

For answers, send email to: [admin@tutor-homework.com](mailto:admin@tutor-homework.com).

**Include file name:** Chemistry\_Worksheet\_0114

Price: \$5

(c) 2012 [www.tutor-homework.com](http://www.tutor-homework.com): Tutoring, homework help, help with online classes.

- Which of the following statements is correct for an electron that has the quantum numbers  $n = 4$  and  $m_l = -2$ ?
  - the electron may be in a p orbital
  - the electron may be in a d orbital
  - the electron is in the second principal shell
  - the electron must have a spin quantum number  $m_s = +\frac{1}{2}$
  
- The set of quantum numbers,  $n = 4, l = 3, m_l = 2$ 
  - describes an electron in a 3p orbital
  - is not allowed
  - describes an electron in a 4d orbital
  - describes one of seven orbitals of a similar type
  
- Which of the following statements is correct for an electron that has the quantum numbers  $n = 5$  and  $m_l = -4$ ?
  - the electron may be in a f orbital
  - the electron must have a spin quantum number  $m_s = -1/2$
  - the electron may be in a p orbital
  - none of the above
  
- Identify the subshell in which electrons with the quantum numbers  $n = 3, l = 2$  may be found.
  - 3d
  - 4f
  - 4d
  - 3p
  
- What type of orbital is occupied by an electron with the quantum numbers  $n = 4, l = 1$ . How many orbitals of this type are found in a multi-electron atom?
  - 4p, 3
  - 4s, 1
  - 4p, 6
  - 4s, 2

6. Identify the subshell in which electrons with the quantum numbers  $n = 6, l = 1$  may be found.
- A. 6p
  - B. 3d
  - C. 6f
  - D. 5p
7. Consider the sulfur atom. For how many electrons does this atom have  $n = 2$  and  $l = 1$ ?
- A. 2
  - B. 4
  - C. 6
  - D. 8
8. Consider the argon atom. For how many electrons does this atom have  $m_l = 1$  and  $m_s = +1/2$ ?
- A. 0
  - B. 1
  - C. 2
  - D. 4
9. Consider the chlorine atom. For how many electrons does this atom have  $n = 3$  and  $l = 0$ ?
- A. 2
  - B. 4
  - C. 6
  - D. 8
10. Identify the subshell in which electrons with the quantum number  $n = 5, l = 4$  are found.
- A. 5d
  - B. 5f
  - C. 4f
  - D. 5g
11. Give the corresponding atomic orbital designations for electrons with the following quantum numbers.

	n	l	$m_l$	$m_s$
1)	3	2	0	-

				1/2
2)	5	3	-1	- 1/2
3)	4	1	+1	- 1/2

- A. 3p,5d,3s
- B. 2d,5f,4p
- C. 2d,5d,4p
- D. 3d,5f,4p

12. Give the corresponding atomic orbital designations for electrons with the following quantum numbers;

	n	l	$m_l$	$m_s$
1)	2	1	0	- 1/2
2)	5	3	-1	- 1/2
3)	3	2	+1	- 1/2

- A. 2p,5f,3p
- B. 2s,5d,3p
- C. 2p,5d,3p
- D. 2p,5f,3d

13. Which of the following sets of quantum numbers is not allowed?

- A.  $n = 3, l = 1, m_l = -1, m_s = +\frac{1}{2}$
- B.  $n = 2, l = 1, m_l = 0, m_s = +\frac{1}{2}$
- C.  $n = 3, l = 0, m_l = 0, m_s = +\frac{1}{2}$
- D.  $n = 2, l = 2, m_l = -1, m_s = -\frac{1}{2}$

14. Which of the following sets of quantum numbers is not allowed?

- A.  $n = 3, l = 1, m_l = -1$
- B.  $n = 2, l = 0, m_l = 0$
- C.  $n = 3, l = 2, m_l = -3$
- D.  $n = 2, l = 1, m_l = 0$

15. Which of the following sets of quantum numbers are not allowed for an electron in an atom?

	n	l	m <sub>l</sub>	m <sub>s</sub>
1)	2	1	0	+1/2
2)	2	3	+1	-1/2
3)	3	2	-2	-1/2
4)	2	2	0	+1/2
5)	2	1	0	+1/2

