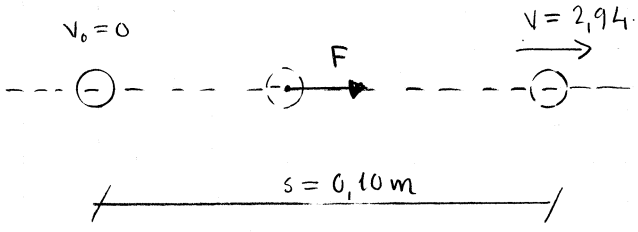
12.14



(a) Elektronens rörelseenergi

$$E_k = mc^2(\gamma - 1) = mc^2\left(\frac{1}{\sqrt{1-\left(\frac{v}{c}\right)^2}} - 1\right)$$

$$= 9{,}109 \cdot 10^{-31}\left(2{,}998 \cdot 10^8\right)^2\left(\frac{1}{\sqrt{1-\left(\frac{2{,}94 \cdot 10^8}{2{,}998 \cdot 10^8}\right)^2}} - 1\right) \text{J}$$

$$= 8{,}187\ 10^{-14}\left(5{,}109 - 1\right) \text{J} = 3{,}36 \cdot 10^{-13} \text{J}$$

(b) Ökningen av rörelseenergin = det av kraften F utvärtade arbetet, dvs

$$E_k - 0 = F \cdot s \Rightarrow F = \frac{E_k}{s} = \frac{3{,}36 \cdot 10^{-13} \text{J}}{0{,}10 \text{m}} = 3{,}36 \cdot 10^{-12} \text{N}$$

(c) Totala energin

$$E_{tot} = \gamma mc^2 = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} = \frac{9{,}109 \cdot 10^{-31} \cdot \left(2{,}998 \cdot 10^8\right)^2}{\sqrt{1-\left(\frac{2{,}94 \cdot 10^8}{2{,}998 \cdot 10^8}\right)^2}} \text{J} = 4{,}18 \cdot 10^{-13} \text{J}$$

Svar (a) $3{,}4 \cdot 10^{-13}$ J (b) $3{,}4 \cdot 10^{-12}$ N (c) $4{,}2 \cdot 10^{-13}$ J