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Student worksheet

6.2 The Earth is in the Milky Way

Pages 142–143

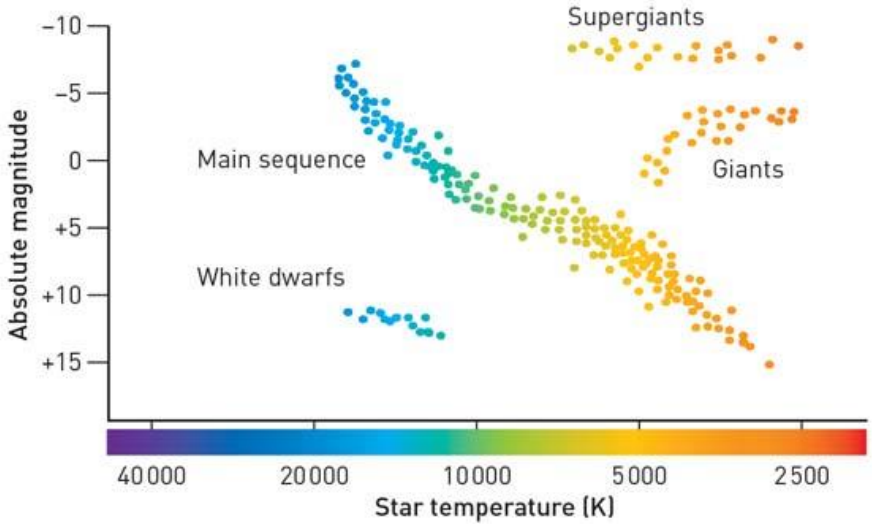
Stellar magnitudes, parallax and distances

1 What are stars?

2 Why is the apparent magnitude scale for the brightness of stars not suitable for comparing how much light a star is emitting compared with our own Sun?

3 What does the colour of a star indicate?

4 Our Sun has a surface temperature of about 5700 K and an absolute magnitude of 4.77. Use this information to indicate where our Sun would be positioned on the Hertzsprung–Russell diagram below.



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5 What type of star would have an absolute magnitude of –8.0 and a surface temperature of 3500 K?

6 When are the best times to make parallax observations from Earth? Choose from one of the following and then explain your answer.

A Every 12 hours

B Every 24 hours

C Every 6 months

D Every 12 months

The Sculptor Galaxy, also known as NGC 253, is a spiral galaxy that can be found in the constellation Sculptor. It has a diameter of 70 000 light-years and is at a distance of 11.4 million light-years.

8 What does the term ‘light-year’ mean with respect to the size of the Sculptor Galaxy and how far it is from Earth?

Extend your understanding

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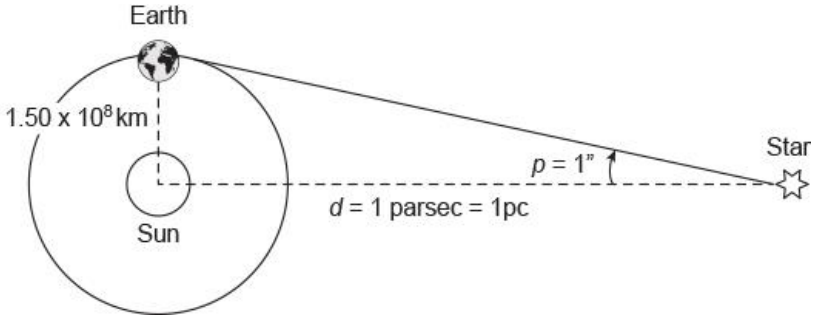
Another unit used to measure large distances in space is the parsec. A parsec (pc) is the distance at which a star, as shown in the diagram below, would have a parallax angle equal to one second (1") of arc.



The absolute magnitude *M* of a star is defined as the apparent magnitude that it would have when viewed at a distance of 10 parsecs (10 pc) from Earth.

Remember that 1 parsec (1 pc) is the distance at which a star would have a parallax angle of one second of arc (1").

The basic formula that links a star's apparent (*m*) and absolute (*M*) magnitude with its distance (*d*) from Earth is:

$$\mathrm{M} = m + 5 - 5\log_{10}(d)$$

where *d* is the distance to the star in parsecs (pc).

9 Sirius is the brightest star in the night sky. It has an apparent magnitude of –1.44 and is at a distance of 2.63 parsecs from Earth. Use the formula above and your calculator to work out its absolute magnitude.

10 Our Sun has an apparent magnitude of –26.8 and is at a distance of 1.50×10^8 kilometres from Earth. Use the formula above and your calculator to show that its absolute magnitude is 4.77.

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11 At a distance of 10 parsecs, which star would appear brighter: our Sun or Sirius? Explain your answer.

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