Reading: Averill 6.1-6.6.2

1. Wavelength ↔ frequency

Averill Chapter 6, Section 1, Numerical Problem 8

An FM radio station broadcasts with a wavelength of 3.21 m. What is the broadcast frequency of the station in megahertz? An FM radio typically has a broadcaast range of 82-112 MHz. What is the corresponding wavelength range in meters for this reception?

2. Energy ↔ wavelength

Averill Chapter 6, Section 2, Numerical Problem 3

A mole of photons is found to have an energy of 225 kJ. What is the wavelength of the radiation?

3. EM waves and power

Averill Chapter 6, Section 2, Numerical Problem 6

A radio station has a transmitter that broadcasts at a frequency of 100.7 MHz with a power output of 50 kW. Given that 1W=1J/s, how many photons are emitted by the transmitter each second?

4. Bohr model: key ideas

Averill Chapter 6, Section 3, Numerical Problem 1

Using a Bohr model and the transition from n=2 to n=3 in an atom with a single electron, describe the mathematical relationship between and emission spectrum and an absorption spectrum. What is the energy of this transition? What does the sign of the energy value represent in this case? What range of light is associated with this transition?

5. Bohr model: calculation

Averill Chapter 3, Section 1, Numerical Problem 3

The hydrogen atom emits a photon with a 486 nm wavelength, corresponding to an electron decaying from the n=4 level to which level? What is the color of the emission?

6. Bohr model: velocity of ejected electron

A photon with a wavelength $\lambda = 3.091 \times 10^{-7}$ m strikes an atom of hydrogen. Determine the velocity of an electron ejected from the excited state, n=3.

7. Bohr model: minimum energy req'd for given excitation

Determine the minimum potential that must be applied to an α-particle so that on interaction with a hydrogen atom, a ground state electron will be excited to n=6.

8. Bohr model: wavelength req'd for given excitation

Calculate the wavelength, λ, of a photon capable of exciting an electron in He^+ from the ground state to n=4.

9. Atomic orbitals and energy levels

Averill Chapter 6, Section 5, Numerical Problem 1

How many subshells are possible for n=3? What are they?

10. Quantum numbers and subshells

Averill Chapter 6, Section 5, Numerical Problem 3

What values of l correspond to a d-subshell? How many orbitals are in this subshell?

11. Practice with quantum numbers

Averill Chapter 6, Section 6, Numerical Problem 8

List the set of quantum numbers for each electron in the valence shell of each element.

a) carbon
b) magnesium
c) bromine
d) sulfur

12. Electronic configurations

Averill Chapter 6, Section 6, Numerical Problem 15

List the set of quantum numbers for each element in the ground state.

a) boron
b) rubidium
c) bromine
d) germanium
e) vanadium
f) palladium
g) bismuth
h) europium

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