

Name: _____

Date: _____

1. Which is the electron configuration of a neutral atom in the ground state with a total of six valence electrons?
- A. $1s^2 2s^2 2p^2$ B. $1s^2 2s^2 2p^4$
 C. $1s^2 2s^2 2p^6$ D. $1s^2 2s^2 2p^6 3s^2 3p^6$
2. What is the electron configuration for Be^{2+} ions?
- A. $1s^1$ B. $1s^2$ C. $1s^2 2s^1$ D. $1s^2 2s^2$
3. The correct electron configuration of the O^{2-} ion is
- A. $1s^2 2s^2 2p^2$ B. $1s^2 2s^2 2p^3$
 C. $1s^2 2s^2 2p^5$ D. $1s^2 2s^2 2p^6$
4. Which ion has the electron configuration of a noble gas?
- A. Cu^{2+} B. Fe^{2+} C. Ca^{2+} D. Hg^{2+}
5. Given the electron configuration of an atom in the ground state:
 $1s^2 2s^2 2p^6 3s^2 3p^4$
 This element is found in the Periodic Table in
- A. Period 4 and Group 16 B. Period 4 and Group 14
 C. Period 3 and Group 16 D. Period 3 and Group 14
6. What is the total number of unpaired electrons in an atom of oxygen in the ground state?
- A. 6 B. 2 C. 8 D. 4
7. What is the total number of valence electrons in an atom of xenon?
- A. 0 B. 2 C. 8 D. 18
8. Which species has the same electron configuration as a Cl^- ion?
- A. S B. Ar C. Br^- D. F^-
9. Which atom in the ground state has three half-filled orbitals?
- A. P B. Si C. Al D. Li

10. What is the total number of completely filled sublevels found in an atom of krypton in the ground state?
- A. 10 B. 2 C. 8 D. 4
11. Which of these elements has an atom with the most stable outer electron configuration?
- A. Ne B. Cl C. Ca D. Na
12. What is the total number of electrons in a S^{2-} ion?
- A. 10 B. 14 C. 16 D. 18
13. Magnesium and calcium have similar chemical properties because an atom of each element has the same total number of
- A. electron shells B. valence electrons
C. neutrons D. protons
14. Which electron transition would result in the emission of energy?
- A. $3s$ to $4s$ B. $3p$ to $4p$ C. $3s$ to $3p$ D. $4p$ to $4s$
15. What is the total number of orbitals in a p sublevel?
- A. 1 B. 2 C. 3 D. 4
16. Which principal energy level can hold a maximum of 18 electrons?
- A. 5 B. 2 C. 3 D. 4
17. The characteristic bright-line spectrum of an element is produced when electrons
- A. are given off as beta particles
B. are gained from another atom
C. move to higher energy levels
D. fall back to lower energy levels
18. Which principal energy level of an atom contains an electron with the *lowest* energy?
- A. $n = 1$ B. $n = 2$ C. $n = 3$ D. $n = 4$
19. Which principal energy level has no f sublevel?
- A. 5 B. 6 C. 3 D. 4

20. Electron X can change to a higher energy level or a lower energy level. Which statement is true of electron X ?
- Electron X emits energy when it changes to a higher energy level.
 - Electron X absorbs energy when it changes to a higher energy level.
 - Electron X absorbs energy when it changes to a lower energy level.
 - Electron X neither emits nor absorbs energy when it changes energy levels.

21. When electrons in an atom in an excited state fall to lower energy levels, energy is
- absorbed, only
 - released, only
 - neither released nor absorbed
 - both released and absorbed

22. Base your answers to the following question(s) 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.

23. From which sublevel or sublevels can an atom of Fe lose electrons when forming the Fe^{3+} ion?
- the $4d$, only
 - the $3p$, only
 - both the $3d$ and $4s$
 - both the $3s$ and $4d$

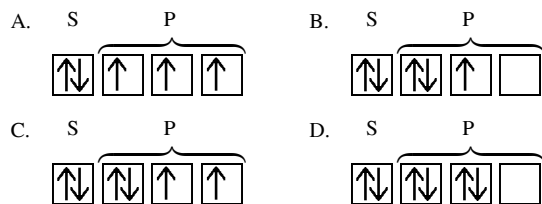
24. Which orbital notation represents the second principal energy level of a silicon atom in the ground state?

