

EXAM QUESTIONS

Chapter 10.3 - Standard Model

Question 1 2011:1:9

(4 marks)

Describe briefly how Edwin Hubble's observations of the redshifts of galaxies were used to formulate Hubble's Law and explain how Hubble's Law is used to support the Big Bang theory.

Question 2 2013:1:2

(3 marks)

A distant star is seen by an astronomer using a powerful telescope to be travelling toward the Earth with a velocity of $0.1c$.

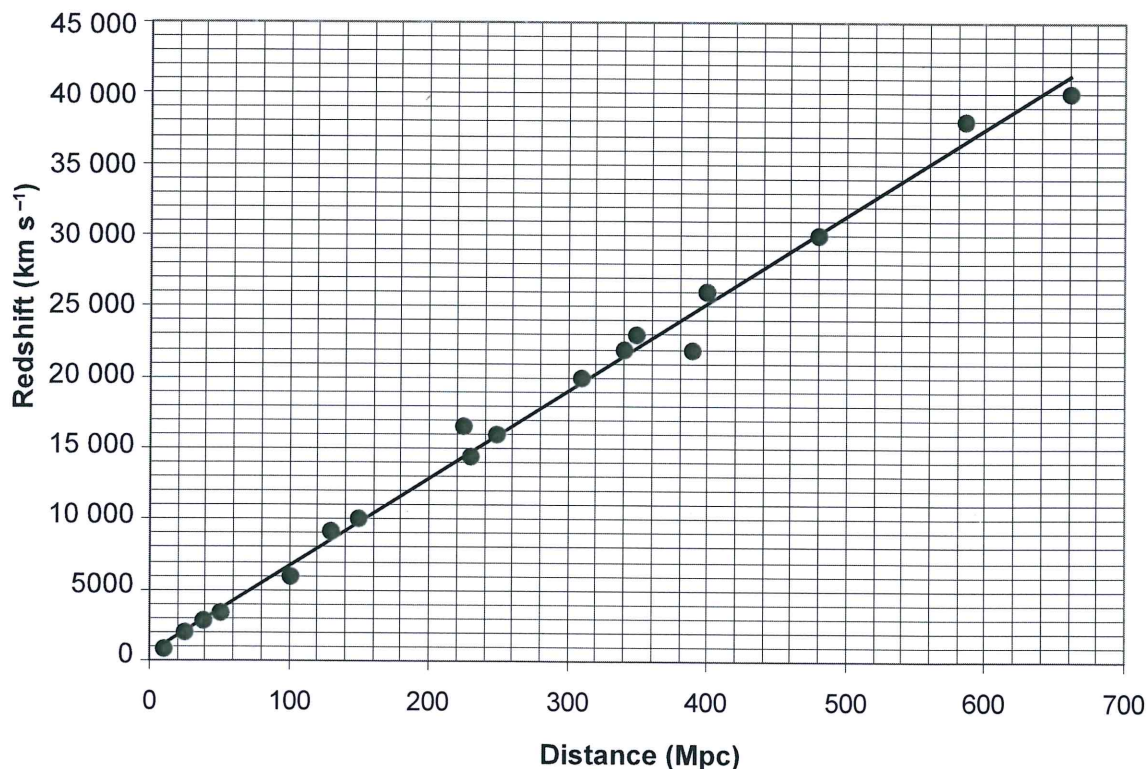
- (a) At what velocity does the light reach the telescope? (1 mark)
- (b) What is it about the starlight's spectrum that tells the astronomer that the star is approaching? Explain your answer. (2 marks)

Question 3 2014:1:12

(5 marks)

Hubble's law can be used to estimate the maximum size of the observable Universe. The graph below indicates the relationship between recessional speed of a star (or galaxy) and the distance to that star (or galaxy).

Distances are given in megaparsecs (Mpc) where $1 \text{ Mpc} = 3.26 \text{ light years}$.



- (a) The vertical axis is labelled 'redshift' with units for velocity (km s^{-1}). Explain briefly the relationship between redshift and the speed of the object. (2 marks)
- (b) Use the gradient of the graph to extrapolate a value for the maximum distance, in Mpc, for a galaxy to be observed from the Earth. Show **all** workings. (3 marks)