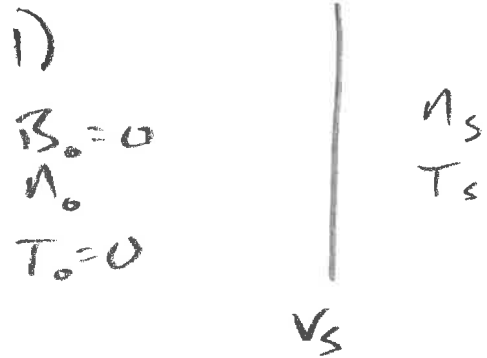


## HW 10



a) For strong shock,  $x \rightarrow \frac{\gamma+1}{\gamma-1} = 4$  for  $\gamma = 5/3$

$$n_s = 4n_0$$

b) For strong shock,  $T_s \rightarrow \frac{2(\gamma-1)}{(\gamma+1)^2} \frac{\mu v_s^2}{k}$

If  $\gamma = 5/3$ ,  $\mu = 1$ ,  $T_s = \frac{3}{16} \frac{v_s^2}{k}$

$$c) \frac{n_s k T_s}{n_0 \mu v_s^2} = \frac{4n_0 k \cdot 3/16 v_s^2/k}{n_0 \mu v_s^2}$$

$$= \frac{3}{4} \text{ for } \mu = 1$$

$$2) \text{ Kinetic energy} = \frac{1}{2} M v_s^2$$

$$M = \frac{4\pi}{3} \rho_0 R^3 \text{ for spherical}$$

$$v_s = \frac{2}{5} \frac{R}{t} \text{ from Figure 39.1}$$

Problem says half the energy is kinetic

$$\frac{1}{2} E = \frac{1}{2} \cdot \frac{4\pi}{3} \rho_0 R^3 \left(\frac{2}{5}\right)^2 \left(\frac{R}{t}\right)^2$$

$$= \frac{2\pi}{3} \cdot \frac{4}{25} \rho_0 R^5 t^{-2}$$

From dimensional analysis,  $R = A E^{1/5} \rho_0^{-1/5} t^{2/5}$

$$\frac{1}{2} E = \frac{8\pi}{75} \rho_0 t^{-2} A^5 E \rho_0^{-1} t^2$$

$$\Rightarrow A^5 = \frac{75}{16\pi}$$

$$A = \left(\frac{75}{16\pi}\right)^{1/5} = 1.0833$$

(close to  $A=1.15167$  expected!)