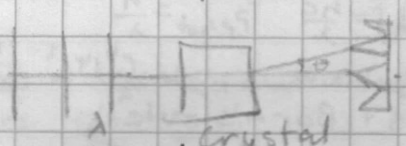
Ex: KE of particles from wavelength.



$E_{neutron} = mc^2 = 939565413\ eV$

$\lambda = ?$

$p = \frac{h}{\lambda} = mv$ $\quad \frac{h}{\lambda} = \frac{v}{c^2}(\ \ )$

Ex: Suppose we measure the wavelength of an outgoing electron in free space (no potential) and obtain 5nm.

What is true about the wave func after the measurement?

e^{ikx} e^{-ikx} $\frac{\hbar^2k^2}{2m}$

$\sin(kx)$ No potential → energy eigenstate

Homework 10: Multiple Electrons

1) Square well: $L = 2.5$ nm. U is $V = 0$ eV inside well. 7 trapped electron

1. $E_{ground} = ?$

E_4 ↑↓
E_3 ↑ ↓
E_2 ↑↓
E_1 ↑↓

$E_1 = \frac{\hbar^2\pi^2}{2mL^2}$

$E_{ground} = E_4 + 2E_3 + 2E_2 + 2E_1$
$= 16E_1 + 18E_1 + 8E_1 + 2E_1$
$= 44E_1$
$\approx$ 2.645 eV

2. $E_{excited} = ?$ (1 electron goes from $E_3 \to E_4$)

$E_{ground} + 7E_1 \approx$ 3.066 eV

3. $E_{excited_2} = ?$

$E_{excited} + 2E_1 = E_{ground} + 9E_1 = 53E_1 \approx$ 3.18 eV

2) 12.2eV electron collides w/ hydrogen atom @ ground state., exciting the electron

1. Highest n the electron can reach?

$-13.6\ eV + (-1.5\ eV) = -12.1\ eV$ $\quad n = 3$

2. After being excited to the highest possible n, when photon energy cannot be emitted by subsequent decay?

12.1eV 10.2eV (4.2eV) 1.9eV

3)

1. Carbon (6 electrons) 2. Neon (10 electrons) Ground:

$2s$ ↑↓ $2p$ — —
$1s$ ↑↓

(2 in p states @ ground)

$2s$ ↑↓ $2p$ ↑ ↑ ↑
$1s$ ↑↓

(6 in p states)

3. Hydrogen: $E_1 - E_2 = -13.6 - (-27.2) = 13.6$

Helium: $E_2 - E_3 = -27.2 - (-30.6) = 3.4$ eV

Hydrogen has larger E_2