Answers to Sample Exam Questions #3

1. E (direction of force is <u>perpendicular</u> to direction of current)
2. B (wavelength of microwaves is much longer than that of ultraviolet waves)
3. C ($[\Delta V]^2 \div R = P = 9$ W, so $[\Delta V]^2 = PR = (9)(4) = 36$ V^2, so $\Delta V = 6$ V; $I = ([\Delta V] \div R = 6/2 = 3$ A .)
4. B (or F) (force on electron is <u>opposite</u> to direction of electric field; also, a change in the sideways-pointing magnetic flux would create a "circular" electric field; if the electron is in just the right spot, it might experience an upward force momentarily)
5. E (frequency is 500 Hz [electric field is zero twice per period]; $\lambda = c/f = (3 \times 10^8) \div 500 = 6 \times 10^5$ m; distance between points with zero field is <u>one-half</u> of a wavelength.)
6. D (total internal reflection can only occur when traveling into a medium with <u>lower</u> refractive index)
7. E (in the parallel circuit, potential difference across <u>each</u> bulb is 120 V, so total power is 3×60 W)
8. E (Forces on top and bottom sides of loop cancel, because they are equal in magnitude and opposite in direction at each point; force on left side of loop is $B_{r=s}$ $(2I)L = [(\mu_0/2\pi)\ I/s]\ [2I]\ [s] = (\mu_0/2\pi)\ 2I^2$; force on right side of loop is in opposite direction, and has magnitude $B_{r=2s}$ $(2I)L = [(\mu_0/2\pi)\ I/2s]\ [2I]\ [s] = (\mu_0/2\pi)\ I^2$; <u>net</u> force on loop is the difference between those two forces, so $F_{net} = (\mu_0/2\pi)\ 2I^2 - (\mu_0/2\pi)\ I^2 = (\mu_0/2\pi)\ I^2$.)