Name ____________________________ **Period** _____________ **Date** ____________

____ 1) What is the maximum number of electrons that may be present in the third energy level of an atom?

1) 8 2) 2 3) 18 4) 32

____ 2) What is the total number of valence electrons in an atom of germanium in the ground state?

1) 8 2) 2 3) 14 4) 4

____ 3) In a calcium atom in the ground state, the electrons that possess the *least* amount of energy are located in the

1) first electron energy level
2) second electron energy level
3) third electron energy level
4) fourth electron energy level

____ 4) What is the electron configuration of a sulfur atom in the ground state?

1) 2–4 3) 2–8–4
2) 2–6 4) 2–8–6

____ 5) An atom of bromine is in the ground state. The outermost electrons are in energy level

1) 1 2) 2 3) 3 4) 4

____ 6) Which electron configuration represents an excited state for an atom of calcium?

1) 2-8-7-1 3) 2-8-7-3
2) 2-8-7-2 4) 2-8-8-2

____ 7) When an excited electron in an atom moves to the ground state, the electron

1) absorbs energy as it moves to a higher energy state
2) absorbs energy as it moves to a lower energy state
3) emits energy as it moves to a higher energy state
4) emits energy as it moves to a lower energy state

____ 8) Which electron configuration represents the electrons of an atom in an excited state?

1) 2-1 3) 2-8-7
2) 2-7-4 4) 2-4

____ 9) An electron in a sodium atom gains enough energy to move from the second energy level to the third energy level. The sodium atom becomes

1) a positive ion
2) a negative ion
3) an atom in an excited state
4) an atom in the ground state

____ 10) Which statement describes how an atom in the ground state becomes excited?

1) The atom absorbs energy, and one or more electrons move to a higher electron orbit.
2) The atom absorbs energy, and one or more electrons move to a lower electron orbit.
3) The atom releases energy, and one or more electrons move to a higher electron orbit.
4) The atom releases energy, and one or more electrons move to a lower electron orbit.

____ 11) A specific amount of energy is emitted when excited electrons in an atom in a sample of an element return to the ground state. This emitted energy can be used to determine the

1) mass of the sample
2) volume of the sample
3) identity of the element
4) number of moles of the element

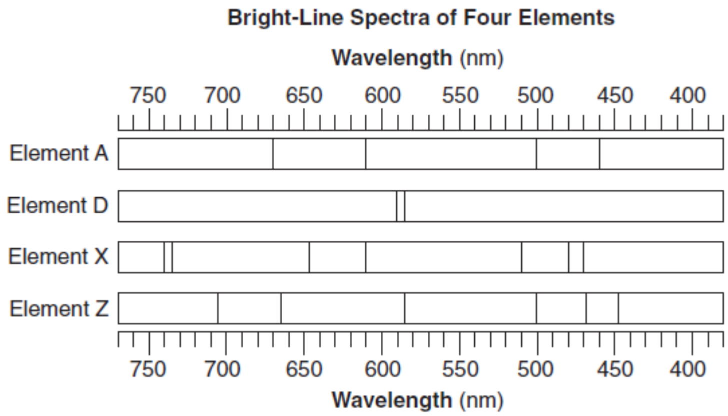
____ 12) The isotopes K-37 and K-42 have the same

1) decay mode
2) bright-line spectrum
3) mass number for their atoms
4) total number of neutrons in their atoms

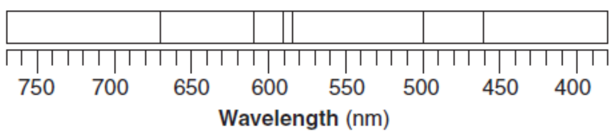
____ 13) Which principal energy level change by the electron of a hydrogen atom will cause the greatest amount of energy to be absorbed?

1) $n = 2$ to $n = 4$ 3) $n = 4$ to $n = 2$
2) $n = 2$ to $n = 5$ 4) $n = 5$ to $n = 2$

____ 14) The bright-line spectra produced by four elements are represented in the diagram below.



Given the bright-line spectrum of a mixture formed from two of these elements:



Which elements are present in this mixture?

1) *A* and *D* 2) *A* and *X* 3) *Z* and *D* 4) *Z* and *X*

____ 15) Base your answer to the following question on the information below.

During a fireworks display, salts are heated to very high temperatures. Ions in the salts absorb energy and become excited. Spectacular colors are produced as energy is emitted from the ions in the form of light.

The color of the emitted light is characteristic of the metal ion in each salt. For example, the lithium ion in lithium carbonate, Li_2CO_3, produces a deep-red color. The strontium ion in strontium carbonate, $SrCO_3$, produces a bright-red color. Similarly, calcium chloride is used for orange light, sodium chloride for yellow light, and barium chloride for green light.

Explain, in terms of subatomic particles and energy states, how the colors in a fireworks display are produced.

____ 16) Base your answer to the following question on the information below.

A glass tube is filled with hydrogen gas at low pressure. An electric current is passed through the gas, causing it to emit light. This light is passed through a prism to separate the light into the bright, colored lines of hydrogen's visible spectrum. Each colored line corresponds to a particular wavelength of light. One of hydrogen's spectral lines is red light with a wavelength of 656 nanometers.

Tubes filled with other gases produce different bright-line spectra that are characteristic of each kind of gas. These spectra have been observed and recorded.

Using the formula c = f and the constant for c (3.00×10^8 m/s), determine the frequency of the red light.