*** Show your steps clearly for full credit.!! ***

Q1. The acceleration $\{a\}$ of an object moving along x-axis is given by: $\quad a = x^n \, v^p \, m^q$

where $\{x\}$ is the distance, $\{v\}$ is the speed and $\{m\}$ is the mass of the object. Find the values of $\{n\}$, $\{p\}$ and $\{q\}$ so that the above equation is dimensionally correct.

Using basic Units (L, T and M) : $\quad a = x^n \, v^p \, m^q \Rightarrow (L/T^2) = L^n \cdot (L/T)^p \cdot M^q$

$$\Rightarrow \quad L^1 \cdot T^{-2} = L^{(n+p)} \cdot T^{-p} \cdot M^q \Rightarrow$$

$n + p = 1$, and $-p = -2 \Rightarrow$ (p = 2) & (n = - 1), where there is no (M) in the left side $\Rightarrow$ (q = 0)

Q2. An astronomical unit (AU), is the average distance of the earth from the sun, approximately 1.49×10^8 km. The speed of the light is about 3×10^8 m/s. Express the speed of light in terms of astronomical units per hour.

$$3 \times 10^8 \ \frac{m}{s} \times \frac{1 \text{ km}}{1000m} \times \frac{1 \text{ Au}}{1.49 \times 10^8 \text{ km}} \times \frac{3600 \text{ s}}{1 \text{ h}} = 7.25 \ \frac{Au}{h}$$