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6. a) wavelength and frequency are inversely proportional, as wavelength increases, frequency decreases.

$$\text{Thus, } c = \lambda \nu \quad \therefore \nu = \frac{c}{\lambda}$$

b) energy and frequency are directly proportional, as frequency increases, energy increases.

$$\text{Thus, } E = h\nu$$

c) energy and wavelength are inversely proportional, as wavelength increases, energy decreases

$$\text{Thus, } \nu = \frac{c}{\lambda} \quad \therefore E = h\left(\frac{c}{\lambda}\right)$$

10. $\nu = ? \text{ Hz}$

$$\lambda = \frac{4.257 \times 10^{-7} \text{ cm} \times 1 \times 10^{-2} \text{ m}}{1 \text{ cm}} = 4.257 \times 10^{-9} \text{ m}$$

$$c = \lambda \nu$$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{4.257 \times 10^{-9} \text{ m}} = 7.05 \times 10^{16} \frac{1}{\text{s}} = \boxed{7.05 \times 10^{16} \text{ Hz}}$$

11. $E = ? \text{ J}$

$$\nu = 3.55 \times 10^{17} \text{ Hz} = 3.55 \times 10^{17} \frac{1}{\text{s}}$$

$$E = h\nu = (6.626 \times 10^{-34} \text{ J}\cdot\text{s})\left(3.55 \times 10^{17} \frac{1}{\text{s}}\right) = \boxed{2.35 \times 10^{-16} \text{ J}}$$

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14. $E = ? \text{ J}$

$$\lambda = \frac{1.00 \times 10^{-3} \text{ nm}}{1 \text{ nm}} \times \frac{1 \times 10^{-9} \text{ m}}{1 \text{ nm}} = 1.00 \times 10^{-12} \text{ m}$$

$$E = h\nu$$

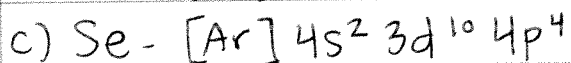
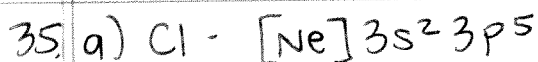
★ use $c = \lambda\nu$ to find ν , then plug ν into $E = h\nu$

$$c = \lambda\nu$$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{1.00 \times 10^{-12} \text{ m}} = 3.00 \times 10^{20} \frac{1}{\text{s}}$$

$$E = h\nu = (6.626 \times 10^{-34} \text{ J}\cdot\text{s}) (3.00 \times 10^{20} \frac{1}{\text{s}})$$

$$E = 1.99 \times 10^{-13} \text{ J}$$



47. $\nu = ? \text{ Hz}$

$$E = 1.55 \times 10^{-24} \text{ J}$$

$$E = h\nu$$

$$\nu = \frac{E}{h} = \frac{1.55 \times 10^{-24} \text{ J}}{6.626 \times 10^{-34} \text{ J}\cdot\text{s}} = 2.34 \times 10^9 \frac{1}{\text{s}} = 2.34 \times 10^9 \text{ Hz}$$