Quantum Theory and the Electronic Structure of Atoms

**Question 1**

What is the frequency of light having a wavelength of 360 nm?

**Question 2**

A radio station is playing at 1,396 kHz. Calculate the wavelength (m). Round to the nearest whole number, do not include units or commas.

**Question 3**

The velocity of a wave is 421 m/s. If the frequency of the wave is 86 Hz, what is its wavelength (m)? Round your answer to two decimal places, do not include units.

**Question 4**

A photon has a wavelength of 350 nm. Calculate the energy of the photon in joules. Show your work for partial credit.

**Question 5**

1. How many electrons would be required to fill the following sublevels?

* 3s
* 4s
* 3d
* 4d
* 3p
* 2d
* 3f
* 4d

|  |
| --- |
|  |

**Question 6**

1. Match the following:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | |  | [Ar]4s1 | |  | a probability map for electrons | |  | [Kr]5s24d105p2 | |  | [Kr] 5s24d105p6 | |  | number of unpaired electrons in Sc | |  | metals form these when they lose an electron | |  | electrons in the highest main energy level | |  | a sphere-shaped orbital | |  | number of unpaired electrons in phosphorous | |  | tiny packets of light | |  | particle responsible for the "chemistry" of atoms | |  | an atom with excess energy | |  | only certain energy levels are allowed | |  | how many waves pass a given point per second | |  | non-metals form these when they gain an electron | |  | lowest possible energy state of an atom | | Answer   |  |  | | --- | --- | | A. | anion | | B. | frequency | | C. | electrons | | D. | photon | | E. | ground state | | F. | excited state | | G. | quantized energy | | H. | s orbital | | I. | orbital | | J. | electron configuration for Tin | | K. | electron configuration for Potassium | | L. | electron configuration for Xenon | | M. | cation | | N. | valence electrons | | O. | 3 | |

**Question 7**

1. Name the element with atomic number (Z) = 15 and atomic mass number = 31, Use the symbol, not the word.

How many electrons does the neutral atom of this element have? Use a number, not a word.

How many neutrons does the neutral atom of this element have? Use a number, not a word.

**Question 8**

Most of the volume of matter is composed of:

**Question 9**

What is the relationship between frequency and wavelength?

**Question 10**

The relationship between energy and frequency of a wave is:

**Question 11**

A traveling wave is produced on a rope. The wave travels until it hits a wall and it is reflected. If the speed of the wave is 1.8 m/s and it takes 10.3 s to get back to the starting point, how long (m) is the rope. Round to two decimal places, do not include units.

**Question 12**

What is the frequency of a radio wave 2 m in wavelength?

**Question 13**

The set of quantum numbers that correctly describes an electron in a 3p orbital is:

**Question 14**

How many photons of light having a wavelength of 656 nm are necessary to provide 1.0 J of energy?

**Question 15**

An aluminum atom has \_\_\_\_\_ unpaired electron(s).

**Question 16**

The average distance between planet X and Earth is about 2.81 x 108 miles. How long (minutes) would it take pictures transmitted from a space vehicle on Planet X's surface to reach Earth? Round to one decimal place, do not include units in your answer.

**Question 17**

If the frequency of light is 6 x 107 Hz, the wavelength (m) would be? Round to one decimal places, do not include units in your answer.

**Question 18**

How much energy (in kilojoules) is found in one mole of photons with a wavelength of 637 nm? Round to the nearest whole number, do not include units.  
  
1 mole of photons = 6.02 x 1023 photons