

Name: \_\_\_\_\_

Key

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

- 1) fourth electron shell
- 2) first electron shell
- 3) third electron shell
- 4) second electron shell

1) 2) The bright-line spectrum of sodium is produced when energy is ↓ high  
low

- 1) released as electrons move from higher to lower electron shells
- 2) absorbed as electrons move from lower to higher electron shells
- 3) released as electrons move from lower to higher electron shells
- 4) absorbed as electrons move from higher to lower electron shells

2) 3) How do the energy and the most probable location of an electron in the third shell of an atom compare to the energy and the most probable location of an electron in the first shell of the same atom?

- 1) In the third shell, an electron has less energy and is farther from the nucleus.
- 2) In the third shell, an electron has more energy and is farther from the nucleus.
- 3) In the third shell, an electron has less energy and is closer to the nucleus.
- 4) In the third shell, an electron has more energy and is closer to the nucleus.

1) 4) What is the total number of protons in an atom with the electron configuration 2-8-18-32-18-1? ⇒

- 1) 79
- 2) 69
- 3) 118
- 4) 197

$28 + 32 + 18 + 1 = 79$   
e<sup>-</sup>

4) 5) Which electron configuration could represent a strontium atom in an excited state? 38 e<sup>-</sup>

- 1) 2-8-18-8-2 ground
- 2) 2-8-18-8-1
- 3) 2-8-18-7-1
- 4) 2-8-18-7-3

2) 6) Which statement describes how an atom in the ground state becomes excited?

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

4) 7) Which electron configuration represents the electrons of an atom in an excited state?

- 1) 2-1 Li
- 2) 2-4 C
- 3) 2-8-7 Cl
- 4) 2-7-4 Al in excited state

2 8) An electron in a sodium atom moves from the third shell to the fourth shell. This change is a result of the atom

- 1) gaining an electron  
 2) absorbing energy  
3) releasing energy  
4) losing an electron

3 9) Which of the following electron configurations represents an excited state for a potassium atom?

- ~~1) 2-8-8-2~~  
~~2) 2-8-8-1 ground~~  
 3) 2-8-7-2  
4) 2-8-7-1
- 19 e<sup>-</sup>

4 10) Compared to an electron in the first electron shell of an atom, an electron in the third shell of the same atom has

- 1) more mass  
2) less mass  
3) less energy  
 4) more energy

2 11) Which electron configuration represents an atom in an excited state?

- ~~1) 2-7 F~~  
 2) 2-6-2  
~~3) 2-8-8-2 Ca~~  
~~4) 2-8-1 Na~~

3 12) The light emitted from a flame is produced when electrons in an excited state

- 1) release energy as they move to higher energy states  
 2) absorb energy as they move to lower energy states  
3) release energy as they move to lower energy states  
4) absorb energy as they move to higher energy states

2 13) Which of the following statements describes the relative energy of the electrons in the shells of a calcium atom?

- 1) An electron in the first shell has the same amount of energy as an electron in the second shell.  
 2) An electron in the third shell has more energy than an electron in the second shell.  
3) An electron in the first shell has more energy than an electron in the second shell.  
4) An electron in the third shell has less energy than an electron in the second shell.

4 14) Which atom in the ground state has a partially filled second electron shell?

- ~~1) sodium atom 2-8-1~~  
~~2) potassium atom 2-8-8-1~~  
~~3) hydrogen atom 1~~  
 4) lithium atom 2-1

# Electron Practice

Name: \_\_\_\_\_ 2-8-3

1) What is the correct electron-dot symbol for an aluminum atom in the ground state?

- A)  $\text{Al}:$       B)  $:\text{Al}:$       C)  $\cdot\text{Al}:$       D)  $\text{Al}:$

2) Which of the following is the electron-dot symbol for an atom with an electron configuration of  $1s^2 2s^2 2p^3$ ?

- A)  $\cdot\text{X}:$       B)  $:\text{X}:$       C)  $\cdot\text{X}:$       D)  $\text{X}:$
- 5 valence  $e^-$

3) What is the total number of valence electrons in a carbon atom in the ground state?

- A) 6      B) 2      C) 12      D) 4

4) In the ground state, all atoms of Group 13 of the Periodic Table have the same number of

- A) nuclear particles      C) occupied principal energy levels  
B) electrons      D) valence electrons

5) What is the maximum number of electrons in an energy level with a principal quantum number of 3?

- A) 6      B) 9      C) 18      D) 3
- $2(3)^2 = 18$

6) If X is the symbol of a noble gas atom in the ground state, its electron-dot symbol could be

- A)  $\text{X} \cdot$       B)  $\text{X}:$       C)  $\cdot\text{X}:$       D)  $:\text{X}:$
- Group 18  
He

7) When the electrons of an excited atom fall back to lower levels, there is an emission of energy that produces

- A) alpha particles      C) gamma radiation  
B) beta particles      D) spectral lines

8) What is the total number of occupied sublevels in an atom of chlorine in the ground state?

- A) 1      B) 5      C) 3      D) 9
- $1s^2 2s^2 2p^6 3s^2 3p^5$

9) Which of the following is the electron configuration of an atom in the ground state?

- A) 2-7-2      B) 2-7-1-1      C) 1-8-2      D) 2-8-1
- Na

10) Which electron transition represents the release of energy?

- A)  $3p$  to  $1s$       B)  $2p$  to  $3s$       C)  $2s$  to  $2p$       D)  $1s$  to  $3p$
- high  $\rightarrow$  low

11) Which electron transition between principal energy levels results in the emission of energy?

- A) 1st to 3rd      B) 1st to 4th      C) 4th to 3rd      D) 2nd to 3rd
- high  $\rightarrow$  low

12) Which of the following is an electron configuration of a fluorine atom in the excited state?

