Ch. 6 - Review Questions - 2, 5, 8, 10, 11, 14, 23, 26, 28, 29, 41, 46, 52, 60, 66 + 70

2. $\lambda \propto \frac{1}{\nu}$; 400 nm - 750 nm

5. a) gamma < d) yellow light < e) red light < b) FM Radio < c) AM Radio

8. a) $\dfrac{3.0\times10^{8}\text{ m}}{\text{s}} \cdot \dfrac{1}{1.73\text{ nm}} \cdot \dfrac{1\times10^{9}\text{ nm}}{1\text{ m}} = 1.73\times10^{17}\text{ s}^{-1}$

b) $\dfrac{3.0\times10^{8}\text{ m}}{\text{s}} \cdot \dfrac{1}{9.83\times10^{9}\text{ s}^{-1}} = 3.05\times10^{-2}\text{ m}$

c) b would be detected

d) $\dfrac{3.0\times10^{8}\text{ m}}{\text{s}} \cdot 90.0\text{ fs} \cdot \dfrac{1\text{ s}}{1\times10^{15}\text{ fs}} = 2.70\times10^{-5}\text{ m}$ (fs: femptoseconds)

10. $\dfrac{3.0\times10^{8}\text{ m}}{\text{s}} \cdot \dfrac{1}{4.47\times10^{14}\text{ s}^{-1}} = 6.71\times10^{-7}\text{ m} = 671\text{ nm}$; orange

11. a) Released in small bundles instead to constant wave.

b) We live in larger (macroscopic) and therefore release large amounts of quanta therefore individual quanta are not noticeable.

14. a) $E = \dfrac{hc}{\lambda}$ $\quad 6.626\times10^{-34}\text{ J}\cdot\text{s} \cdot \dfrac{3.0\times10^{8}\text{ m}}{\text{s}} \cdot \dfrac{1}{146\text{ nm}} \cdot \dfrac{10^{9}\text{ nm}}{\text{m}} = 1.36\times10^{-18}\text{ J}$

b) $E = h\nu$ $\quad 6.626\times10^{-34}\text{ J.S} \cdot \dfrac{99.7\text{ M}}{\text{s}} \cdot \dfrac{1\times10^{6}}{1\text{ M}} = 6.61\times10^{-26}\text{ J}$

c) $\nu = \dfrac{E}{h}$ $\quad \dfrac{6.10\times10^{-21}\text{ J}}{6.626\times10^{-34}\text{ J}\cdot\text{s}} = 9.21\times10^{12}\text{ s}^{-1}$; Infrared

23. Line spectra represents incremented energies that are represented by the varying energy levels.

26. a) emitted b) absorbed c) absorbed

28 a) $\nu = \left(\frac{R_H}{h}\right)\left(\frac{1}{n_i^2} - \frac{1}{n_f^2}\right) \Rightarrow \frac{2.18\times10^{-18}J}{6.626\times10^{-34}J\cdot s}\left(\frac{1}{4} - \frac{1}{49}\right) = 7.55\times10^{14}s^{-1}$

$E = 5.01\times10^{-19}J$

$n=2 \rightarrow n=7$

$\lambda = 3.97\times10^{-7}m = 397nm$

b) $n=5 \rightarrow n=6$ $\quad \nu = 4.02\times10^{13}s^{-1}$

$E = 2.66\times10^{-20}J$

$\lambda = 7.46\times10^{6}\ m$

a) + b) are absorbed energy

c) is emitted energy

c.) $n=6 \rightarrow n=3$ $\quad \nu = 2.74\times10^{14}s^{-1}$

$E = -1.82\times10^{-19}J$

$\lambda = 1.10\times10^{6}\ m$

29a) All frequencies associated with $n_f = 2$ fall in the visible light spectrum

b) $n=3$ $\quad \nu = 4.57\times10^{14}s^{-1}$ $\quad \lambda = 6.57\times10^{-7}m = 657nm$

$n=4$ $\quad \nu = 6.17\times10^{14}s^{-1}$ $\quad \lambda = 4.86\times10^{-7}m = 486nm$

$n=5$ $\quad \nu = 6.91\times10^{14}s^{-1}$ $\quad \lambda = 4.34\times10^{-7}m = 434nm$

a) $n=4$ $\quad l = 0, 1, 2, + 3$

b) $l=2$ $\quad m_l = -2, -1, 0, 1 + 2$

46 a) No - no p orbitals in $n=1$

b) Yes

c) Yes

d.) No - only 3 orientations for p orbitals $m_l = -1, 0, +1$

52. $s < p < d < f$; degenerate orbitals have the same energy.

60 a) $n=3 = 18e^-$ $\quad$ b) $n=4, l=2 \Rightarrow 10e^-$ $\quad$ c) $n=4, l=3, m=2 \Rightarrow 2e^-$

d) $n=2, l=1, m=0\ s=-1/2 \Rightarrow 1e^-$

66a) K = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ $\quad$ b) Al ⇒ $1s^2 2s^2 2p^6 3s^2 3p^1$ $\quad$ c) S ⇒ $1s^2 2s^2 2p^6 3s^2 3p^4$

d) Mn = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$ $\quad$ e) Y ⇒ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^1$

f) Nd ⇒ $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 5d^1 4f^3$

or $4f^4$

70. a) F, Cl $\quad$ b.) Ti, Zr, Hf $\quad$ c.) Ga, In, Tl $\quad$ d) Sm, Pu