

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Q1.

- (a) The Sombrero Galaxy is 50 million light years away from the Earth.

- (i) Calculate the distance to this galaxy in parsecs.

- (ii) Use Hubble's Law to show that this galaxy is receding at 1000 km s^{-1} .

- (iii) One of the lines in the Hydrogen spectrum has a wavelength of 656.3 nm when measured in a laboratory on Earth. Calculate the wavelength of the same line in the observed spectrum of the Sombrero Galaxy.

(4)

- (b) Show how Hubble's Law can be used to estimate the age of the Universe. State the assumption made.

(3)

(Total 7 marks)

Q2.

- (a) The original dish design of the Lovell Radio Telescope at Jodrell Bank used a 50 mm open wire mesh. Estimate the minimum wavelength detectable using this design.

(1)

- (b) Before completion, the mesh was replaced by a solid metal surface of diameter 76 m capable of detecting radio signals as small as 60 mm wavelength. Calculate the resolving power of the telescope when detecting radiation of this wavelength.

(2)

- (c) The Jodrell Bank Observatory also has a 13 m diameter radio telescope. State **two** advantages the telescope described in part (b) has over this smaller telescope when detecting radio waves of the same wavelength. Support each answer with a calculation.

advantage 1:

advantage 2:

(4)

(Total 7 marks)

Q3.

- (a) Define

- (i) apparent magnitude,

- (ii) absolute magnitude.

(2)

- (b) Bellatrix and Elinath are two stars with the same apparent magnitude. The distance from the Earth to Bellatrix is 470 light years and its absolute magnitude is -4.2 .

(i) Calculate the distance to Bellatrix in parsecs.

(ii) Calculate the apparent magnitude of Bellatrix.

(iii) Elinath has an absolute magnitude of -3.2 . State, giving a reason, which of the two stars is closer to the Earth.

(6)
(Total 8 marks)