1. Rank the following types of electromagnetic radiation from highest to lowest frequency: IR, TV, X-ray, Green.

a. TV > IR > Green > X-ray
b. X-ray > IR > Green > TV
c. Green > X-ray > TV > IR
d. X-ray > Green > IR > TV
e. TV > Green > IR > X-ray

2. Which of the following scientists originated that debate over whether light was a wave or a particle?

I. Christiaan Huygens
II. Albert Einstein
III. Isaac Newton

a. I only
b. II only
c. III only
d. I and II
e. I and III
f. II and III
g. I, II and III

3. What was the main reason that classical mechanics did such a bad job of describing and predicting the interactions of light and matter?

a. Classical mechanics incorrectly assumed that the speed of light is a constant.
b. Classical mechanics treated light exclusively as a wave, which failed to account for the quantized nature of its energy.
c. Isaac Newton, founder of classical mechanics, believed light was a particle and not a wave.
d. Classical mechanics actually did an excellent job of predicting and describing interactions between light and matter.

4. What is the de Broglie wavelength of planet earth as it revolves around the sun (mass = 5.9736 E24 kg and velocity = 29.783 km/s)?

a. 3.724 E-59 m
b. 3.724 E-56 m
c. 3.724 E-57 m
d. 3.724 E-61 m

5. Which of the following is/are true concerning the particle in a box?

I. the electron can be found anywhere in the box with equal probability
II. the electron is always in motion
III. the electron's energy can be equal to zero

a. I only
b. II only
c. III only
d. I and II
e. I and III
f. II and III
g. I, II and III

6. What is the minimum uncertainty in Earth's position if the uncertainty in its velocity is 0.1 $m \cdot s^{-1}$(mass = 5.9736 E24 kg)?

a. 1.1 E-57 m
b. 5.5 E-58 m
c. 1.8 E-58 m
d. 8.8 E-59 m

7. How many total orbitals are found in principal energy levels 3 and 4?
a. 32
b. 50
c. 9
d. 25
e. 18
f. 16

8. The highest energy ground state electron in an Yttrium (Y) atom could be described by which of the following sets of quantum numbers.
a. $n = 4$, $l = 3$, $m_l = 0$, $m_s = -½$
b. $n = 4$, $l = 2$, $m_l = 2$, $m_s = +½$
c. $n = 5$, $l = 2$, $m_l = -1$, $m_s = +½$
d. $n = 5$, $l = 3$, $m_l = -4$, $m_s = -½$