CHAPTER 7

(39) $\lambda = 7.80 \times 10^2$ nm

$\nu = ?$ Hz

$c = 3.00 \times 10^8$ m/s $= 3.00 \times 10^{17}$ nm/s

$c = \lambda\nu$

3.00×10^{17} nm/s $= (7.80 \times 10^2$ nm$)(\nu)$

$\boxed{\nu = 3.85 \times 10^{14}\ \text{Hz}}$

(41) $\lambda = 1.0$ cm

$\nu = ?$

$E = ?$

$c = \lambda\nu$

$(3.00 \times 10^8\ \text{m/s}) = (0.01\ \text{m})\,\nu$

$\boxed{\nu = 3.0 \times 10^{10}\ \text{Hz} = 3.0 \times 10^{10}\ \frac{1}{s}}$

$E = h\nu$

$E = (6.626 \times 10^{-34}\ \text{J}\cdot\text{s})(3.0 \times 10^{10}\ \frac{1}{s})$

$\boxed{E = 2.0 \times 10^{-23}\ \text{J}}$ for one photon

Avogadro's number $= 6.02 \times 10^{23}$

$\therefore \dfrac{6.02 \times 10^{23}\ \text{photons}}{1\ \text{photon}} \left| \dfrac{2.0 \times 10^{-23}\ \text{J}}{} \right. = \boxed{12\ \text{J}}$

(43) $\lambda = 280 - 320$ nm

$\nu = ?$

$c = \lambda\nu$

3.00×10^{17} nm/s $= (280$ nm$)(\nu)$

$\nu = 1.1 \times 10^{15}\ \frac{1}{s}$

$c = \lambda\nu$

3.00×10^{17} nm/s $= (320$ nm$)(\nu)$

$\nu = 9.4 \times 10^{14}\ \frac{1}{s}$

$\boxed{\therefore \text{frequency range of UV light is } 9.4 \times 10^{14}\ \frac{1}{s} - 1.1 \times 10^{15}\ \frac{1}{s}}$

(45) Wave A has the longer wavelength

4 waves in 1.6×10^{-3} m

$\therefore \lambda = \frac{1.6 \times 10^{-3} \text{ m}}{4} = \boxed{4.0 \times 10^{-4} \text{ m}}$

Wave B has the higher frequency and larger photon E

8 waves in 1.6×10^{-3} m

$\therefore \lambda = \frac{1.6 \times 10^{-3} \text{ m}}{8} = 2.0 \times 10^{-4} \text{ m}$

$C = \lambda \nu$

$(3.00 \times 10^{8} \text{ m/s}) = (2.0 \times 10^{-4} \text{ m})(\nu)$

$\boxed{\nu = 1.5 \times 10^{12} \frac{1}{s}}$

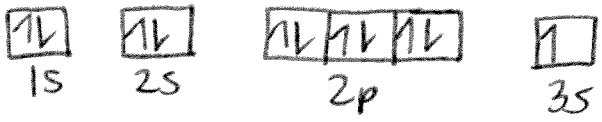
$E = h\nu$

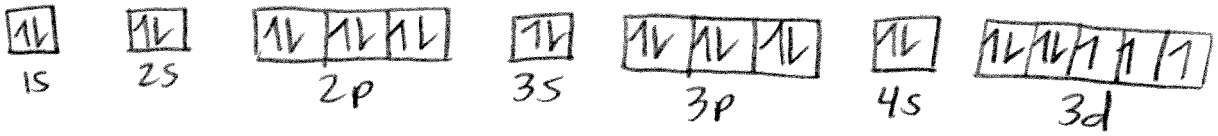
$E = (6.626 \times 10^{-34} \text{ J}\cdot\text{s})(1.5 \times 10^{12} \frac{1}{s})$

$\boxed{E = 9.9 \times 10^{-22} \text{ J}}$

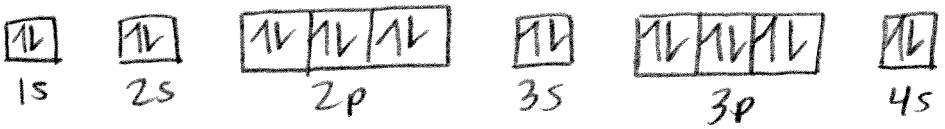
Since both wave A and B are light, they will both travel at the speed of light, 3.00×10^{8} m/s.

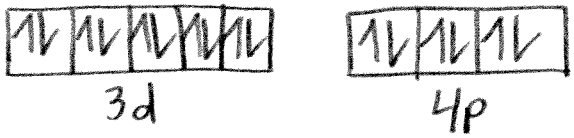
Both waves are infrared radiation.

(83) a) Na  one unpaired e^-

b) Co 

3 unpaired e

c) Kr 



Zero unpaired e-

(85) Si - $1s^2 2s^2 2p^6 3s^2 3p^2$

Ga - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$

As - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$

Ge - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$

Al - $1s^2 2s^2 2p^6 3s^2 3p^1$

Cd - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10}$

S - $1s^2 2s^2 2p^6 3s^2 3p^4$

Se - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

(91) a) Valence configuration of $3s^2 3p^4$ = Sulfur (S)

b) ground state configuration of $1s^2 2s^2 2p^3$ = nitrogen (N)

c) ground state ion configuration of $4s^2 4p^5$

(Valence)

negative one charge, thus originally $4s^2 4p^4$ = Selenium (Se)