- A. 1, 3, 5
- B. 2, 4
- C. 2, 4, 5
- D. 3, 4

16. Elements of a group in the periodic table \_\_\_\_\_

- A. have similar chemical properties.
- B. are isotopes.
- C. are also called a period.
- D. have consecutive atomic numbers

17. A horizontal row in the periodic table containing a sequence of elements is a \_\_\_\_\_

- A. period
- B. group
- C. family
- D. subgroup

18. What would be the atomic number of an element that might have one electron in the 6f subshell?

- A. 109
- B. 12
- C. 127
- D. 118
- E. None of the above

19. Which of the following electron configurations is correct for cobalt, (atomic number 27)?

- A. [Ar]5s<sup>2</sup>4d<sup>7</sup>
- B. [Ar]4s<sup>2</sup>3d<sup>7</sup>
- C. [Ar]4s<sup>2</sup>4d<sup>9</sup>
- D. [Kr]4s<sup>2</sup>3d<sup>7</sup>

20. Which of the following electron configurations is correct for sulfur, (atomic number 16)?

- A.  $1s^2 2s^2 2p^6 3s^4 3p^2$
- B.  $1s^2 2s^2 2p^6 3s^2 3p^4$
- C.  $1s^2 2s^2 2p^6 3s^2 3p^2$
- D.  $1s^2 2s^2 2p^6 3s^4 3p^4$

21. Which of the following electron configurations is correct for iron, (atomic number 26)?

- A.  $[\text{Kr}]4s^1 4d^7$
- B.  $[\text{Kr}]4s^1 3d^6$
- C.  $[\text{Ar}]4s^2 3d^6$
- D.  $[\text{Kr}]4s^2 3d^6$

22. Consider the chlorine atom. For how many electrons does this atom have  $n = 3$  and  $l = 0$ ?

- A. 2
- B. 4
- C. 6
- D. 8

23. Consider the argon atom. For how many electrons does this atom have  $ml = 1$ ?

- A. 0
- B. 1
- C. 2
- D. 4

24. Which of the following elements has the smallest electron affinity?

- A. F(9)
- B. B(5)
- C. N(7)
- D. C(6)

25. Which of the following elements has the largest electron affinity?

- A. N(7)
- B. Na(11)

- C. O(8)
- D. F(9)

1. Consider the following elements and arrange them in order of increasing number of electrons depicted in electron dot symbols. Which one occupies the intermediate position in the series? P-5, Se-6, Si-4, I-7, and B-3

- A. P
- B. B
- C. Si
- D. I

2. Consider the following elements and select the one which has the smallest number of electrons shown in an electron dot symbol. Al-3, Se-6, Si-4, Sb-5 and Br-7

- A. Al
- B. Br
- C. Si
- D. Sb

3. Consider the following species. Which contain an odd number of electrons?  $\text{BrO}_3$ ,  $\text{HO}_2^-$ ,  $\text{N}_2\text{O}$ ,  $\text{SO}_3$  and  $\text{SO}_3^{2-}$

- A. 2 and 5
- B. only 2
- C. 3 and 4
- D. only 1

4. Consider the following species. Which contain an odd number of electrons?  $\text{O}$ ,  $\text{O}^{2-}$ ,  $\text{O}_2^{2-}$ ,  $\text{O}_2^-$  and  $\text{O}_3$

- A. only 3
- B. only 2
- C. 2 and 3
- D. only 4

5. Consider the following species. Which contain an odd number of electrons?  $\text{NO}_2$ ,  $\text{CO}$ ,  $\text{O}_3^-$ ,  $\text{O}_2^{2-}$  and  $\text{SO}_2$

