



## DAY OR NIGHT?

### Welcome to Generation Science

Brought to you by Edinburgh Science Learning, *Generation Science* shows and workshops spark pupils' curiosity and bring science to life.

With more than 30 years of experience delivering high quality, engaging shows and workshops, we are leaders in our field.

### What we do

Each show or workshop is fully equipped and delivered by trained science communicators. We create fun, interactive environments where everyone gets out of their seats and gets involved. Our inspiring demonstrations and engaging activities are linked to the Curriculum for Excellence, explaining key concepts in a unique and memorable way.

### Event Description

*Day or Night* uses storytelling to introduce the movements of the Sun, Moon and Earth. The characters Benny and Jack lead pupils on an interactive journey to a snapshot in time where they discover any moment can be a different time in another country.

Using a range of props the story introduces the concept of the Earth as a sphere that spins on its own axis, meaning some countries are facing the Sun whilst others are in shadow, hence day and night.

### Curriculum Links

*Day or Night* complements the following experiences and outcomes:

**SCN0-06a:** I have experienced the wonder of looking at the vastness of the sky, and can recognise the sun, moon and stars and link them to patterns of daily life.

**SCN1-06a:** By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year.

### Learning Outcomes

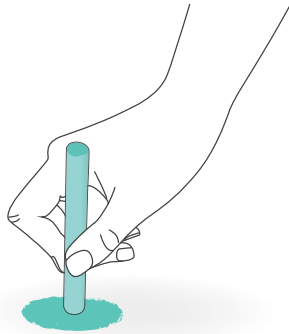
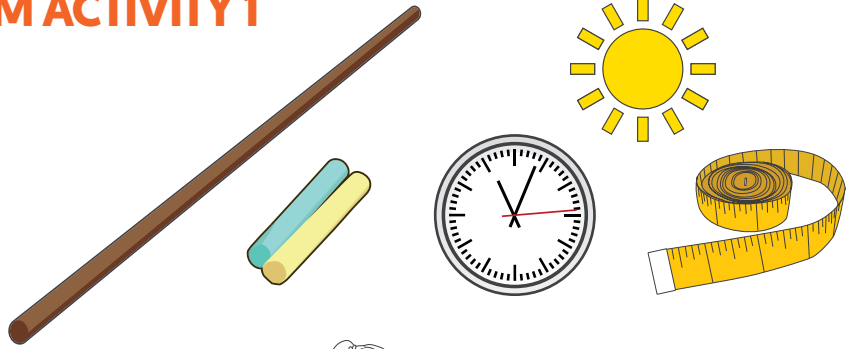
- Explain that the 'time' at any point on Earth depends on the position of the Sun in the sky
- Identify that at any point in time, somewhere on Earth it is daytime and somewhere else it is night time
- Describe that the Earth spins on its own axis, the Earth moves around the Sun and the Moon moves around the Earth
- Describe that the side of the Earth facing the Sun is in daytime, and the side facing away from the Sun is in night time

# FOLLOW-UP CLASSROOM ACTIVITY 1

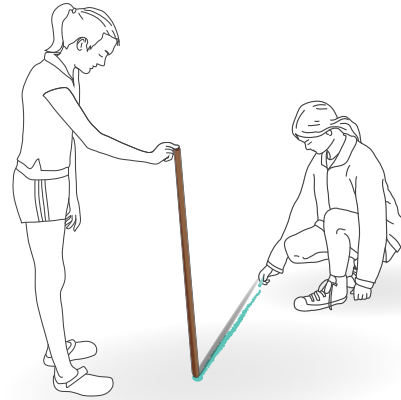
## Shadow Stick

### You will need:

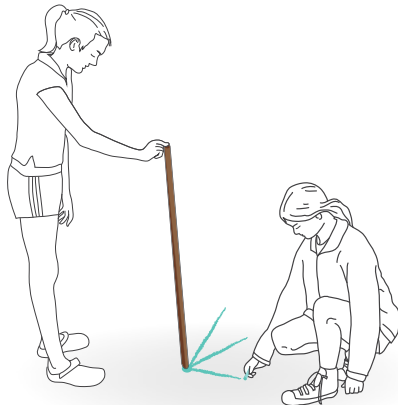
- A stick (or any straight object that can stand up)
- Chalk or stones
- Clock
- Tape measure or metre stick
- A sunny day



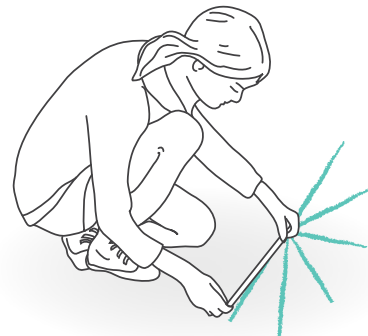
1. With the chalk, mark a spot in the playground.



2. Hold the stick vertically on the chalk spot. Use the chalk (or stones) to mark the length of the shadow the stick casts.



