The de Broglie Wavelength (SwiftStudy Printable)

Key Formula

$$\lambda = \frac{h}{mv} \quad \text{OR} \quad \lambda = \frac{h}{p}$$

λ	de Broglie wavelength	m
h	Planck's constant = 6.63×10^{-34} J·s	
m	mass	kg
v	velocity	m/s
p	momentum	kg·m/s

Tips to Remember

- You should expect the de Broglie wavelength of a macroscopic object to be extremely small—so small, in fact, that you might think it was a mistake if you didn't know what to expect. After all, the world would be a mighty strange place if baseballs and ostriches had wavelengths large enough that you could observe their diffraction patterns. Even with tiny particles such as electrons, your de Broglie wavelengths will be on the order of nanometers or picometers (10^{-9} or 10^{-12} m).
- Did you notice the very small value of Planck's constant? If you haven't yet learned how to use the scientific notation button on your calculator, now might be a good time. Calculator models vary, but many (including the TI graphing calculators) use a button labeled "EE." You can enter 6.63×10^{-34} as 6.63, then "EE," then -34, and the screen will show it as 6.63E-34.
- The two forms of the equation shown above are completely equivalent. Some texts assume that you know that the momentum is mass times velocity, so they use the second form for conciseness. Others use the first form because homework problems commonly supply the mass and velocity of the object separately.