

Computer Marked Assignment

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Course and assignment number:
S281 43

AUG 1994

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

Covering: Block 3

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 ('?').

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.

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

Cut-off date:

Friday 2 September 1994

PART A

This part relates to Book 3, Chapters 1 and 2, and carries 50% of the marks for this assignment.

Q1 The key lists various constituents of the Milky Way. Which two are *not* common within the halo? Select *two* items from the key and pencil across *two* cells in row 1.

KEY for Q1

- A Low metallicity stars
- B Dark matter
- ☒ C OB associations
- D Hot ionized hydrogen (H⁺)
- ☒ E Dense clouds

Q2 Much of our knowledge of the Milky Way close to the Galactic centre is obtained from radio and infrared observations. Why are these wavelength ranges particularly suitable for studying this region? Select *one* item from the key, and pencil across *one* cell in row 2.

KEY for Q2

- A Radio spectra contain lines whose Doppler shifts enable motion to be studied.
- B Material close to the Galactic centre is at a fairly low temperature, and so emits mainly in these wavelength ranges.
- C Radiation at these wavelengths can travel through Baade's window, which is a 'tunnel' of relatively unobscured space close to the Galactic centre.
- D Absorption by dust in the Galactic plane is less severe at these wavelengths than at other wavelengths.
- E The circumnuclear dust ring produces extinction of radiation at other wavelengths.

Q3 Which one of the statements in the key is both true and supports the view that spiral arms are produced by localized enhancements of density? Pencil across *one* cell in row 3.

KEY for Q3

- A Spiral arms are marked by the presence of luminous O and B stars.
- B The average density of the interstellar medium is many times greater in the spiral arms than elsewhere in the galactic disc.
- C Stars are on average much closer together in the spiral arms than elsewhere in the galactic disc.
- D If the spiral arms rotated at the same rate as the material in the disc, they would become wound up and not maintain their shape.
- E The shape of the galactic rotation curve is consistent with a spiral distribution of matter in the galactic disc.

Q4 Which item in the key best matches the classification, according to the Hubble scheme, of the galaxy shown in Figure 1 (on p. 2)? Pencil across *one* cell in row 4.

KEY for Q4

- | | |
|------------|--------------|
| A E0-E3 | D Sc |
| B E4-E7 | E SBa or SBb |
| C Sa or Sb | F SBc |

Q5 A spectral line in a distant galaxy is observed to have a wavelength of 516.2 nm, and is identified as the hydrogen line whose wavelength is 486.1 nm when measured in the laboratory. Calculate the distance to the galaxy, assuming $H_0 = 75 \text{ km s}^{-1} \text{ Mpc}^{-1}$. Select from the key the value closest to yours, and pencil across *one* cell in row 5.

KEY for Q5

- | | |
|------------------------------------|---|
| A $1.6 \times 10^{-1} \text{ Mpc}$ | <input checked="" type="checkbox"/> E $2.5 \times 10^2 \text{ Mpc}$ |
| B $1.6 \times 10^{-1} \text{ Mpc}$ | F $4.2 \times 10 \text{ Mpc}$ |
| C 4.2 Mpc | G $2.3 \times 10^3 \text{ Mpc}$ |
| D $2.3 \times 10^2 \text{ Mpc}$ | H $2.5 \times 10^3 \text{ Mpc}$ |

$$v = H_0 d$$

$$\frac{\Delta \lambda}{\lambda} = \frac{v}{c} = \frac{H_0 d}{c}$$