

# SOLAR CELL CHALLENGE



## TEACHER INFORMATION

### Solar Cell Challenge 2022, hosted by the ARC Centre of Excellence in Exciton Science

#### **\*Introduction session\***

One of our researchers can help you run an introduction lesson (in person or via video depending on your school's location). Just let us know when you register!

#### **What is the Solar Cell Challenge?**

The Solar Cell Challenge is an experimental challenge for students to complete at school under the supervision of their teachers. It is designed for students in years 7-10, working in small teams of 2-3 to create a Dye Sensitised Solar Cell. While a method is required and provided, there are several steps of the process where variables need to be manipulated or worked through via the process of trial and error to complete the experiment properly. There are also some specific independent variables which students are encouraged to manipulate in order to try and create the most efficient Solar Cell. As a result, this challenge best suits high achieving Year 7-8 students and confident Year 9-10 students.

The bulk of the required materials for the challenge are found in a school laboratory, but there are some that are more difficult to source. These bits of equipment are sent via airmail to schools along with methods, risk assessments and other information upon registration. More details regarding equipment are below.

As students complete the challenge, they are required to record evidence of their experimentation, whether it be in video, photographic, or other creative forms. This evidence is to be submitted along with their answers to a few questions regarding how they found the process.

#### **Who is the challenge for?**


The competition is to be completed in small groups (2-3 participants) in science classes/clubs across Australia. Students can be from years 7-10 and teams can be mixed year levels. Participating schools can be from any state or territory in Australia.

One kit is required per group of students.

#### **When is the challenge?**

The Challenge will take place in Term 4.

#### **What are the key dates in 2022?**

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|--|--------------------------------|
|  Registrations close                  | 18 November                    |
|  Resource packages arrival at schools | 2 - 4 weeks after registration |
|  Submissions close                    | 2 December                     |

### **How long does the challenge take to complete?**

It is expected that approximately 3 x 1hr school lessons will be enough for students to complete the planning and experimentation phases of the challenge. However, you might need to complete the challenge multiple times to get it working, this will of course add time. A simplified version of the challenge is being developed so please reach out if you are interested in trialing that.

### **What is the cost of the challenge?**

- ☀️ A single school can register for up to 20 FREE experimental kits.
- ☀️ As there are 2 - 3 students per team, this will allow 40 - 60 students to enter the competition.
- ☀️ Any additional kits required will cost \$20 per kit (including postage).

### **How do students present their results and win prizes?**

Students are required to collect evidence of their experimentation. They can do this via video, photos- whatever they prefer.

There will also be a short set of questions for the students to articulate a little more about how they found the process, where their difficulties were and how they manipulated variables. They will also be required to submit a form (signed by parents/guardians) and upload this to the online form.

Both the questions and the evidence will need to be submitted via an online form you will be provided.

Once all of a school's entries are complete, the teacher of the school needs to email [outreach@excitonscience.com](mailto:outreach@excitonscience.com) to confirm this and a prize pack will be sent to the school. Students who have provided particularly compelling evidence and experimental feedback will be provided with special prizes and mentions in the prize pack.

### **What is the expected teacher involvement?**

The main role of teachers is to provide administrative and laboratory support during the challenge in performing the roles outlined below:

- ☀️ Registering school and teams for challenge and organizing payment if appropriate
- ☀️ Preparing time for students to perform the experiments and providing appropriate supervision for experimentation
- ☀️ Liaising with lab technicians and/or collecting appropriate equipment
- ☀️ Consulting and supporting students through safe problem-solving processes when encountering difficulties with the challenge method

Teachers are to only minimally help a team and/or contribute to the challenge solution itself. They may support students by performing a scientific technique in the case of negating significant risk at their discretion and prompting or encouraging students when working through difficulties with the method. They are also encouraged to help students think in a scientifically creative (but safe) manner about how to enhance their Solar Cell.

### **How are students registered for the competition?**

Teachers need to register students for the Solar Cell Challenge through their school email and address. They can do this here - <https://excitonscience.com/solar-cell-challenge-registration-2022>

Kits can take up to 4 weeks to arrive at your school, so please register with plenty of time. We will endeavor to shorten this turn-around time significantly.

Please note that no refunds can be made on any payments for kits (if more than 20 were ordered).

**What equipment is provided and what does the school or students need to provide?**

<b>What is provided by Exciton Science?</b>	<b>What does the school/student need to provide?</b>
<ul style="list-style-type: none"> <li>- Methods for students and teachers including relevant risk assessments</li> <li>- Titanium dioxide (TiO<sub>2</sub>) powder</li> <li>- ITO conductive glass (6 slides per team)</li> </ul>	<ul style="list-style-type: none"> <li>- 1 x Multimeter (with <math>\mu</math>A sensitivity)</li> <li>- 2 x Alligator clips</li> <li>- 1 x Plastic chopping board/lab-safe surface</li> <li>- 10-20cm Masking tape</li> <li>- 1 x Electronic measuring scales</li> <li>- 1 x Small spatula</li> <li>- 1 x Mortar and pestle</li> <li>- 0.035M Acetic acid (pH 3-4) (&lt;10mL)</li> <li>- I<sub>3</sub><sup>-</sup>/I<sup>-</sup> electrolyte solution (&lt;10mL) *Note other Iodine based redox solutions also can be used (such as those used to create I<sub>2</sub>/I<sup>-</sup> half-cells)</li> <li>- 1 x Measuring cylinder (<math>\approx</math>10mL)</li> <li>- 3 x Plastic pipettes</li> <li>- Glass stirring rod</li> <li>- Forceps/Laboratory tweezers</li> <li>- Hot plate</li> <li>- 3 x Small beakers</li> <li>- Deionised water (for rinsing)</li> <li>- Ethanol (for rinsing)</li> <li>- Matches</li> <li>- 1 x Tea candle</li> <li>- 2 x Q-tips</li> <li>- 2 x Small bull dog paper clips</li> <li>- Dye solution (Be creative! It is encouraged that your students source this themselves!)</li> </ul>

**How do I find out more if I'm still unsure about something?**

Email us at [outreach@excitonscience.com](mailto:outreach@excitonscience.com).

Please remember that we are here to make this challenge as enjoyable for your students and easy for you to run as possible. Please email us if you have suggestions or requests and we will do our best to accommodate your needs.