

COSMIC SCALES

CCEA GCE Physics

Unit AS 2: 2.7 Astronomy

Objective

To identify various astronomical objects and to understand their sizes, their distances from Earth and their location in the cosmos.

Background

The grounds of Armagh Observatory and Planetarium include a scale model of the Solar system and a distance ladder model of the Universe — together known as the Astropark. The models aim to demonstrate relative distance scales encountered in deep space as well as different concepts of time. Various astronomical objects are featured, from the Sun and planets through to the cosmic microwave background ... the fading afterglow of the Big Bang.

Step 1 – Identify the Objects

Each group is given a set of images of astronomical objects and a set of cards with data corresponding to each object.

1. Match the objects to their data.
2. Some of the data is missing. Identify the type and location of each object, either from the following lists, or otherwise. Complete the data cards.

Type: Comet, Moon, Minor Planet, Dwarf Planet, Planet, Star, Star-forming nebula, Planetary nebula, Supernova remnant, Galaxy, Galaxy cluster, Large Scale Structure, ...

Location: Solar System, Solar Neighbourhood, Milky Way, Local Group of Galaxies, Near Universe, Far Universe, ...

Step 2 – Build a Distance Ladder

1. Arrange the objects and data cards in order of distance from Earth.
2. Complete the data table provided. Remember to include units for distance.
3. Collect a copy of the image sheet and label the objects.

Notes on Units

Astronomical Unit = Earth-Sun Distance = 1.496×10^{11} m

1 parsec = 3.09×10^{16} m = 2.06×10^5 AU = 3.26 light years: distance that 1 AU subtends angle of 1 arc second

Solar mass: $1 M_{\odot} = 1.989 \times 10^{30}$ kg

Solar radius: $1 R_{\odot} = 6.96 \times 10^8$ m

Earth mass: $1 M_{\oplus} = 5.972 \times 10^{24}$ kg

Earth radius: $1 R_{\oplus} = 6.37 \times 10^6$ m

