CH 231 Quest Review 1

Measurement, Dimensional Analysis, Atoms and Elements in Chemistry

How many sig figs? 0.0004 40. 4050 40.0040 0.004040

Calculate: 4.39+9.6881 5.637*3.400 (5.003 – 2)/1.46

Convert:

12.6 ml/inch^2 to L/ft^2

85m/s to km/day

$x\,{}^{y}Al$ What are the values of x and y?

Which pair of elements illustrates the law of multiple proportions?

CO and $CaCO_3$ H_2SO_4 and H_2s SO and SO_2 CO_2 and $C_{12}H_{22}O_{11}$

If 100 grams of water vapor were to condense such that there was no more water vapor, how many grams of liquid water should be found?

Given tungsten (W-184)

a) Determine number of protons, neutrons, and electrons

b) Tungsten is dense, with a density of 19.3 g/cm^3. What is the mass of a piece of tungsten whose volume is 14.0 km^3?

How many valence electrons does each of the following have:
Li Ca B O F I S Na Mg

Valence electrons in calcium travel about 2.212 km in 1.50 second. How many minutes would it take this valence electron to travel around the Earth? (24,901 miles) Note: 1 mile equals 1600 meters.

Jamesonnium (Jh) has 3 naturally occurring isotopes. If Jamesonnium has an average atomic weight of 87.11 amu, what is the mass of Jh-88?

Isotope	Mass amu	Percent abundance
Jh-85	84.87	11.54%
Jh-86	86.22	43.60%
Jh-88		

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Chlorine has two naturally occurring isotopes, chlorine-35 having a mass of 34.9689 amu and chlorine-37 having a mass of 36.9659 amu. If chlorine has an atomic weight of 35.4527, what is the percent abundance of each isotope of chlorine?

Toluene (C_7H_8) has a density of 8.65 g/ml. What volume in liters of toluene should be used if James has 5.4 moles of it?

James is trying to transfer currency. If one U.S dollars is equivalent to .60 James dollars, and 1 James dollar is equivalent to 12 James quarters, and 5 James quarter is equal to 1 James euros, how many James euros are in 77 U.S quarters?

Consider a Hydrogen Atom

a) Without doing any calculations, determine which of the electron transitions in a hydrogen atom would emit photons with the shortest wavelength. Justify your answer.

n=2 → n=1 n=3 → n=2 n=3 → n=1 n=4 → n=2

b) An excited hydrogen atom absorbs a photon of light of wavelength 487 nm. If the electron ends up in the n=4 level, in what level was it originally?

c) Once the hydrogen starts returning to ground state and emits light, calculate the uncertainty in position of its electron (9.1094×10^{-28} g)if it is moving at 80% of the speed of light and if the uncertainty in the velocity is 2%?

d)If the total energy of a mole of a photon emitted from this exothermic process is 120 kJ, what is the wavelength of the photons?

Light, waves, energy, and the photoelectric effect

What is the energy of one photon of orange light? (650nm)

The frequency of a light wave is $4.5*10^{-19}$ Hz. What is its wavelength?

A starship delivery robot isn't watching where its going and runs into you. If it has a mass of 18000 grams, and is moving at 16 meters/minute, what is its kinetic energy?

Determine the longest wavelength of light that can remove an electron from a sample of potassium metal, if the binding energy for one electron in potassium is 4.59×10^{-18} J

A photon of light strikes a detector in a camera's light meter with an energy of 6.00x10 -17 J. What is the frequency and wavelength of this photon?

If a photon with a wavelength of 350 nm impacts a metal whose binding energy is 4.00 x 10 -20 J, will the metal surface eject and electron? If so, what is the kinetic energy of the liberated electron?

If a photon with a wavelength of 350 nm impacts a metal whose frequency threshold is 6.037 x 1013 hertz, will the metal surface eject and electron? If so, what is the velocity of the liberated electron? (mass of electron is $9.11*10^{-28}$ g)

Splat! Sean is struck by a snowball (mass of 75 grams) at 45 km/hr.

a) What is the wavelength of this snowball in nanometers?

b) What is the uncertainty of the position of this snowball with a velocity uncertainty of 5%?

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Quantum numbers:

Write all possible quantum numbers (n,l,ml,ms)

3s 4p

Consider Rhodium (z=45)

a) Provide Rhodium's electron configuration

b) Represent Rhodium using an orbital box diagram and state whether it is paramagnetic or diamagnetic

c) Provide a valid set for electron's is Rh's highest energy subshell

d) Give the quantum numbers for Rh's 42nd electron and its 34th electron

e) Using the electron configuration from part a, choose which possible cation of rhodium (ranging from +1 to +8) would most readily form and explain why.

f) How many electrons can be described with the quantum numbers n=4 l=2