$$\lambda = \frac{h}{mv}$$

$h = 6.626 \times 10^{-34}$

1. What is the de Broglie wavelength (in nm) associated with a 2.5 g Ping-Pong ball traveling at 15.6 m/s?

On Power Point

2. What is the wavelength of an electron moving at 5.31×10^{6} m/sec?
Given: mass of electron = 9.11×10^{-31} kg

$$\lambda = \frac{6.626 \times 10^{-34}\ J\ s}{(9.11 \times 10^{-31}\ kg)(5.31 \times 10^{6}\ \frac{m}{s})}$$

$$\boxed{\lambda = 1.37 \times 10^{-10}\ m}$$

3. Find the de Broglie wavelength for an electron moving at the speed of 6.63×10^{6} m/s

$$\lambda = \frac{6.626 \times 10^{-34}\ J \cdot s}{(6.63 \times 10^{6}\ m/s)(9.11 \times 10^{-31}\ kg)}$$

$$\boxed{\lambda = 1.10 \times 10^{-10}\ m}$$

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$$\Delta E = R_H\left(\frac{1}{n_i^2} - \frac{1}{n_f^2}\right)$$

R_H=2.18 x 10^{-18} J

1. Calculate the wavelength (in nm) of a photon emitted by a hydrogen atom when its electron drops from the n = 5 state to the n = 3 state.

$E = \frac{hc}{\lambda}$

$c = \lambda \nu$

$E = h\nu$

$\nu = \frac{c}{\lambda}$

$\Delta E = 2.18\times10^{-18}\left(\frac{1}{25} - \frac{1}{9}\right)$

$\Delta E = -1.55\times10^{-19}$ J

$1.55\times10^{-19} = \frac{6.626\times10^{-34}\cdot 3\times10^{8}}{\lambda}$

$\lambda = 1.28\times10^{-6}$ m

$1.28\times10^{-6}\text{ m} \times \frac{1\times10^{9}\text{ nm}}{1\text{ m}}$

$= 1.28\times10^{3}$ nm

2. What is the energy change when an electron drops from the n=3 energy state to the n=1 energy state in a hydrogen atom?

n_i n_f

$\Delta E = 2.18\times10^{-18}\left(\frac{1}{9} - \frac{1}{1}\right)$

$\Delta E = -1.94\times10^{-18}$ J

2. What is the change in energy when an electron relaxes from the n=3 state to the n=2 state? Is energy absorbed or emitted? What is the wavelength of light associated with this transition?

n_i n_f

$\Delta E = 2.18\times10^{-18}\left(\frac{1}{9} - \frac{1}{4}\right)$

$\Delta E = -3.03\times10^{-19}$ J

$(\lambda)\ 3.03\times10^{-19}\text{ J} = \frac{(6.626\times10^{-34}\text{ J·s})(3\times10^{8}\ \frac{\text{m}}{\text{s}})}{\lambda}$

$\lambda = 6.56\times10^{-7}$ m or 656 nm