

BIO LAB:

Understanding Light-years



LEVEL:
Year 7



TOPIC:
Physics



TIME REQUIREMENT:
45 mins

CURRICULUM ALIGNMENT

- Measure and control variables, select equipment appropriate to the task and collect with accuracy (ACSI126)
- Comparing times for the rotation of Earth, the sun and moon, and comparing the times for the orbits of Earth and the moon (ACSSU115)
- Predictable phenomena on Earth, including seasons and eclipses are caused by the relative positions of the sun, Earth and the moon (ACSSU115)

BACKGROUND

When measuring the distance of objects or points in space, we most commonly use the measurement of light-years. Light-years are the distance light travels in one Earth year. With light travelling at approximately 300,000,000 m/sec, a single light-year is approximately 9,500,000,000,000 km. To put these figures into perspective, the Milky Way is 100,000,000,000,000 km or 100,000 light-years wide. One of the closest stars to Earth, Sirius is 9 light-years away. Light takes a very long time to travel across space, and thus, images (such as those captured via a telescope) of objects in space are actually images of the past. For example, the image you see of Sirius via a telescope is actually from 9 years ago when the light began its journey toward earth from its location 9 light-years away.

This engaging activity allows students to practice measuring and manipulating units. Conversion units of distance can be very difficult to manipulate when considering the vast distances of solar systems and galaxies. Light-years provide an alternative unit of measurement to discuss expansive distances; however, students may have difficulty comprehending them. To make a single light-year more understandable, this activity will ask students to replicate the journey of a single light-year by creating their own measurement unit based on a distance travelled in a set time interval. This unit will be titled, 'student minute' as it is based on the distance a student can walk within a minute. This practical will enable students to understand speed and how it combines measurements of distance and time. The aim of this practical is to make a light-year more comprehensible through the example of a 'student year'. Students will also gain a greater understanding of metric measure and calculating large distances.

METHOD - STUDENT PRACTICAL

- 1 Travel to a large open space, as designated by your teacher. Find a partner to conduct the practical with.
- 2 Lay out a linear track of 20 metres long using the transect line. You may also use a rock or landmark if you conduct the activity outside.
- 3 Using a stopwatch and a Trundle Wheel (or metre stick), measure and record how far you are able to walk along the transect line in 10 sec when walking at a normal pace. Ask your partner press start on the stopwatch and begin walking. Stop walking immediately when your partner yells 'stop'. Mark, measure and record the distance travelled using the masking tape.
- 4 Repeat this step 3 times while trying to walk at the same speed each time. You will then swap and operate the stopwatch for your partner.
- 5 Calculate the average distance of the 3 trials.
- 6 Calculate student second, student minute, student day, and student year. Compare these values to a light-year.



MATERIALS

- Transect Line
- Stopwatch
- Metre Stick
- Calculator
- Scissors
- Masking Tape



TEACHER TIP

If the space is available, create multiple tracks to allow students to participate simultaneously.



SAFETY PRECAUTIONS

- Wear appropriate personal protective equipment (PPE).
- Wear appropriate footwear for walking.
- Ensure walking path is clear of any debris or safety hazards.

