



X. Dr.TORÓ LÁSZLÓ TALENTUM VERSENY/ Döntő/ 2024. március 9.
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Tantárgy: Fizika / Disciplina: Fizică
Osztály: XII. / Clasa: a XII-a
JAVÍTÓKULCS / BAREM

I-es TÉTEL

40 PONT

A.

a) $m=4m_0$ $\frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}=4 \cdot m_0$ $v=c \cdot \frac{\sqrt{15}}{4}=2,9 \cdot 10^8 \frac{m}{s}$	5 p 5 p
b) $e \cdot U = E_m$ $e \cdot U = m \cdot c^2 - m_0 \cdot c^2$ $U = \frac{3 \cdot m_0 \cdot c^2}{e} = 2,818 \cdot 10^9 V = 2,818 GV$	2 p 5 p 3 p

B.

a) $x' = \frac{x - v \cdot t}{\sqrt{1-\frac{v^2}{c^2}}}$ $x' = 1,811 \cdot 10^6 \text{ km}$	5 p 5 p
b) $t' = \frac{t - \frac{v}{c^2} \cdot x}{\sqrt{1-\frac{v^2}{c^2}}}$ $t' = -2,807 \text{ s}$	5 p 5 p



II-es TÉTEL

20 PONT

<p>a) $h \cdot \nu = L + E_m$</p> $\lambda_e = \frac{h}{p} = \frac{h}{m_0 \cdot v}$ $v = \frac{c}{\lambda}$ $\frac{h \cdot c}{\lambda} = L + \frac{p^2}{2 \cdot m_0}$ $p = \sqrt{2 \cdot m_0 \cdot \left(\frac{h \cdot c}{\lambda} - L \right)} = 20,66 \cdot 10^{-25} \text{ kg} \cdot \frac{\text{m}}{\text{s}}$ $\lambda_e = 3,2 \cdot 10^{-10} \text{ m}$	<p>2 p</p> <p>3 p</p> <p>2 p</p> <p>3 p</p> <p>5 p</p>
<p>b) $\nu_0 = \frac{L}{h}$</p> $\nu_0 = 4,58 \cdot 10^{14} \text{ Hz}$	<p>3 p</p> <p>2 p</p>

III-as TÉTEL

30 PONT

<p>$h \cdot \nu_0 = h \cdot \nu + E_m$</p> $\frac{h \cdot c}{\lambda_0} = \frac{h \cdot c}{\lambda} + m \cdot c^2 - m_0 \cdot c^2$ $\frac{h \cdot c}{\lambda_0} = \frac{h \cdot c}{\lambda} + \left(\frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} - m_0 \right) \cdot c^2$ <p>$\lambda = 4,405 \cdot 10^{-12} \text{ m}$</p> <p>$\Delta\lambda = \lambda - \lambda_0 = 1,405 \cdot 10^{-12} \text{ m}$</p>	<p>2 p</p> <p>4 p</p> <p>4 p</p> <p>5 p</p> <p>4 p</p>
$\Delta\lambda = \frac{h}{m_0 \cdot c} \cdot (1 - \cos\theta)$	<p>3 p</p>
$\cos\theta = 1 - \frac{\Delta\lambda \cdot m_0 \cdot c}{h}$ <p>$\cos\theta = 0,421$</p> <p>$\theta = 65,1^\circ$</p>	<p>3 p</p> <p>3 p</p> <p>2 p</p>