

Renewable Energy – Module 4

How can solar energy be used?

How does solar PV work?

Make a selection of solar powered rotating models



Spinner



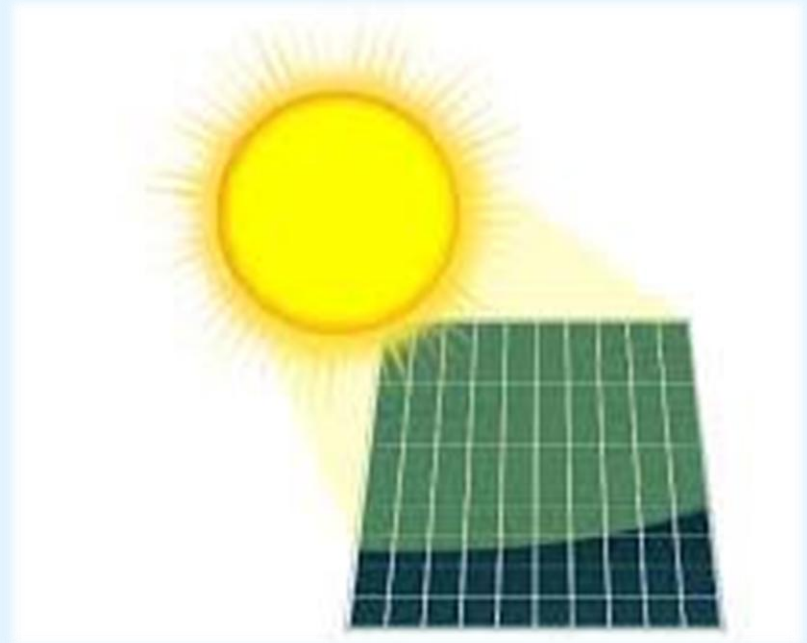
How can solar energy be used?

- Solar energy can be used to heat water or to make electricity.
- Water is pumped through solar heating panels where it receives energy from the sun.
- Solar photovoltaic (PV) panels convert light into electrical energy.
- Solar panels only work during the day.



How does solar PV work?

- A solar photovoltaic (PV) panel absorbs light energy from the sun.
- It converts this into electrical energy.



Make a solar powered spinner



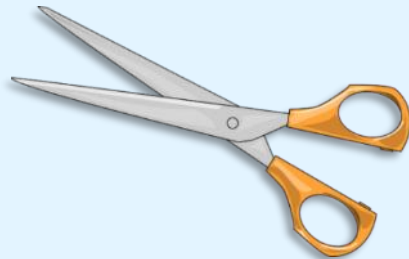
STEM Learning Objectives

- **Science:** *Light* (extend your experience of light looking at a range of phenomena) and *Earth and space* (find out the way that ideas about the solar system have developed).
- **Technology** – design purposeful, functional, appealing products.
- **Engineering** – design, make, test and improve a product.
- **Maths** – draw 2D shapes; know that diameter is twice the radius.



Work Safely

Look at the tools and equipment. Can you spot any potential hazards?

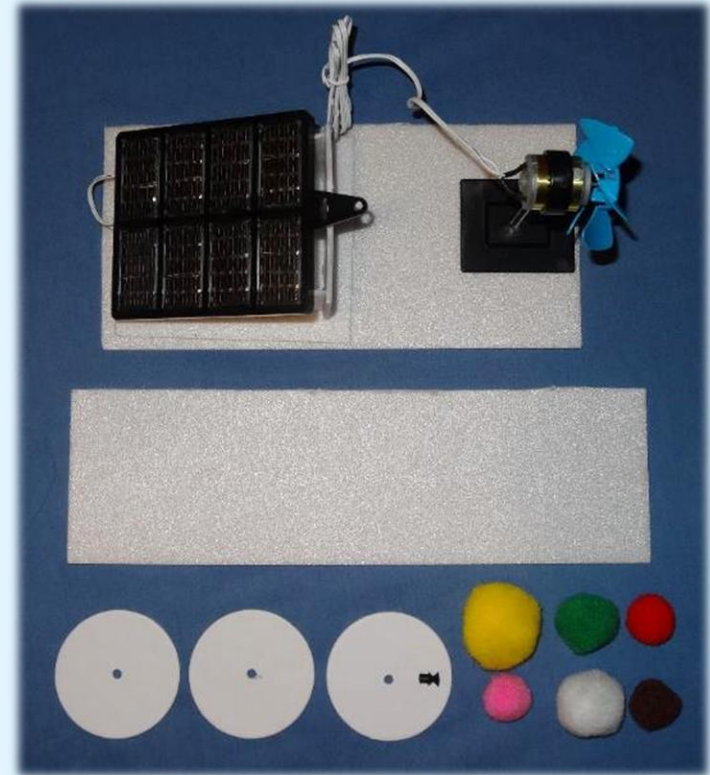


Can you think of ways to reduce the risks?

