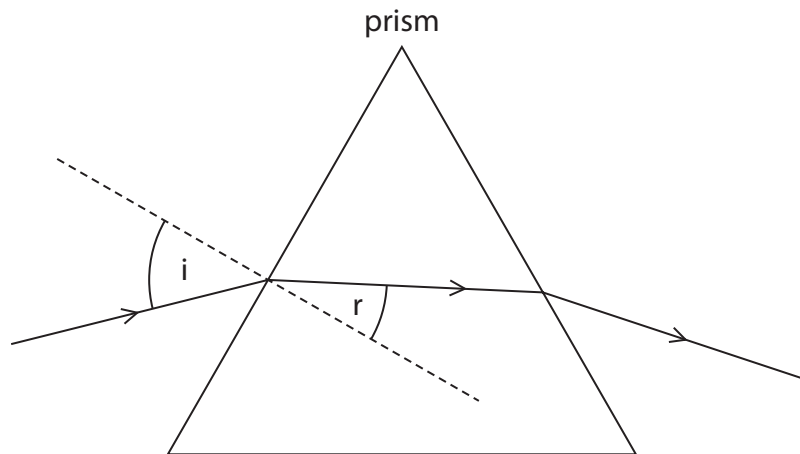


- 7 (a) A glass prism can be used to refract light.



- (i) State the name of the piece of equipment used to measure angles.

(1)

- (ii) Measure the angle of incidence and the angle of refraction for the light entering the prism.

(2)

angle of incidence = degrees

angle of refraction = degrees

- (iii) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

- (iv) Calculate the refractive index of the glass.

(2)

refractive index =



- (b) Two galaxies, A and B, emit red light with a reference wavelength of 630 nm.

An astronomer measures the wavelength of red light from galaxy A when the light arrives at the Earth.

The astronomer's value for the wavelength is 645 nm.

- (i) Calculate the difference between the astronomer's value for the wavelength and the reference wavelength of red light.

(1)

difference in wavelength = nm

- (ii) The change in wavelength happens because galaxy A is moving away from the Earth.

Calculate the speed of galaxy A.

[speed of light = 3.0×10^8 m/s]

(3)

speed = m/s



(iii) Light from galaxy B has twice the redshift as light from galaxy A.

Galaxy B is twice as far away from Earth as galaxy A.

Explain how these observations support the Big Bang theory of the origin of the Universe.

(2)

(Total for Question 7 = 12 marks)

