

Unit 4 Review Worksheet

Section I - Problems

Given:

$$E = h \cdot \nu$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = \lambda \cdot \nu$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

1. What is the frequency of a wave with a wavelength of $3.5 \times 10^{-4} \text{ m}$? $8.6 \times 10^{11} \text{ Hz}$
2. What is the energy of a photon with a frequency of $5.41 \times 10^{17} \text{ Hz}$? $3.58 \times 10^{-16} \text{ J}$
3. What type of electromagnetic radiation is described in question 2? $\lambda = 5.5 \times 10^{-10} \text{ m}$, so most likely x-rays

Section II - Electromagnetic Spectrum

4. Label both ends of the spectrum with high/low frequency, high/low energy, and long/short wavelength
radio waves microwaves infrared light ROYGBIV ultraviolet light x-rays gamma rays

5. Which has a higher energy, gamma or x-rays?
6. Which has a shorter wavelength, radio or ultraviolet?
7. Which has a lower frequency, yellow or green light?
8. In the equation $E = h \cdot \nu$, energy and frequency are directly proportional.
9. In the equation $c = \lambda \cdot \nu$, wavelength and frequency are inversely proportional.
10. The symbol for wavelength is λ . photon or
11. Electrons give off energy in the form of a EM radiation when returning to the ground state.
12. Which scientist proposed the idea that electrons travel around the nucleus in fixed paths? Bohr
13. When an electron moves from the ground state to the excited state, energy is absorbed.
14. Bohr chose the element hydrogen to prove his theory.
15. The dual wave-particle nature of electrons describes how the electrons in atoms can behave as a wave and a particle.

long λ
low ν
low E

short λ
high ν
high E

16. What is an electron cloud? area around the nucleus where e- are located
17. Who proposed the uncertainty principle? Heisenberg
18. Who is credited with the idea that electrons are placed in the lowest energy level first? Aufbau
19. What rule requires that each of the "p" orbitals (at a particular energy level) receive one electron before any of the orbitals can have two electrons? Hund's Rule
20. What is the maximum number of electrons in any orbital? 2
21. The principal quantum number, n, indicates the energy level.
22. The maximum number of electrons in an energy level can be determined by the equation $2n^2$.
That means the maximum number of electrons in the 3rd energy level is 18.
23. The number of sublevels in any energy level can be determined by # of the energy level
24. The number of orbitals in an energy level can be determined by the equation n^2 .
So, the 3rd energy level has 9 orbitals. (1 is/are "s" orbitals, 3 is/are "p" orbitals, and 5 is/are "d" orbitals)
25. List the four sublevels according to increasing energy. s - p - d - f
26. The "s" sublevel is shaped like a sphere and has 1 orbitals.
27. A "p" sublevel is shaped like a dumbbell and has 3 orbitals.
28. The "d" sublevel has 5 orbitals and the "f" sublevel has 7 orbitals.

