Relativity Thought Experiment

p. 683

Purpose: Copy the purpose listed but also give the speed in km/h (something we can relate to)

Analysis: Answer a,b,c,d (relativistic mass and density) ρ_0 = rest density

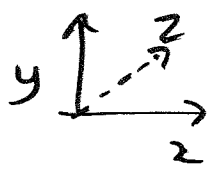
Answer #2 (relativistic time)

Answer #3 (relativistic length)

Marks		
	a,b,c,d	/5 (Inquiry)
	#2 & #3 b)	/5 (Application)

Relativistic Density

rest density = ρ_0 = 1 g/cm^3 (water!)



travelling fast ∴ reduced length

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{1\,g}{1\,cm^3} = \frac{1\,g}{1\,cm \times 1\,cm \times 1\,cm}$$

$$\text{Relativistic Density} = \frac{\text{rel. } m}{\text{rel. } V} = \frac{\dfrac{m_0}{\sqrt{1-v^2/c^2}}}{1\,cm \times 1\,cm \times 1\sqrt{1-\frac{v^2}{c^2}}}$$

$L_0 = 1\,cm$

$$L = L_0\sqrt{1-\frac{v^2}{c^2}} \qquad \rho = \frac{\dfrac{m_0}{\sqrt{1-v^2/c^2}}}{\sqrt{1-\frac{v^2}{c^2}}}$$

(density rel.)

$$\rho = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \times \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

Relativistic Density Formula

$$\rho = \frac{m_0}{1-\frac{v^2}{c^2}}$$

$m_0 = 1\,g$ 

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a, b, c, d (p)
2
3 b