

Stars and Galaxies

Coursework Sheet 6

1. A star like the Sun which has an intrinsic colour of $B-V=+0.6$ is observed to have a colour $B-V=+1.5$ and an apparent magnitude $m_V=23.5$. What is the visual extinction to this object and how far away in the Galaxy is it assuming the absolute magnitude of the Sun is $M_V=+4.8$.

(5 marks)

2. A region of our Galaxy has $A_V=10$. How many times fainter in the V-band are the objects here than they would otherwise be if there was no extinction? The extinction in the K-band, A_K , in the near-infrared at a wavelength of 2 microns is only $1/8^{\text{th}}$ of what it is at V. How many times fainter are they at this waveband.

(2 marks)

3. The mass density, ρ_{ISM} , of the typical interstellar medium mixture of gas and dust is about $2 \times 10^{-21} \text{ kg m}^{-3}$. The dust makes up 1% of this by mass. Assuming all dust grains have a radius of $0.05 \mu\text{m}$ and are made of material with a density of $3 \times 10^3 \text{ kg m}^{-3}$ what is the number density, n_d , of dust grains, i.e. how many per cubic metre?

(3 marks)