



GOLD AWARD

MAKE A SPEAKER SYSTEM



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



**Design & make
project**

Design and make a working speaker system and compare it to commercial speakers.

#physics

#sound

#entertainment



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

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Design and build a speaker system

In this project, you will design and build your own working speaker system. Speakers work by using the motor effect. Two magnetic fields interact with each other, making a paper cone vibrate in an out. One magnetic field is produced by a permanent magnet, and the second, by the electric current from the sound signal.

Getting started

If you look at a series of different commercially produced speakers, they will all have features in common, but speakers come in all sorts of shapes and sizes. Why is this?

Find out about the different geometries of coil and magnet.

Design your own system using scrap or readily available materials. You may need to experiment with different designs first.

Use your design to build a set of speakers. You will have found out that different sizes are needed to get the full frequency range. How can you incorporate these into a speaker system?

You could try to make your speaker system for a particular purpose. For example, you might try to make the smallest possible speaker with a decent range that can be hidden in the corner of a room.

Try playing a series of music tracks through your speaker system. Repeat this test using a set of commercial speakers. What is the difference?

You could use a microphone connected, through a computer's sound card, to an oscilloscope programme to compare the signals. What are the similarities and differences? You could try to increase the scale of the project by making an entire surround sound system. You'll have to carry out more research to find out about the different frequency ranges that different speakers have. You'll also have to think about making a dedicated bass unit (a sub-woofer).

Things to think about

What materials are available to you to make a speaker from? Could you use recycled materials?

Could you make a speaker from recycled materials?

If you design a speaker for a phone, how would it work?

What equipment will you use to test your speaker?

How will you compare your speaker to a commercial one?

Useful resources

Contact a local electronics company to help you find out about how speakers work.

Contact a speaker manufacturer to find out how they test their products.



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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.

Make sure you use tools properly, supervised in your school's D+T workshop and always follow the proper health and safety guidelines.

Remember that loud sounds can damage hearing.

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.