a full bath it overflowed. This gave him a clue to solving a king-sized problem – how to determine whether or not the new royal crown was pure gold. “Eureka!” he cried, meaning “I’ve found it!”. Read about Archimedes to find out how the overflowing bath helped him to determine the density of the crown, and thus solve the problem.

Make a collection of 1p and 2p coins with various dates on them. How have they changed over time?

Design an experiment using a Eureka can to prove that a modern 1p or 2p ‘copper’ or ‘bronze’ coin is neither pure copper nor bronze.

Devise a way to improve your method to make your measurements more precise. You need to be able to calculate the density of a coin as precisely as possible, ideally to at least 3 decimal places.

Use your improved method to compare 5p, 10p, 20p and 50p ‘silver’ coins. Show that the coins are not real silver. Are they all the same?

Find out about measuring the purity of gold in carats. Work out how to determine the carat value using your improved version of Archimedes' method. If you are able to, test some rings or jewellery to decide their carat value. Compare your results with the items' hallmarks if it has one.

Find out how the purity of gold or silver is checked at an Assay Office before it is granted a hallmark. Just as in Archimedes' day, this is an official test procedure as a precaution against goldsmiths and silversmiths cheating their customers.

Things to think about

How will you ensure your test is fair?

How could you use the dates on coins to test whether the composition of coins has changed over time?

How many coins will you need to test?

How could a magnet help you to test what coins are made of?

Useful resources

Ask your teacher if you can use a Eureka can or you could try making one.



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Health and safety

A science project 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!

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.