Session #3: Homework Problems

Problem #1

From a standard radio dial, determine the maximum and minimum wavelengths

(λ_{max} and λ_{min}) for broadcasts on the

(a) AM band
(b) FM band

Problem #2

For light with a wavelength (λ) of 408 nm determine:

(a) the frequency
(b) the wave number
(c) the wavelength in Å
(d) the total energy (in Joules) associated with 1 mole of photons
(e) the "color"

Problem #3

For "yellow radiation" (frequency, ν, = 5.09 x 10^{14} s^{-1}) emitted by activated sodium, determine:

(a) the wavelength (λ) in [m]
(b) the wave number ($\bar{\nu}$) in [cm^{-1}]
(c) the total energy (in kJ) associated with 1 mole of photons

Problem #4

Potassium metal can be used as the active surface in a photodiode because electrons are relatively easily removed from a potassium surface. The energy needed is 2.15 x 10^{5} J per mole of electrons removed (1 mole =6.02 x 10^{23} electrons). What is the longest wavelength light (in nm) with quanta of sufficient energy to eject electrons from a potassium photodiode surface?

Problem #5

For red light of wavelength (λ) 6.7102 x 10^{-5} cm, emitted by excited lithium atoms, calculate:

(a) the frequency (ν) in s^{-1};
(b) the wave number ($\bar{\nu}$) in cm^{-1};
(c) the wavelength (λ) in nm;
(d) the total energy (in Joules) associated with 1 mole photons of the indicated wavelength.

Problem #6

Calculate the "Bohr radius" for He^{+}.

Problem #7

(a) Determine the atomic weight of He^{++} from the values of its constituents.

(b) Compare the value obtained in (a) with the value listed in your Periodic Table and explain any discrepancy if such is observed. (There is only one natural $^{4}_{2}He$ isotope.)

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