

Computer Marked Assignment

S281 44

Make sure you know how to use the CMA form: detailed instructions are given in your student handbook (or supplement).

Covering: Block 4

You are strongly advised to attempt every question in this assignment.

If you do not wish to answer a question, pencil across the 'don't know' cell ('?').

Cut-off date:

If you think that a question is unsound in any way, pencil across the 'unsound' cell ('U') in addition to pencilling across either an answer cell or the 'don't know' cell.

Friday 26 September 1997

Note For each question, you must pencil across either the required number of answer cells or the 'don't know' cell.

Q1 to Q4 These questions concern a cluster of galaxies with an average recessional speed from Earth of $3\,600\text{ km s}^{-1}$, and another cluster, in the same line of sight, with an average recessional speed of $4\,200\text{ km s}^{-1}$. Assume the Hubble constant to be $75\text{ km s}^{-1}\text{ Mpc}^{-1}$. Option G in the key indicates that the speed is directed away from the point of observation, and H that it is directed towards the point of observation.

KEY for Q1-Q3

- | | |
|---------|---------|
| A 0.002 | E 0.013 |
| B 0.007 | F 0.014 |
| C 0.011 | G + |
| D 0.012 | H - |

Q1 What is the average redshift of the nearer cluster (as viewed from Earth)? Select the item that is closest to your answer from A to F in the key, and then select one of G or H.

Pencil across two cells in row 1.

Q2 What is the average redshift of the further cluster as viewed from the nearer cluster? Select the item that is closest to your answer from A to F in the key, and then select one of G or H.

Pencil across two cells in row 2.

Q3 What is the average redshift of the Local Group as viewed from the nearer cluster? Select the item that is closest to your answer from A to F in the key, and then select one of G or H.

Pencil across two cells in row 3.

Q4 What is the distance of the further cluster from Earth? Select the item from the key that is nearest to your answer.

KEY for Q4

- | | |
|-----------|------------|
| A 5 kpc | E 50 Mpc |
| B 50 kpc | F 500 Mpc |
| C 500 kpc | G 5000 Mpc |
| D 5 Mpc | |

Pencil across one cell in row 4.

Q5 to Q7 These questions concern the Einstein-de Sitter model of the Universe.

Q5 Suppose that the Universe is described by the Einstein-de Sitter model. Choose one item from the key which best describes this Universe.

KEY for Q5

A $\frac{R(t)}{R(t_0)} = \frac{t}{t_0}, q = \frac{1}{2}, t_0 = \frac{1}{2}(H_0)^{-1}$ X

B $\frac{R(t)}{R(t_0)} = \frac{t}{t_0}, q = 0, t_0 = (H_0)^{-1}$ X

C $\frac{R(t)}{R(t_0)} = \frac{t}{t_0}, q = 0, t_0 = \frac{2}{3}(H_0)^{-1}$ X

D $\frac{R(t)}{R(t_0)} = \left(\frac{t}{t_0}\right)^{1/2}, q = \frac{1}{2}, t_0 = \frac{1}{2}(H_0)^{-1}$ X G

E $\frac{R(t)}{R(t_0)} = \left(\frac{t}{t_0}\right)^{1/2}, q = \frac{2}{3}, t_0 = (H_0)^{-1}$ X

F $\frac{R(t)}{R(t_0)} = \left(\frac{t}{t_0}\right)^{2/3}, q = \frac{2}{3}, t_0 = \frac{1}{2}(H_0)^{-1}$ X

G $\frac{R(t)}{R(t_0)} = \left(\frac{t}{t_0}\right)^{2/3}, q = \frac{1}{2}, t_0 = \frac{2}{3}(H_0)^{-1}$ ✓

H $\frac{R(t)}{R(t_0)} = \left(\frac{t}{t_0}\right)^{2/3}, q = \frac{1}{2}, t_0 = \frac{3}{2}(H_0)^{-1}$

Pencil across one cell in row 5.