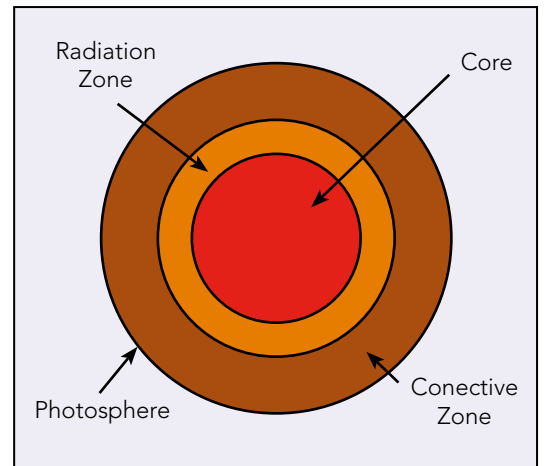


# The Sun and Solar Wind

Our Sun (Sol) is an average-sized main sequence star of G2 stellar class. The Sun is thought to consist of the following layers:

- **core:** a very dense area where thermonuclear reactions occur and hydrogen nuclei fuse to form helium nuclei. Temperatures in the core may reach  $1.6 \times 10^7$  K.
- **radiation zone:** where heat is carried from the core outwards by radiation.
- **convective zone:** where heat is transferred by convection of gases.
- **photosphere:** the luminous surface of the Sun. Less than 5000 km deep with temperatures ranging from approximately 4700 K to 6000 K. Sunspots occur on the photosphere.
- **chromosphere:** a layer extending about 130 000 km above the surface. Pressure and density decrease with height while the temperature rises to 50 000 K.
- **corona:** this is diffuse, invisible under normal conditions (it can be studied during eclipses) and extends for several million kilometres. It emits high-energy particles ('solar Wind').



The solar wind leaves the Sun at speeds of up to 600 km/s. It spirals out with the rotation of the Sun, affecting the electrically-charged tails of comets, and curves around the magnetic fields of Earth, and around Jupiter. (These are the only planets known to have radiation belts associated with strong magnetic fields).

Sometimes a small area near a sunspot can suddenly explode, giving off gamma rays, X-rays, radio waves and electrically charged particles in an event called a solar flare. The particles can reach Earth and cause disruption to electronic communications. They are thought to be responsible for the Aurora Borealis and Aurora Australis (Northern Lights and Southern Lights) and even cause the outer layers of the Earth's atmosphere to expand. Due to the potential danger to satellites and space missions, organisations that send objects, or astronauts, into space need to check 'space weather'. Sunspot and solar flare activity is monitored and reported by many observatories. One observatory in Australia (Learmonth, Exmouth, WA) studies solar activity.



**Helium is named after Helios, the sun god of Greek mythology.**



- 1 What is the 'solar wind'? \_\_\_\_\_
- 2 If the Earth is 150 million km away from the Sun and the solar wind travels at a mean speed of 400 km/s, how long will it take to reach the Earth? Show your working. \_\_\_\_\_  
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- 3 Draw a labelled diagram of the layers of the Sun, showing the location of the core, radiation zone, convective zone, photosphere and chromosphere. \_\_\_\_\_
- 4 What is the maximum temperature in the core of the Sun? \_\_\_\_\_
- 5 When can the 'corona' of the Sun be seen? \_\_\_\_\_
- 6 Name three things given off by a solar flare. \_\_\_\_\_
- 7 Name two effects that solar flares have on the Earth. \_\_\_\_\_
- 8 In which region of the Sun do sunspots occur? \_\_\_\_\_
- 9 A telecommunications company plans to send a satellite into orbit. Why might the company need to take account of solar activity? \_\_\_\_\_
- 10 What is another name for our Sun? \_\_\_\_\_