

$$4.7 \quad a) \quad \lambda = \frac{h}{p} = \frac{h}{\sqrt{2mk}}$$

$$m_{he} = 4.002 \text{ u} = 4.002 \times 931.49 \text{ MeV}/c^2$$

$$= 3.727 \times 10^9 \text{ eV}/c^2$$

$$\lambda = \frac{4.136 \times 10^{-15} \text{ eV}\cdot\text{s}}{\sqrt{2 \cdot 3.727 \times 10^9 \text{ eV}/c^2 \cdot 0.02 \text{ eV}}}$$

$$= \frac{(4.136 \times 10^{-15} \text{ eV}\cdot\text{s})(3 \times 10^8 \text{ m/s})}{\sqrt{2 \cdot 3.727 \times 10^9 \cdot 0.02 \text{ (eV)}^2}}$$

$$= 1.02 \times 10^{-10} \text{ m}$$

$$b) \quad y_m = \frac{m\lambda D}{d} \Rightarrow \lambda = \frac{d \Delta y}{D}$$

spacing is $4.13 \approx 8 \mu$

$$d = 8 \mu = 8 \times 10^{-6} \text{ m}$$

$$D = 64 \text{ cm} = 6.4 \times 10^{-1} \text{ m}$$

$$\lambda = \frac{(8 \times 10^{-6} \text{ m})(8 \times 10^{-6} \text{ m})}{(6.4 \times 10^{-1} \text{ m})} = 1.0 \times 10^{-10} \text{ m}$$

Agreement as expected