- $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$
- $\uparrow\downarrow \uparrow\downarrow \uparrow \uparrow$
- $\uparrow\downarrow \uparrow\downarrow \square \square$
- $\uparrow\downarrow \uparrow \uparrow \square \square$

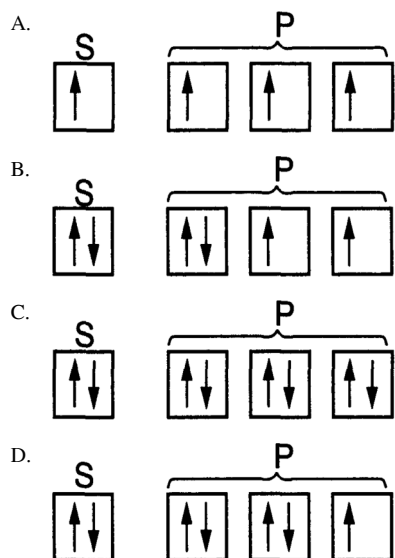
25. Which is the orbital notation for the electrons in the third principal energy level of an argon atom in the ground state?

- | | | |
|----------------------|--|---|
| 3s | 3p | 3d |
| $\uparrow\downarrow$ | $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ | $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ |
- | | | |
|----------------------|--|---|
| 3s | 3p | 3d |
| $\uparrow\downarrow$ | $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ | $\square \square \square \square \square$ |
- | | | |
|----------------------|--|---|
| 3s | 3p | 3d |
| $\uparrow\downarrow$ | $\uparrow\downarrow \uparrow \uparrow$ | $\uparrow \uparrow \square \square \square$ |
- | | | |
|----------------------|--|--|
| 3s | 3p | 3d |
| $\uparrow\downarrow$ | $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ | $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow$ |

26. Which orbital notation correctly represents the outermost principal energy level of a nitrogen atom in the ground state?



27. Which orbital notation correctly represents a noble gas in the ground state?



28. In the electron cloud model of the atom, an orbital is defined as the most probable

- A. charge of an electron
- B. conductivity of an electron
- C. location of an electron
- D. mass of an electron

29. What is the net charge of an ion that consists of 10 electrons, 11 protons, and 12 neutrons?

- A. 1^+
- B. 2^+
- C. 1^-
- D. 2^-

30. A K atom *differs* from a K^+ ion in that the K atom has one

- A. more electron
- B. less electron
- C. more proton
- D. less proton

31. Potassium forms an ion with a charge of

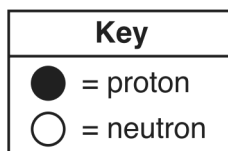
- A. 1^+ by losing one electron
- B. 1^- by losing one electron
- C. 1^+ by gaining one electron
- D. 1^- by gaining one electron

32. How many electrons are contained in an Au^{3+} ion?

- A. 76
- B. 79
- C. 82
- D. 197

33. The gold foil experiment led to the conclusion that each atom in the foil was composed mostly of empty space because most alpha particles directed at the foil
- A. passed through the foil
 - B. remained trapped in the foil
 - C. were deflected by the nuclei in gold atoms
 - D. were deflected by the electrons in gold atoms
34. Which part of a helium atom is positively charged?
- A. electron
 - B. neutron
 - C. nucleus
 - D. orbital
35. The greatest composition by mass in an atom of $^{17}_8\text{O}$ is due to the total mass of its
- A. electrons
 - B. neutrons
 - C. positrons
 - D. protons
36. An atom of any element must contain
- A. an equal number of protons and neutrons
 - B. an equal number of protons and electrons
 - C. more electrons than neutrons
 - D. more electrons than protons
37. What is the atomic number of an element whose atoms each contain 47 protons, 60 neutrons, and 47 electrons?
- A. 13
 - B. 47
 - C. 60
 - D. 107
38. In a sample of pure copper, all atoms have atomic numbers which are
- A. the same and the atoms have the same number of electrons
 - B. the same but the atoms have a different number of electrons
 - C. different but the atoms have the same number of electrons
 - D. different and the atoms have a different number of electrons
39. Which atom has a nucleus that contains 13 protons and 14 neutrons?
- A. Mg
 - B. Be
 - C. Al
 - D. N
40. Which notation represents an atom of sodium with an atomic number of 11 and a mass number of 24?
- A. $^{24}_{11}\text{Na}$
 - B. $^{11}_{24}\text{Na}$
 - C. $^{13}_{11}\text{Na}$
 - D. $^{35}_{11}\text{Na}$