Collect your materials

You will need:

- A solar energy kit (from the electric boat completed in module 3)
- A polystyrene foam base (completed in module 2)
- Offcuts of polystyrene foam
- Several card discs
- A motor pulley
- Pompoms



Assemble your tools

You will need:

- A ruler
- A sheet of card
- Coloured felt tip pens
- A pair of scissors
- A pair of compasses
- A cool melt glue gun



Prepare the motor

- Pull the propeller off the motor shaft.
- Replace it with the motor pulley - the nose of the pulley must face away from the motor as shown.
- Use the plastic spanner from the solar energy kit to loosen the nut slightly on the motor stand.
- Turn the motor so the shaft faces vertically upwards.
- Re-tighten the nut.



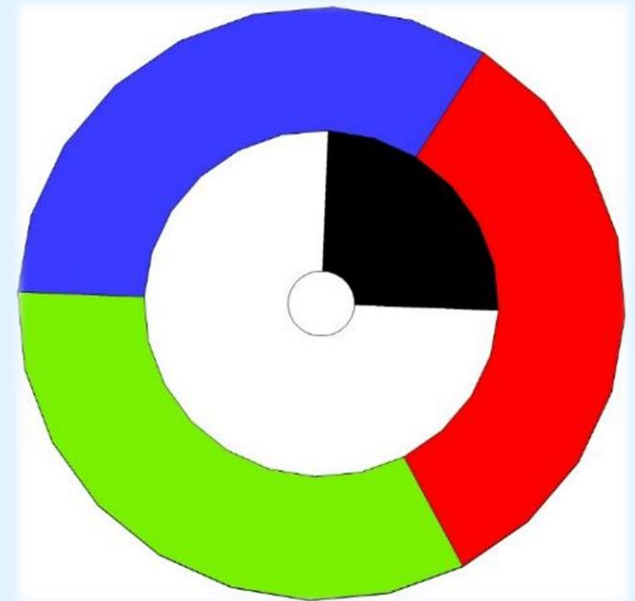
Mount the solar panel and motor

1. Carefully peel the solar panel and the motor stand off the boat.
2. Place the solar panel on its stand.
3. Glue the motor stand back to the other end with the motor on the side furthest away from the solar panel.

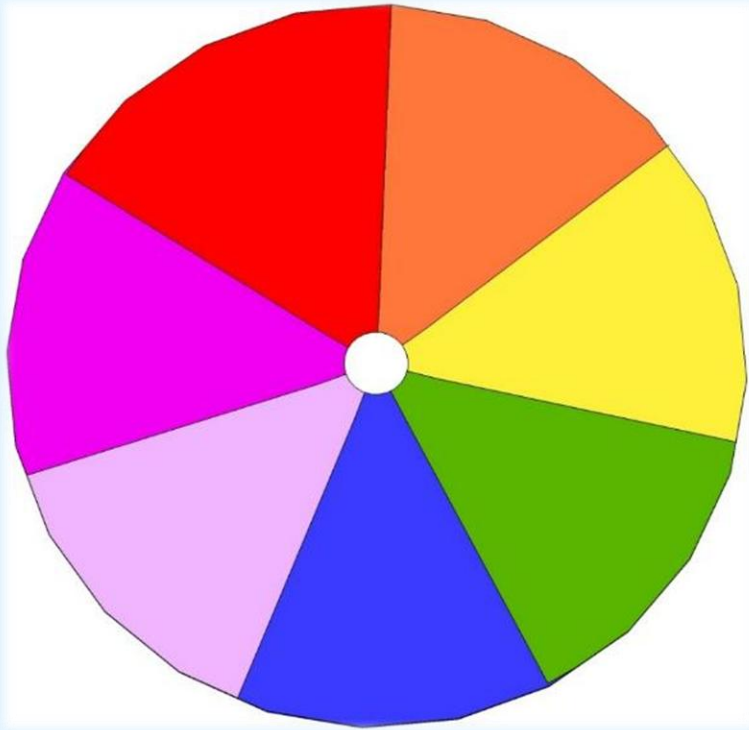


Make Maxwell's disc

1. Hold the card disc firmly on the sheet of card and draw a circle of 4cm diameter on it.
2. Colour the outer ring in red, green and blue.
3. Colour a segment of the inner ring in black.
4. Place the disc on the nose of the motor pulley and get the motor to spin.
5. Watch the colours that appear.
6. Increase the size of the black segment until the colours match.



