Chapter 12
Short answer question

This question is about the expansion of the Universe.

(a) The speed of light is 3.0×10^8 m s^{-1}. Show that the distance light will travel through space in one year is about 10^{16} m.
(Assume one year = 3.2×10^7 s)

(b) (i) During the past century it has been possible to observe galaxies which are receding from Earth.
One such galaxy is observed in the area of the sky known as Virgo. The distance to this galaxy is 10 000 million light years.
Explain why the galaxy is observed as it was 10 000 million years ago.

(ii) Show that the galaxy is about 1.0×10^{26} m from Earth.

(c) The light from the galaxy shows 'red-shift'. This is thought to be due to the expansion of space and is called 'cosmological red-shift'.

(i) Explain what is meant by 'red-shift'.

(ii) Explain how the expansion of space causes a cosmological red-shift.

(iii) The cosmological red-shift is greater for galaxies farther away from the Earth. Describe how the model of an expanding Universe explains this observation.