- A)  $1s^2 2s^2 2p^4 3s^1$       B)  $1s^2 2s^2 2p^5 3s^1$       C)  $1s^2 2s^2 2p^4$       D)  $1s^2 2s^2 2p^5$
- Ground

13) How does the ground state electron configuration of the hydrogen atom differ from that of a ground state helium atom?

- A) Hydrogen has one electron in a higher energy level.  
B) Hydrogen has two electrons in a lower energy level.  
C) Hydrogen contains a completely filled orbital.  
D) Hydrogen contains a half-filled orbital.

14) In an atom that has an electron configuration of  $1s^2 2s^2 2p^3$ , what is the total number of electrons in its sublevel of highest energy?

- A) 1      B) 2      C) 3      D) 4

15) Which of the following is a possible electron configuration for argon in the excited state?

- A)  $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$       B)  $1s^2 2s^2 2p^5 3s^2 3p^6$   
C)  $1s^2 2s^2 2p^6 3s^1 3p^7$       D)  $1s^2 2s^2 2p^6 3s^2 3p^5$

16) If  $n$  represents the principal energy level, the maximum number of electrons possible in that principal energy level is equal to

- A)  $2n$       B)  $2n^2$       C)  $n$       D)  $n^2$
- $2(n)^2$

- 17) As an atom in the excited state returns to the ground state, the energy of the atom  
 A) decreases (circled) B) remains the same C) increases
- 18) What is the total number of orbitals in the third principal energy level?  $s=1, p=3, d=5$   
 A) 1 B) 9 (circled) C) 16 D) 4
- 19) What principal energy level of an atom contains an electron with the lowest energy?  
 A)  $n=1$  (circled) B)  $n=2$  C)  $n=3$  D)  $n=4$
- 20) What is the total number of occupied principal energy levels in a neutral atom of neon in the ground state?  
 A) 1 B) 2 (circled) C) 3 D) 4
- 21) Which electron configuration represents an atom in the excited state?  
 A) 2-2-1 Boron (circled) B) 2-1 C) 2-8-1 D) 2-8-2
- 22) Which electron transition is accompanied by the emission of energy?  $high \rightarrow low$   
 A) 2s to 2p B) 3p to 4p C) 1s to 2s D) 3p to 3s (circled)
- 23) What is the atomic number of an atom with six valence electrons?  $Group 16$   
 A) 10 B) 12 C) 6 D) 8 (circled)
- 24) The total number of orbitals found in an f sublevel is  
 A) 1 B) 5 C) 3 D) 7 (circled)
- 25) An atom in the ground state contains 8 valence electrons. This atom is classified as a  
 A) halogen B) metal C) semimetal D) noble gas (circled)
- 26) The chemical properties of an atom are related to the number of its  
 A) nucleons B) valence electrons (circled) C) neutrons D) stable isotopes
- 27) Which electron configuration contains three half-filled orbitals?  $p^3 \quad \uparrow \uparrow \uparrow$   
 A)  $1s^2 2s^2 2p^3$  (circled) B)  $1s^2 2s^2 2p^6$  C)  $1s^2 2s^2 2p^5$  D)  $1s^2 2s^2 2p^4$
- 28) What is the electron configuration of a gold atom in the ground state?  
 A) 2-8-18-32-18-1 (circled) B) 2-8-18-31-18-2 C) 2-8-18-32-18-2 D) 2-8-18-18-1
- 29) As an electron moves from its ground state to an excited state, the potential energy of the atom  
 A) decreases B) remains the same C) increases (circled)
- 30) Which atom in the ground state has three unpaired electrons in its outermost principal energy level?  
 A) N  $1s^2 2s^2 2p^3$  (circled) B) Li C) B D) Ne
- 31) Which of the following 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)  $1s^2 2s^2 2p^6 3s^2 3p^6$  C)  $1s^2 2s^2 2p^4$  (circled) D)  $1s^2 2s^2 2p^6$
- 32) In which sublevel would an electron have the highest energy?  
 A) f (circled) B) 4s C) 4d D) 4p
- 33) The characteristic spectral lines of elements are caused when electrons in an excited atom move from  
 A) higher to lower energy levels, releasing energy (circled) B) lower to higher energy levels, releasing energy C) higher to lower energy levels, absorbing energy D) lower to higher energy levels, absorbing energy
- 34) What principal energy level has no f sublevel?  
 A) 5 B) 6 C) 3 (circled) D) 4
- 35) Which principal energy level change by the electron of a hydrogen atom will cause the greatest amount of energy to be absorbed?  
 A)  $n=2$  to  $n=4$  B)  $n=5$  to  $n=2$  C)  $n=4$  to  $n=2$  D)  $n=2$  to  $n=5$  (circled)

36) C An element has an atomic number of 18. What is the principal quantum number ( $n$ ) of its outermost electrons? 2-8-8 Argon  
 A) 1 B) 2 C) 3 D) 4

A An atom in the ground state has 7 valence electrons. Which electron configuration could represent this atom in the ground state?

38) C Which principal energy level can hold a maximum of 18 electrons? 2-7-7 excited  
 A) 2-8-7 ~~B) 2-5~~ C) 3  $2(3)^2 = 18$  ~~D) 1-7 excited state~~

D 39) In an atom, the  $s$  sublevel has  
 A) 5 B) 2 C) 3 D) 4

B 40) The total number of completely filled orbitals in an atom of nitrogen in the ground state is  
 A) 3 orbitals B) 5 orbitals C) 7 orbitals D) 1 orbital

The total number of completely filled orbitals in an atom of nitrogen in the ground state is  
 A) 1 B) 2 C) 3 D) 5