3. Repeat several times during the day on the same dot. If possible, do it in the morning, at midday and late in the afternoon.



4. Measure the markings and record the times in a table or diagram.

### Extension

When is the shadow at its shortest and longest? Mark north, south, east and west around your stick. Does your shadow change direction?

### Explanation

The Earth is rotating around its own axis spinning towards the East. This means the sun appears [rises] in the East and then disappears [sets] in the West. During the day it rises in the sky, reaching its highest point at midday.

At the equator, this highest point is

straight upwards, but as you move towards either of the poles, this point becomes lower in the sky. The sun's movement through the sky also becomes lower in winter.

Shadows are produced when light is obstructed by an object. Shorter shadows are produced the higher the

sun appears in the sky. At midday, the sun's highest point, shadows will be the shortest of the day. At sunrise and sunset, the lowest points, shadows are at their longest.

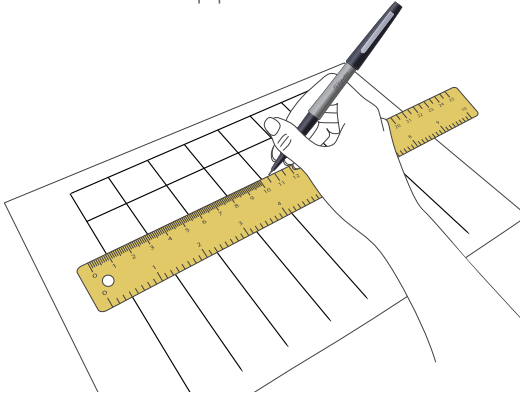
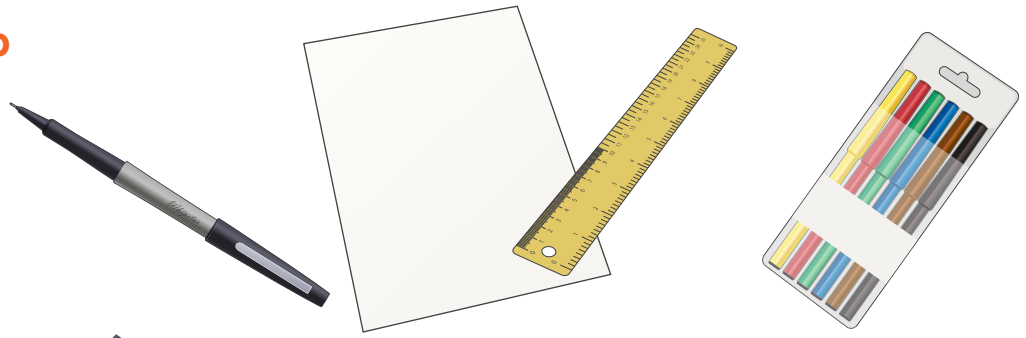
Shadows also change their direction during the day as the sun moves position in the sky.

# FOLLOW-UP CLASSROOM ACTIVITY 2

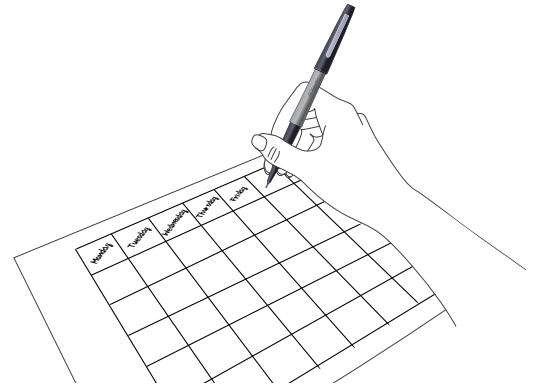
## Moon Phase Map

### You will need:

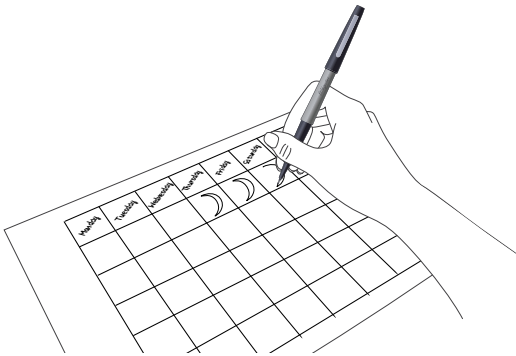
- Piece of A4 card
- Black felt tip pen
- Ruler
- Other coloured felt tip pens



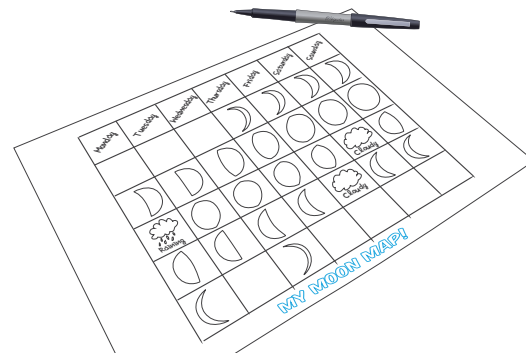
1. Using the black felt tip pen and ruler, mark out 42 boxes on the card – seven boxes across the long edge and six boxes down the short edge. Each box should be around 3cm square.



