First Homework Corrections

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1 Units, Constants, and Conversions

Evaluate the following. Express without prefixes and in the simplest SI unit(s) possible.

1.

$$(4mA)(3ns)(2V)$$

$$(4mA)(3ns)(2V) = (4ma)(3ns)(2 \times \frac{kg \times \frac{m}{s^2} \times m}{A \times s})$$

$$(4mA)(3ns)(2V) = 4 \times 3 \times 2 \times 10^{-3} \times \frac{A \times s \times kg \times \frac{m^2}{s^2}}{A \times s}$$

$$\boxed{(4mA)(3ns)(2V) = 24 \times 10^{-12} \frac{kgm^2}{s^2}}$$

2.

$$\frac{e}{m_e}\sqrt{\frac{k_e}{G}}$$

$$\frac{e}{m_e}\sqrt{\frac{k_e}{G}} = \frac{(1.6 \times 10^{-19}C)}{(9.1 \times 10^{-31}kg)} \times \frac{\sqrt{(8.99 \times 10^{9} \frac{N \times m^2}{C^2})}}{\sqrt{(6.67 \times 10^{-11} \frac{N \times m^2}{kg^2})}}$$

$$\boxed{\frac{e}{m_e}\sqrt{\frac{k_e}{G}} = .2 \times 10^{22}}$$

3.

$$3.1eV$$

$$3.1eV = 3.1(1.6 \times 10^{-19}V)$$

$$3.1eV = 4.96 \times 10^{-19}C \times \frac{J}{C}$$

$$\boxed{3.1eV = 4.96 \times 10^{-19}J}$$

2 Dimensions

Consider a column of liquid with volume (V) ad surface area (A). The pressure due to the fluid (P) is a function of depth below the surface (y). Here g is earth's gravity constant.

$$P = \rho g y$$

Determine the dimensions and SI units of the following quantities.

1.
$$\frac{\Delta P}{\Delta y}$$

$$\frac{\Delta P}{\Delta y} = \frac{kg}{m \times ms^2}$$

$$\boxed{\frac{\Delta P}{\Delta y} = \frac{kg}{m^2 s^2}}$$

$$\boxed{ML^{-2}T^{-2}}$$

2.
$$P \cdot A$$

$$P \cdot A = \frac{kg}{ms^2} m^2$$

$$\boxed{P \cdot A = kg \frac{m}{s^2}}$$

$$\boxed{ML^2T^{-2}}$$

3.

$$P \cdot V$$

$$P \cdot V = \frac{kg}{ms^2} \times m^3$$

$$\boxed{P \cdot V = kg\frac{m^2}{s^2}}$$

$$\boxed{ML^2T^{-2}}$$

4.

$$\rho \cdot V$$

$$\rho \cdot V = \frac{kg}{m^3} \times m^3$$

$$\boxed{\rho \cdot V = kg}$$

$$\boxed{M}$$

3 Vectors

Given the vectors below, evaluate the following terms:

1.

$$p - 2q$$

$$p - 2q = [3, 4] - 2[-5, 12]$$

$$p - 2q = [3, 4] - [-10, 24]$$

$$\boxed{p - 2q = [13, -20]}$$

2.

$$3p - q$$

$$3p - q = 3[3, 4] - [-5, 12]$$

$$3p - q = [9, 12] - [-5, 12]$$

$$\boxed{3p - q = [14, 0]}$$