Physics 1214, Homework #10: solutions

Answers to multiple choice questions: M1: A,C; M2: C; M3: D; M4: C.

P1 $f_2 = \dfrac{d}{|M|+1} = 0.333$ cm $\qquad f_1 = f_2|M| = 66.7$ cm

P2 Electron : $\lambda = \dfrac{h}{\sqrt{2mE}} = 0.174$ nm $\qquad$ Proton : $\lambda = \dfrac{hc}{E} = 24.8$ nm

P3 There are six lines:

$4 \to 3$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{4^2} - \dfrac{1}{3^2}\right)} = 1875$ nm

$4 \to 2$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{4^2} - \dfrac{1}{2^2}\right)} = 486$ nm

$4 \to 1$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{4^2} - \dfrac{1}{1^2}\right)} = 97.2$ nm

$3 \to 2$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{3^2} - \dfrac{1}{2^2}\right)} = 656$ nm

$3 \to 1$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{3^2} - \dfrac{1}{1^2}\right)} = 102.5$ nm

$2 \to 1$: $\quad \lambda = \dfrac{1}{R\left(\dfrac{1}{2^2} - \dfrac{1}{1^2}\right)} = 121.5$ nm

P4 $m_l = -3, -2, -1, 0, +1, +2, +3 \qquad m_s = +1/2, -1/2$

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