Blue skies and sunsets

White light consists of light with a mixture of different frequencies. Each frequency of light has a different wavelength. In the visible spectrum, red light has the longest wavelength and violet light has the shortest.

Photographs of astronauts on the Moon show that the sky there appears black. The skies on Earth can be different colours, depending on how the light from the Sun is scattered by different particles in the air.

When the Sun is high in the sky the light from it is white light. On a day without clouds the sky appears to be blue. Molecules of oxygen and nitrogen in the atmosphere scatter the blue wavelengths in white light more than the colours with longer wavelengths. These molecules are much smaller than the wavelengths of light.

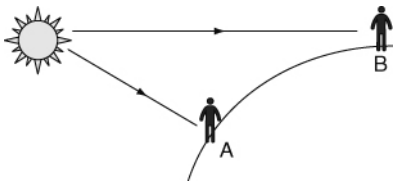
Very red sunsets are due to particles of dust in the air, or to particles of salt if the Sun is setting over the sea. These particles are much larger than gas molecules, and are good at scattering the longer wavelengths of visible light.

1 Objects form shadows on sunny days, but you can still see objects that are in the shadow of something else.

- **a** Explain how this shows that sunlight is scattered in the atmosphere.
- **b** Explain how this shows that *all* light is scattered in the atmosphere, not just blue light.
- **c** If all the wavelengths of light are scattered, why does the sky appear blue?

2 A thin layer of cloud appears white. Suggest how the clouds are scattering the different wavelengths in the light coming from the Sun.

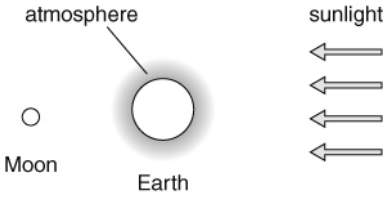
3 The Sun often appears more yellow, or even red, when it is about to set, even if there is no dust or salt in the air. Use the diagram on the right to help you to explain this.



4 Why might you expect the sky to look violet rather than blue on a clear day?

5 A lunar eclipse occurs when the Moon moves into the shadow of the Earth. When this happens the Moon is not usually completely invisible, but often looks dark red.

- **a** Explain where the light has come from that allows us to see the eclipsed Moon. Copy and complete the diagram on the right to help you to explain.
- **b** Explain how this shows that light is refracted by the Earth's atmosphere.
- **c** Suggest why the eclipsed Moon looks red, rather than white or blue.



6 Optional extra: Find out why photographs taken on the surface of Mars often show the sky as red.

I can…

- apply my knowledge of light and colour to explain atmospheric effects.