

Section 1 • Space

Student textbook, page 24

The Scale of the Universe (pages 8 to 20)

1. a) What is an astronomical unit?
An astronomical unit (AU) is a unit of measurement equal to the average distance between the Earth and the Sun.
 - b) What is its equivalent in kilometres?
149 597 870 km (which we round off to 150 million km)
 - c) What is measured with it? *The astronomical unit is used to express distances within the solar system.*
2. a) What is a light-year? *A light-year (ly) is a unit of measurement equal to the distance travelled by light through empty space for one year.*
 - b) What is its equivalent in kilometres?
9460 billion km (9.46×10^{12} km)
 - c) What is its equivalent in astronomical units? *63 240 AU*
 - d) What is measured with it? *This unit of measurement is used to express distances outside the solar system.*
3. Convert the distance between Mercury and the Sun, 57.9 million km, into astronomical units.
 $57\,900\,000 \div 150\,000\,000 = 0.386 \text{ AU}$
4. Convert the distance between the Sun and Venus, 0.723 3 AU, into millions of km. $0.723\,3 \times 150\,000\,000 = 108\,495\,000 \text{ km}$
5. Convert the distance between the Sun and the North Star, 4.143×10^{15} km, into light-years.
 $4.143 \times 10^{15} \div 9\,460\,000\,000\,000 = 4.38 \times 10^2 \text{ ly}$
6. Convert the distance between the Sun and the star Arcturus, 36.7 ly, into millions of km.
 $36.7 \times 9\,460\,000\,000\,000 = 3.47 \times 10^{14} \text{ km}$
7. From the list below, choose the word that best corresponds to the statements that follow:

Star
Oort cloud
Galaxy cluster
Galaxy
Galaxy supercluster
Kuiper belt
Gravity

 - a) A concentration of stars and interstellar matter held together by gravitational force *Galaxy*
 - b) The force that holds a group of stars or a group of galaxies together *Gravity*
 - c) A vast flat zone outside the orbit of Neptune *Kuiper belt*
 - d) A ball-shaped region that surrounds the solar system *Oort cloud*
 - e) A group of galaxies *Galaxy cluster*
 - f) A celestial body that emits visible light *Star*
 - g) A group of galaxy clusters *Galaxy supercluster*
8. Below are the different levels of the hierarchical structure of the Universe. What specific name is given to the levels that help us to situate Earth within the Universe?

- a) Supercluster *Local Supercluster*
- b) Galaxy cluster *Local Group*
- c) Galaxy *Milky Way*
- d) Star *Sun*

Conditions Conducive to the Development of Life (pages 20 to 23)

9. Why is the presence of a lithosphere (a solid surface) an important condition for the development of life on a planet? *Once the first molecules have formed, they need a solid surface in order to assemble into more complex molecules.*
10. What are the characteristics of the habitable zone? *The habitable zone is the region surrounding a star in which the temperature allows water to remain liquid on the surface of a planet.*
11. Why does the shape of a planet's orbit have to be roughly circular? *The shape of a planet's orbit determines how the quantity of energy it receives will change, which in turn influences changes in temperature on the planet.*
12. Why is an atmosphere important for the development of life on a planet? *An atmosphere protects life forms from harmful solar radiation such as ultra-violet rays and X-rays. An atmosphere also makes a water cycle possible.*
13. Can a planet's mass reduce the chances that life will develop on it? Explain your answer. *A larger planet has a stronger gravitational force and retains the particles that form its atmosphere more easily. A lightweight celestial body, such as the Moon, does not have enough gravity to hold in the gaseous particles needed to form an atmosphere.*

Section 2 • The Earth

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Fossils (pages 27 and 28)

1. a) What is a fossil? *The word "fossil" describes all traces of life from geological periods. They are generally found in sediment and in sedimentary rocks (e.g. limestone and sandstone).*
- b) Give a few examples of elements that can become fossilized. *Fossils are the remains of animals, plants or humans, including skeletons, shells, carapaces, leaves and eggshells. Fossils can also be traces of activity (e.g. footprints and burrows).*
2. a) What is fossilization? *Fossilization is the transformation of a living organism into a fossil.*
- b) Briefly explain the various stages of fossilization. *An animal dies. Its remains are covered with sediment. Rock is formed and the animal is fossilized.*

Stratigraphy (pages 28 and 29)

3. What is a stratigraphic layer? *A stratigraphic layer is made up of sedimentary deposits with the same characteristics (colour, particle size, type of rock).*
4. a) What is stratigraphy? *Stratigraphy is the science that studies the superposition of rock layers. The objective of this branch of science is to explain the events that caused the arrangement of the different layers.*