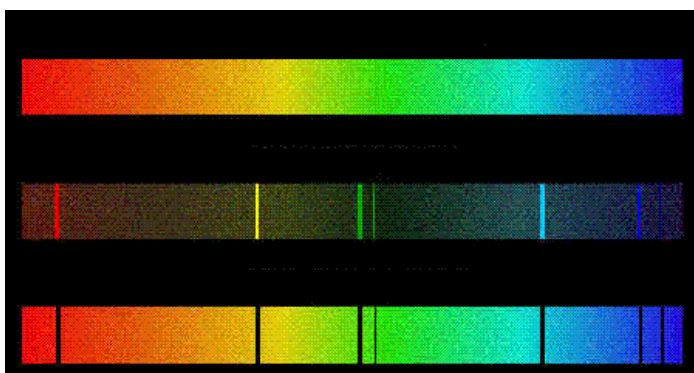


Student Name:**Grade:** 09**Test Name:** November Chemistry for All: Unit 3 - Quantum Mechanics **Version:** 1

1. Will an electromagnetic wave of high frequency have a longer or shorter wavelength than one of low frequency?
 - (a) The wavelengths are the same.
 - (b) The higher frequency has a longer wavelength.
 - (c) The lower frequency has a shorter wavelength.
2. The color emitted during a flame test is the result of which of the following?
 - (a) Electrons absorbing energy only.
 - (b) Electrons releasing energy only.
 - (c) Protons absorbing energy only.
 - (d) Neutrons releasing energy.
3. True or false: Each metal has a characteristic emission spectrum.
 - (a) True
 - (b) False
4. For which element are higher energy photons released; Li^+ which emits red light or Cu^{2+} which emits green light? How do you know?
 - (a) Li^+ because red light has a longer wavelength.
 - (b) Li^+ because red light has a higher frequency.
 - (c) Cu^{2+} because green light has a higher frequency.
 - (d) Cu^{2+} because green light has a lower frequency.

5. Which of the following correctly identifies the difference between absorption and emission spectra.
- (a) In absorption a photon is absorbed by a proton, in emission a photon is emitted by a proton.
 - (b) In absorption an electron is absorbed by a photon, in emission an electron is emitted by a photon.
 - (c) In absorption a photon is absorbed by an electron, in emission a photon is emitted by an electron.
 - (d) In absorption a proton is absorbed by a photon, in emission a proton is emitted by a photon.
6. What difference causes electrons to emit either red or violet color bands in a bright-line emission spectrum?
7. What change occurs with the electrons in an atom that results in the emission spectra for an element?
- (a) The electrons move from the ground state to a higher energy level.
 - (b) The electrons move from a higher energy level back to the ground state.
 - (c) The electrons move from the ground state to a lower energy level.
 - (d) No change occurs.
8. Label the spectra as absorption, continuous, and emission.



9. Give one reason why all elements have a unique emission spectrum?
- (a) They don't, some are the same.
 - (b) They have different arrangements of protons.
 - (c) They have different arrangements of electrons.
 - (d) They have different arrangements of neutrons.
10. Hydrogen produces four different colored lines in an emission spectrum. If hydrogen only has 1 electron, then how can 4 lines be produced?
11. True or False: Atoms absorb certain wavelengths of light due to unique electron configurations in the outer shell.
- (a) True
 - (b) False
12. Which of the following electromagnetic waves has the highest relative energy?
- (a) Radiowaves
 - (b) Ultraviolet Light
 - (c) X-Rays
 - (d) Red Light
13. What trend is observed between the wavelength and the energy of a wave in the electromagnetic spectrum?
- (a) Longer wavelength, higher energy
 - (b) Longer wavelength, lower energy
 - (c) Shorter wavelength, lower energy
 - (d) There is no relationship

14. The element sulfur has an electron configuration of: $1s^2 2s^2 2p^6 3s^2 3p^4$
- What does the superscript 6 refer to?
 - What does the letter s refer to?
 - What does the coefficient 3 refer to?
15. Write the electron configurations for the following neutral atoms:
- Li_____
 - Cl_____
 - Fe_____
16. Which is the correct noble gas configuration for sulfur?
- $[\text{Ar}] 3p^4$
 - $[\text{Ne}] 3s^2 3p^4$
 - $[\text{Ar}] 3s^2 3p^4$
 - $[\text{Ne}] 3s^2 3p^2$
17. Which element has an electron configuration of: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
- argon
 - zinc
 - cadmium
 - copper

18. Write the kernel structure (noble gas configuration) for the following neutral atoms:

Be_____

Al_____

Cr_____

Br_____

19. Match the oxidation state to the element

- | | |
|-------|-------|
| 1. Na | a. -1 |
| 2. Al | b. +2 |
| 3. Mg | c. +3 |
| 4. Cl | d. +1 |

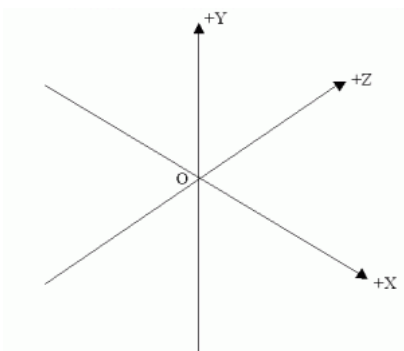
20. The "s" shell in an electron configuration can best be described as what shape?

- (a) Clover
- (b) Dumbell
- (c) Sphere
- (d) Circle

21. The "p" shell in an electron configuration can best be described as what shape?

- (a) Clover
- (b) Dumbell
- (c) Sphere
- (d) Circle

22. Draw the 3 possible orientations of the p orbitals below.



23. The Heisenberg Uncertainty Principle can be summarized as which of the following?
- (a) No more than two electrons can be found in any one orbital.
 - (b) Electrons must have opposite spins when they occupy the same orbital.
 - (c) Orbitals of equal energy are occupied by one electron before pairing occurs.
 - (d) You cannot know both the location and velocity of an electron at any time.
24. True or false: The velocity and location of an electron can be determined experimentally.
- (a) True
 - (b) False
25. Explain why the Bohr model of the atom is not an accurate representation of the modern atomic theory.

26. Which of the following most closely represents the quantum theory of the atom?

