You Have a Wavelength!

When **any** piece of matter is moving, it has a wavelength.

The effects of this wavelength can only be seen when you are dealing with a very small piece of matter, such as a proton or an electron.

The wavelength of moving matter is

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

- h is called Planck's constant.

$$\mathrm{h} = 6.626 \times 10^{-34}\,\mathrm{Joule} - \mathrm{seconds}$$

- p is momentum.

- λ is called the de Broglie wavelength.

Take another look at the Planck constant:

$$h = \frac{6.626}{10000000000000000000000000000000000} Joule - \text{sec}$$

- This can also be written as

$$0.0000000000\ 0000000000\ 0000000000\ 000626\ \text{Joule} - \text{seconds}$$

- This is a very small number.

Calculate the de Broglie wavelength of your classmate:

- Your classmate has a mass of _____.

  1 kilogram = 2.2 pounds

  So your classmate's mass in kilograms is

$$\_\_\_\ lbs \times \frac{1kg}{2.2lbs} = \_\_\_\_$$

Your classmate's average speed is

$$v = \frac{\text{distance}}{\text{time}} = \_\_\_\_\_$$

Calculate the de Broglie wavelength of a moving proton:

- A proton is moving at 25,000 meters per second.

  Protons have a mass of

  1.672×10^{-27} kg

  Use a calculator to determine the determine the de Broglie wavelength of the proton.