81)

$$\frac{\text{Force}}{\text{Area}} = \frac{L_\odot}{4\pi d^2} \times \frac{1}{c}$$

i.e $\frac{(\text{Power}/\text{velocity})}{\text{Area}}$

$$= \frac{3.38 \times 10^{33}\ \text{erg/s} \div 3 \times 10^{8}\ \text{cm/s}}{4 \times 3.14159265 \times 1.496 \times 10^{13}\ \text{cm}}$$

$$= [\text{Need Mathematica}]\ \frac{N}{m^2}$$

82)

Bremsstrahlung : Yes

Synchrotron : Yes

$C^{18}O$ $J=1\rightarrow0$: Yes

Thomson scattered : Yes

Blackbody : No

Starlight : No

Q3)

$$\hbar\omega = kT = \frac{hc}{\lambda}$$

$$\Rightarrow T = \frac{hc}{k\lambda}$$

$$= \frac{6.63\times10^{-27}\ g\,cm^2/s \times 3\times10^{8}\ cm/s}{1.38\times10^{-16}\ erg/K \times 1100\times10^{-10}\ m}$$

$$= [\text{Need Mathematica}]\ K$$

84)

a) It is in the early stage of the curve of growth (linear stage)

b) Need to know critical density

Fairmont

85)

a) Number of H atoms = $\frac{10^{10} M_{\odot}}{m_H}$

(Assuming all atoms in the 2 states)

$\Rightarrow n_1 + n_2 = \frac{10^{10} \times 1.99 \times 10^{33}\ g}{1.67 \times 10^{-27}\ kg}$

Given $n_2/n_1 = 3$

$\Rightarrow n_2 \rightarrow$ Solve [{ $n_1 + n_2 = \frac{10^{10} \times 1.99 \times 10^{33}}{1.67 \times 10^{-24}}$,

$n_2/n_1 = 3$ },

{n_1, n_2}] [[2]]

86)

Optically thin $\Rightarrow \underline{T}_\nu(0) \propto n$

$\Rightarrow$ Line integrated flux would be reduced by factor of 2 if density is halved.

87)

Assume rotation measure produced by ISM = 0 (since its not given)

⇒ Zero uniform magnetic field needed.

[Minimal assumptions used]

98)

$$\frac{mv^2}{r} = \text{Force}_{\text{centripetal}} = Bqv$$

$$= v = Bqr/m$$

Magnetic force

$$\text{Period} = \frac{2\pi r}{v} = \frac{2\pi m}{Bq}$$

[Add some relativistic stuff]