Chemistry 141 Name

Dr. Cary Willard

Quiz 6A (20 points) April 8, 2013

Data: E = nhν, c=νλ, c=3.00 x 108 m/sec, h = 6.626 x 10−34 J sec

1. (11 points) A carbon-oxygen double bond in a certain organic molecule absorbs radiation that has a frequency of 6.04 x 1015 /sec
	1. What is the wavelength of this electromagnetic radiation in nanometers?

$$λ=\frac{c}{ν}=\frac{3.00×10^{8} m/sec}{6.04 ×10^{15} /sec}=4.97×10^{-8}=49.7 nm$$

* 1. What is the energy of one photon of this electromagnetic radiation?

$$E=nhν=\left(1\right)\left(6.626×10^{-34} J sec\right)\left(6.04 ×10^{15} /sec\right)=4.00×10^{-18}J$$

* 1. How much energy in kJ would be absorbed by 0.75 mol of this molecule? (Each molecule contains only one double bond.)

$$?J=0.75 mol×\frac{6.022 ×10^{23}bonds}{1 mol}×\frac{4.00×10^{-18}J}{1 bond}×\frac{1 kJ}{1000 J}=1810 kJ$$

* 1. A carbon oxygen bond in a different molecule absorbs radiation with a frequency equal to 5.4 x 1017 /sec. Is this radiation more or less energetic?

Because this frequency is higher than the other frequency, it is more energetic.

1. (3 points) What is the physical significance of the value of ψ2 at a particular point in an atomic orbital?

ψ2 tells us the probability of finding an electron at any particular location in an atomic orbital.

1. (3 points) Scientists use emission spectra to confirm the presence of an element in materials of unknown composition. Why is this possible?

Because every element has its own specific emission spectra, the presence of an elements emission spectra conclusively determines that the element is present in the sample.

1. (3 points) Explain using quantum why there are no 3f orbitals.

When n = 3, the possible values of l are 0, 1, and 2. These values of l correspond to s, p, and d type orbitals. Since 4 is a disallowed value of l, it is not possible for an f sublevel to exist.

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Quiz 6B (20 points) April 8, 2013

Data: E = nhν, c=νλ, c=3.00 x 108 m/sec, h = 6.626 x 10−34 J sec

1. (11 points) A carbon-oxygen double bond in a certain organic molecule absorbs radiation that has a frequency of 8.04 x 1015 /sec
	1. What is the wavelength of this electromagnetic radiation in nanometers?

$$λ=\frac{c}{ν}=\frac{3.00×10^{8} m/sec}{8.04 ×10^{15} /sec}=3.73×10^{-8}=37.3 nm$$

* 1. What is the energy of one photon of this electromagnetic radiation?

$$E=nhν=\left(1\right)\left(6.626×10^{-34} J sec\right)\left(8.04 ×10^{15} /sec\right)=5.32×10^{-18}J$$

* 1. How much energy in kJ would be absorbed by 0.75 mol of this molecule? (Each molecule contains only one double bond.)

$$?J=0.75 mol×\frac{6.022 ×10^{23}bonds}{1 mol}×\frac{5.32×10^{-18}J}{1 bond}×\frac{1 kJ}{1000 J}=2410 kJ$$

* 1. A carbon oxygen bond in a different molecule absorbs radiation with a frequency equal to 5.4 x 1013 /sec. Is this radiation more or less energetic?

Because this frequency is lower than the other frequency, it is less energetic.

1. (3 points) What is the physical significance of the value of ψ2 at a particular point in an atomic orbital?

ψ2 tells us the probability of finding an electron at any particular location in an atomic orbital.

1. (3 points) Scientists use emission spectra to confirm the presence of an element in materials of unknown composition. Why is this possible?

Because every element has its own specific emission spectra, the presence of an elements emission spectra conclusively determines that the element is present in the sample.

1. (3 points) Explain using quantum why there are no 3f orbitals.

When n = 3, the possible values of l are 0, 1, and 2. These values of l correspond to s, p, and d type orbitals. Since 4 is a disallowed value of l, it is not possible for an f sublevel to exist.