CONCEPT: DE BROGLIE WAVELENGTH

- **The De Broglie Wavelength** associates the wave nature of a moving *object* with its velocity through Planck's constant.
  - □ **Object**: A photon, a subatomic particle or literally anything with a velocity.

De Broglie Wavelength Formula

The De Broglie Wavelength Formula is used when we have the **velocity** and **wavelength** of an object.

$$\lambda = \frac{\quad}{\bullet}$$

- □ λ = Wavelength in meters.
- □ h = Planck's Constant as _____ J•s
- □ m = mass of object in _____.
- □ v = velocity in _____.

□ Based on the formula, the wavelength of an object is _____ proportional to its mass and velocity.

EXAMPLE: Find the wavelength of a proton with a speed of 6.25×10^{5} m/s. (Mass of a proton = 1.67×10^{-27} kg)

PRACTICE: What is the velocity (in m/s) of an electron that has a wavelength of 3.13×10^{5} pm? (Mass of an electron = 9.11×10^{-31} kg).

CONCEPT: DE BROGLIE WAVELENGTH

PRACTICE: The faster an electron is moving, the _____ its kinetic energy, and the _____ its wavelength.

a) higher, shorter b) higher, longer c) lower, longer d) lower, shorter

PRACTICE: What is the speed (in m/s) of a subatomic particle that has a wavelength of 3.13×10^{5} pm? (Mass of a proton = 1.67×10^{-27} kg).

PRACTICE: Consider an atom traveling at 3.00×10^{15} m/s. The de Broglie wavelength is found to be 7.1316×10^{-39}. Determine the mass (in g) of the atom.