2. In the top row of seven boxes, write a day of the week at the top of each column, from Monday to Sunday.



3. That evening, look up at the moon. Starting at the top of the chart, draw the shape you see inside the box for that day.



4. Repeat this every day for a whole month, working through each box. By the end of the month you should be able to see a pattern.

### Tip

Scottish winter nights can be good to see the moon as they are quite often frosty with clear skies. You might even see some stars while you are looking.

### Explanation

The orbit of the Moon around the Earth makes it seem as if the Moon is changing shape in the sky. From Earth we see the Moon change from a thin crescent to a full disc.

We can see the Moon because light

from the Sun is reflected off its surface. The part of the Moon facing the Sun is illuminated and the part facing away from the Sun is in darkness, so like the Earth, half of the Moon is always illuminated.

The phases of the Moon depend on its

position in relation to the Earth. When we see a full Moon, it is positioned so that the part facing the Sun is also facing us. We can't see the Moon when the half that is facing the Sun is facing away from us. We see the Moon as a crescent when the section facing the Sun is only partially facing us.



## THE SCIENCE BEHIND THE SHOW

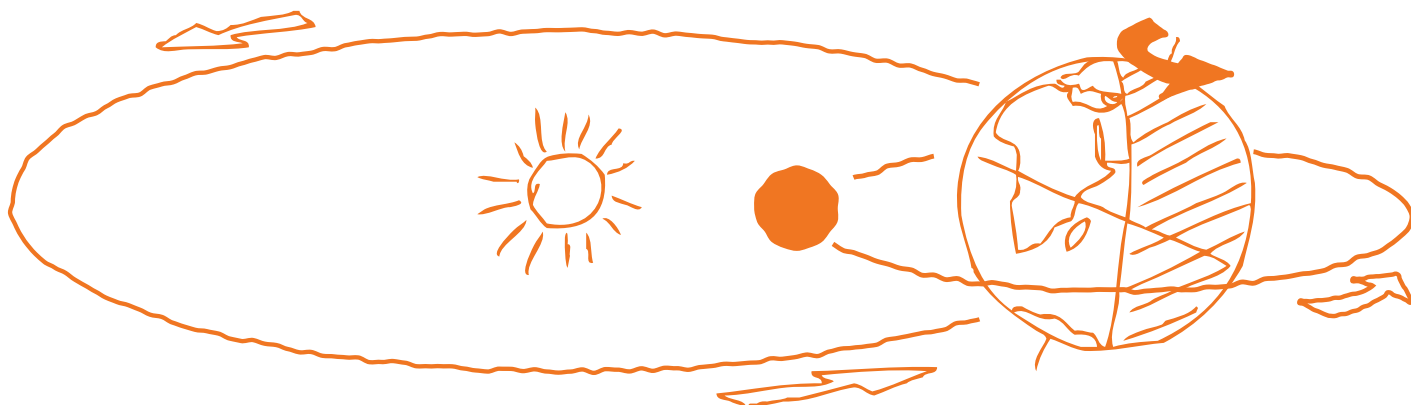
**We have day and night because the Earth rotates as it orbits the Sun.** It spins on its axis, which is an imaginary line passing through the North and South Poles. The Earth spins slowly all the time, but we don't feel any movement because it turns smoothly and at the same speed.

**The Earth takes a whole day (24 hours) to make a complete rotation on its own axis.** At any time the Sun is lighting up one half of the Earth, and the other half is in shadow. As the Earth rotates we move from shadow to light (sunrise) and back to shadow (sunset) and so on. It is daytime in the UK when our part of the planet is facing the Sun and is in the Sun's light. It is night time in the UK when our part of the planet is facing away from the Sun. When it is night time in the UK, countries on the other side of the Earth (such as Australia) are facing the Sun. They have their day while we have our night.

**Although the Sun appears to move across the sky, it is actually staying still.** It is the rotation of the Earth that makes it seem as though the Sun is moving. The Sun appears to move from the east at the start of the day when it 'rises' to the west at the end when it 'sets'. This is because the Earth is spinning towards the east so this is where we see it first.

**An orbit is the path of an object around a particular point in space,** for example the path the Moon takes around the Earth. Orbits are determined by gravity (the attractive force between two objects), and are often 'elliptical', the shape of an oval. It takes the Earth 365 days, or one year, to orbit the Sun.

**The Moon orbits around the Earth.** The Moon does not produce light but it does reflect light from the Sun, which is why we are able to see it from Earth. It takes the Moon 28 days to make a complete orbit of the Earth. This is a lunar month.



### Some Useful Links

[spaceplace.nasa.gov](https://spaceplace.nasa.gov)