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Chapter 4 Test Review

Constants: $c = 3.00 \times 10^{8}$ m/s $h = 6.63 \times 10^{-34}$ J·s 1 m = 1×10^{9} nm

You will not be given the equations on the test. Make sure they are memorized!

1) What is the energy of a photon whose frequency is 3.0×10^{12} sec^{-1}?

2) Show your work and calculate the following.

a. Calculate ν for a λ = 700.0 nm.

b. Calculate ν for a λ = 400.0 nm.

c. Calculate the energy for each wavelength above.

a)

b)

d. Which wavelength has the greatest frequency?

e. Which wavelength has more energy?

f. How are energy, wavelength, and frequency related?

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3) A red light has a wavelength of 728 nm.

a. What is the frequency of the light?

b. What is the speed of the wave in m/s?

4) A purple light has a frequency of 7.42×10^{14} /sec.

a. What is its wavelength?

b. Find the energy for this wavelength.

5) You broke your big toe! The x-ray they take of your toe uses waves that have a length of 2.19×10^{10}m.

a. What is the speed of the wave in m/s?

b. What is the wavelength in nm?

c. What is the frequency of the x-ray?

6) Element Math Game: http://education.jlab.org/elementmath/ M – A = n
‖
P – e = C

7) Periodic Table of Isotopes : http://ie.lbl.gov/education/isotopes.htm

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8) Balancing Nuclear Equations:

a. ^{214} Bi □ ^{214} Po + _____

b. ^{90} Rb □ _____ + ^{o} e

c. ^{235} U □ _____ + ^{4} He

d. ^{230} Po emits an alpha particle.

e. ^{14} C emits a beta particle.

9) Half-Life Problems:

a. If one starts with 20 mg of a radioactive isotope with a half-life of 2.0 days, how much remains after eight days?

b. The half-life of an isotope is 10 years. If we start with a 10 gram sample of the isotope, how much is left after 20 years?

c. Start with 12.0 g of a given isotope. After 11 years only 3.0 grams is left. What is the half-life of the isotope?

10) Average Atomic Mass

Naturally occurring lead is composed of four isotopes: 1.40% ^{204} Pb (203.97 amu), 24.10% ^{206} Pb (205.97 amu), 22.10% ^{207}Pb (206.98 amu), and 52.40% ^{208}Pb (207.98 amu). What is the average atomic mass of lead?

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Honors Chemistry Chapter 4 Answer Key

1) 2.0×10^{-21} J

2) a. $4.29 \times 10^{14}\ s^{-1}$
   b. $7.5 \times 10^{14}\ s^{-1}$
   c. 2.84×10^{-19}J ; 4.97×10^{-19}J
   d. 400 nm
   e. 400 nm

3) a. $4.12 \times 10^{14}\ s^{-1}$
   b. 3.0×10^{8} m/s

4) a. 4.04×10^{-7} m
   b. 4.92×10^{-19} J

5) a. 3.0×10^{8} m/s
   b. 2.19×10^{19} nm
   c. $1.37 \times 10^{-2}\ s^{-1}$

6) Element Math Game: http://education.jlab.org/elementmath/ (1st 36 elements)

M – A = n
‖
P – e = C

7) Periodic Table of Isotopes : http://ie.lbl.gov/education/isotopes.htm

8) Balancing Nuclear Equations:

a. $^{214}_{83}\text{Bi} \rightarrow {}^{214}_{84}\text{Po} + {}^{0}_{-1}\text{e}$

b. $^{90}_{37}\text{Rb} \rightarrow {}^{90}_{38}\text{Sr} + {}^{0}_{-1}\text{e}$

c. $^{235}_{92}\text{U} \rightarrow {}^{231}_{90}\text{Th} + {}^{4}_{2}\text{He}$

d. $^{230}_{84}\text{Po} \rightarrow {}^{4}_{2}\text{He} + {}^{226}_{82}\text{Pb}$

e. $^{14}_{6}\text{C} \rightarrow {}^{0}_{-1}\text{e} + {}^{14}_{7}\text{N}$

9) Half-Life Problems:
   a. 1.25 mg
   b. 2.5 g
   c. 5.5 years

10) Average Atomic Mass = 207.22 amu