41. The diagram below represents the nucleus of an atom.



What are the atomic number and mass number of this atom?

- A. The atomic number is 9 and the mass number is 19.
- B. The atomic number is 9 and the mass number is 20.
- C. The atomic number is 11 and the mass number is 19.
- D. The atomic number is 11 and the mass number is 20.

42. Which two particles have approximately the same mass?

- A. neutron and electron
- B. neutron and deuteron
- C. proton and neutron
- D. proton and electron

43. An atom of ${}^{226}_{88}\text{Ra}$ contains

- A. 88 protons and 138 neutrons
- B. 88 protons and 138 electrons
- C. 88 electrons and 226 neutrons
- D. 88 electrons and 226 protons

44. Which atom contains exactly 15 protons?

- A. phosphorus-32
- B. sulfur-32
- C. oxygen-15
- D. nitrogen-15

45. What is the structure of a krypton-85 atom?

- A. 49 electrons, 49 protons, and 85 neutrons
- B. 49 electrons, 49 protons, and 49 neutrons
- C. 36 electrons, 36 protons, and 85 neutrons
- D. 36 electrons, 36 protons, and 49 neutrons

46. Which of the following nuclei is an isotope of $\begin{matrix} 10p \\ 11n \end{matrix}$?

- A. $\begin{matrix} 10p \\ 9n \end{matrix}$
- B. $\begin{matrix} 11p \\ 10n \end{matrix}$
- C. $\begin{matrix} 9p \\ 11n \end{matrix}$
- D. $\begin{matrix} 11p \\ 12n \end{matrix}$

47. Which symbols represents atoms that are isotopes of each other?

- A. ${}^{14}\text{C}$ and ${}^{14}\text{N}$
- B. ${}^{16}\text{O}$ and ${}^{18}\text{O}$
- C. ${}^{131}\text{I}$ and ${}^{131}\text{I}$
- D. ${}^{222}\text{Rn}$ and ${}^{222}\text{Ra}$

Unit 3 - Electrons, Light, and Ions 15-16 10/07/2016

- | | |
|-----------------------|---|
| 1.
Answer: B | 21.
Answer: B |
| 2.
Answer: B | 22.
Answer: When electrons in the ions move from higher energy states to lower energy states, lights of specific wavelengths are emitted. |
| 3.
Answer: D | Light is emitted when electrons return from higher electron shells to lower electron shells. |
| 4.
Answer: C | 23.
Answer: C |
| 5.
Answer: C | 24.
Answer: A |
| 6.
Answer: B | 25.
Answer: B |
| 7.
Answer: C | 26.
Answer: A |
| 8.
Answer: B | 27.
Answer: C |
| 9.
Answer: A | 28.
Answer: C |
| 10.
Answer: C | 29.
Answer: A |
| 11.
Answer: A | 30.
Answer: A |
| 12.
Answer: D | 31.
Answer: A |
| 13.
Answer: B | 32.
Answer: A |
| 14.
Answer: D | 33.
Answer: A |
| 15.
Answer: C | 34.
Answer: C |
| 16.
Answer: C | 35.
Answer: B |
| 17.
Answer: D | 36.
Answer: B |
| 18.
Answer: A | 37.
Answer: B |
| 19.
Answer: C | 38.
Answer: A |
| 20.
Answer: B | |

39.
Answer: C

40.
Answer: A

41.
Answer: B

42.
Answer: C

43.
Answer: A

44.
Answer: A

45.
Answer: D

46.
Answer: A

47.
Answer: B