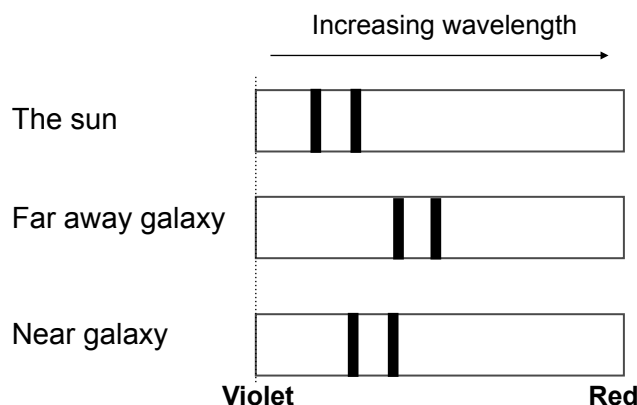


- 1 The visible part of the electromagnetic spectrum from a star or galaxy includes dark lines. The lines are at specific wavelengths.

The diagram shows the position of the dark lines in the spectrum from the sun and two galaxies.



- 1 (a) (i) Explain how the spectra for the sun and the two galaxies give evidence of the Big Bang. [5 marks]

Lines for the two galaxies shift or have shifted towards red end of spectrum (compared to the sun). [1]

Wavelengths seem to increase. [1]

Galaxies are moving away from the Earth. [1]

Far away galaxy is moving faster than near galaxy or near galaxy is moving away more slowly than far away galaxy [1]

which suggests that they all originated at a single point [1].

Don't talk in terms of red light - and if you say red shift, you must explain what that means.

- 1 (a) (ii) Cosmic microwave background radiation (CMBR) gives further evidence for the Big Bang theory.

What is cosmic microwave background radiation?

[3 marks]

CMBR is a form of electromagnetic radiation. [1]

It (CMBR) fills the universe or is present in the whole of the universe. [1]

It comes from radiation that was there soon after the beginning of the universe or soon after the Big Bang. [1]

(Total 8 marks)

End