Make a Newton disc



1. A rainbow is an example of sunlight being split into its component colours by raindrops.
2. What colour would you expect to see if you were to combine the colours of the rainbow?
3. Try colouring in a disc with all the colours of the rainbow.
4. Place it on the motor pulley, spin it up to speed and see what colour you get.

Make a model of the solar system



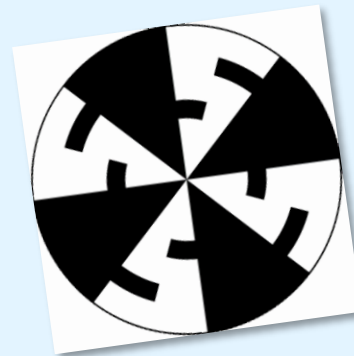
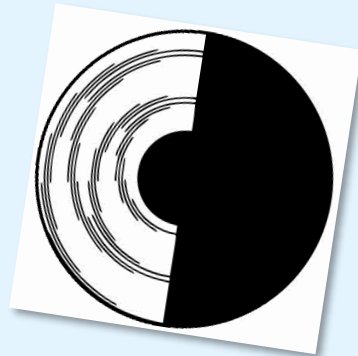
1. Use pompoms to represent the sun and planets (or some of the planets!).
2. Decide which model you will make.
3. Suggest some limitations in how this represents the movement of the solar system.

Originally the Earth was thought to be at the centre with the sun and planets moving around it (the geocentric model)

In the 16th century Nicolaus Copernicus presented the model with the sun at the centre (the heliocentric model)

Make a Benham disc

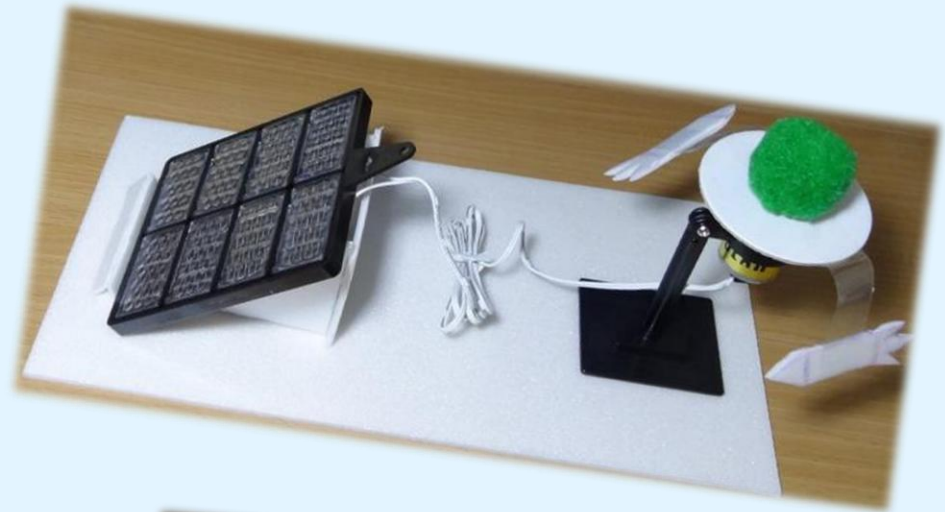
Try making a Benham disc – here are some examples.



Try partially covering the solar panel with your hand to slow the disc down and see what effects you get.

Charles Benham developed them in 1895 to create optical illusions

Design your own models



What did you learn?

- How can solar energy be used?
- What does a solar PV panel do when light falls on it?
- Explain the geocentric model of the solar system.
- Explain the heliocentric model of the solar system.
- Which one is thought to be correct nowadays?
- How is a rainbow formed?
- Describe some of the optical effects you have seen.
- Which energy conversions take place in the solar powered spinner?

