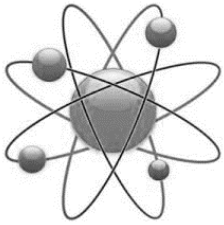
PHYSICS & CHEMISTRY

DNL / 2NDE



THEME 1 : ASTRONOMY

Activity 03 : Introduction / Part 3

Work to do: Read the documents, and prepare an oral presentation (5 min max) that presents the answers of the questions below.

Document 1. What is a light-year?

We use light-time to measure the vast distances of space. It's the distance that light travels in a specific period of time. Also: LIGHT IS FAST, nothing travels faster than light.

How far can light travel in one minute? 11,160,000 miles. It takes 43.2 minutes for sunlight to reach Jupiter, about 484 million miles away. Light is fast, but the distances are *vast*. In an hour, light can travel 671 million miles.

When we talk about the enormity of the cosmos, it's easy to toss out big numbers – but far more difficult to wrap our minds around just how large, how far, and how numerous celestial bodies really are. To get a better sense, for instance, of the true distances to exoplanets – planets around other stars – we might start with the theater in which we find them, the Milky Way galaxy.

Our galaxy is a gravitationally bound collection of stars, swirling in a spiral through space. Based on the deepest images obtained so far, it's one of about 2 trillion galaxies in the observable universe. Groups of them are bound into clusters of galaxies, and these into superclusters; the superclusters are arranged in immense sheets stretching across the universe, interspersed with dark voids and lending the whole a kind of spiderweb structure. Our galaxy probably contains 100 to 400 billion stars, and is about 100,000 light-years across. That sounds huge, and it is, at least until we start comparing it to other galaxies. Our neighboring Andromeda galaxy, for example, is some 220,000 light-years wide. Another galaxy, IC 1101, spans as much as 4 million light-years.

Adapted from: https://exoplanets.nasa.gov/faq/26/what-is-a-light-year/

Document 2. Proxima century and Proxima b

Proxima Centauri b (or Proxima b), also referred to as Alpha Centauri b, is an exoplanet orbiting within the habitable zone of the red dwarf star Proxima Centauri, which is the closest star to the Sun and part of the larger triple star system Alpha Centauri. It is about 4.2 light-years (1.3 parsecs) from Earth in the constellation Centaurus, making it and Proxima d, along with the currently disputed Proxima c, the closest known exoplanets to the Solar System.

Q1. Fill the gap in the following sentences:

A light-year is the _____ light travels in _____.

It is a unit of _____ and should not be misinterpreted as a unit of time.

Q2. Convert those distances into kilometers:

One light-second = _____km

One light-minute = _____ km

One light-hour = _____km

One light-day = _____km

One light-month = _____km

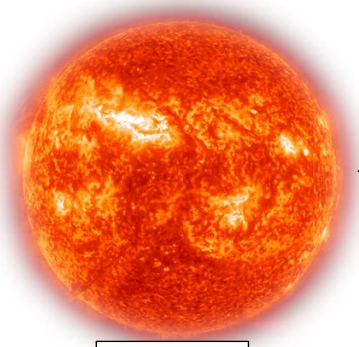
One light-year = _____km

Q3. Fill the document 3 with the right distances in both kilometers and light-time unit.

Document 3. Distances in the universe

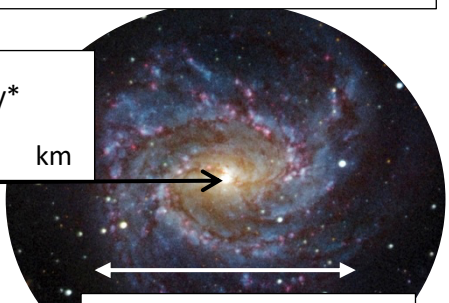
_____,
the nearest star from the Sun.

Our galaxy : _____



25,000 ly*

= km



The Sun

2.5 millions ly

= km

_____,
our nearest galaxy

* ly : light-year.

Q4.

September 14, 2055. Signals have been detected from the exoplanet Proxima b. As the head of the interstellar exploration department, **your task is to calculate the length of time** (duration) **of the journey from the Earth to Proxima b**. You might need to use document 4.

Document 4. Spaceship settings

Total mass: 450,000 tons
Electrical power generator: 50 MW
Mean speed: 240,000 km/h
Number of rooms: 380
Mean temperature: 24°C
Number of pet allowed: 0