- A. 2 and 4
- B. 2 and 5
- C. 2, 4 and 5
- D. 1 and 3

6. Write resonance structures for  $\text{NO}_2^-$  and  $\text{NO}_3^-$ . Based on these structures one can

- conclude that
- A. both have the same bond length
  - B.  $\text{NO}_2^-$  has longer bonds than  $\text{NO}_3^-$
  - C.  $\text{NO}_2^-$  has shorter bonds than  $\text{NO}_3^-$
  - D. bond lengths are variable in both compounds
7. The ion,  $\text{CS}_3^{2-}$  consists of a central carbon atom bonded to the three other atoms. Write a resonance form conforming to the Lewis octet rule and determine the number of double bonds in this species.
- A. zero
  - B. three
  - C. two
  - D. one
8. Write resonance structures for  $\text{SO}_2$  and  $\text{SO}_3$ . Based on these structures one can conclude that
- A. both have the same bond length
  - B.  $\text{SO}_2$  has longer bonds than  $\text{SO}_3$
  - C.  $\text{SO}_2$  has shorter bonds than  $\text{SO}_3$
  - D. bond lengths are variable in both compounds
9. What types of hybrid orbitals are involved in bonding of  $\text{BH}_4^-$ ?
- A. sp
  - B.  $\text{sp}^2$
  - C.  $\text{sp}^3$
  - D.  $\text{dsp}^3$
10. What types of hybrid orbitals are involved in bonding of  $\text{BCl}_3$ ?
- A. sp
  - B.  $\text{sp}^2$
  - C.  $\text{sp}^3$
  - D.  $\text{dsp}^3$
11. What types of hybrid orbitals are involved in bonding of  $\text{PCl}_5$ ?
- A. sp
  - B.  $\text{sp}^2$
  - C.  $\text{sp}^3$

D.  $dsp^3$

12. Which of the species in the following list is tetrahedral?



A. 1 and 3

B. 1 and 4

C. 1 only

D. 2 and 3

13. Which of the species in the following list is square planar?



A. 2 and 3

B. 3 only

C. 1 only

D. 1 and 4

14. Which of the following molecules is nonlinear?

A. HCN

B.  $C_2H_2$

C.  $SO_2$

D.  $CO_2$

15. Which of the following elements has the smallest electron affinity?

A. N(7)

B. B(5)

C. C(6)

D. F(9)

16. The largest of the following species is:

A.  $As^{3-}$

B.  $Se^{2-}$

C.  $S^{2-}$



D. Br

17. Draw the Lewis formula for  $\text{IF}^{2+}$ . How many lone pair(s) of electrons are there in the valence shell of the central atom?
- A. 0
  - B. 1
  - C. 2
  - D. 3
18. Draw the Lewis formula for  $\text{NF}^{4+}$ . I'm pretty sure they mean  $\text{NF}_4^+$ . How many lone pair(s) of electrons are there in the valence shell of the central atom?
- A. 0
  - B. 1
  - C. 2
  - D. 3
19. Draw the Lewis formula for  $\text{PF}_3$ . How many lone pair(s) of electrons are there in the valence shell of the central atom?
- A. 0
  - B. 1
  - C. 2
  - D. 3
20. The bond angles in  $\text{BCl}_3$  are:
- A. exactly  $109.5^\circ$
  - B. slightly less than  $109.5^\circ$
  - C. slightly less than  $90^\circ$
  - D. exactly  $120^\circ$
21. The bond angles in  $\text{IF}^{4-}$  are:
- A. slightly less than  $109.5^\circ$
  - B. slightly less than  $90^\circ$
  - C. exactly  $109.5^\circ$
  - D. exactly  $90^\circ$
22. The bond angles in  $\text{IF}^{2+}$  are:
- A. exactly  $109.5^\circ$
  - B. exactly  $120^\circ$

- C. slightly less than  $90^\circ$   
D. slightly less than  $109.5^\circ$
23. Calculate the  $H_o$  for the following reaction using the given bond energies. (H-Cl = 431 kJ; O-O = 494 kJ; H-O = 463, Cl-Cl = 243).  
 $4 \text{HCl(g)} + \text{O}_2\text{(g)} \rightarrow 2 \text{H}_2\text{O(g)} + 2 \text{Cl}_2\text{(g)}$   
A. -102  
B. -120  
C. -139  
D. -152
24. Use the following bond energies to calculate  $H_o$  for the given reaction. (H - C = 414; C - C = 347; C = C = 619; H - O = 464; C - O = 351).  
 $\text{CH}_3\text{CH}_3\text{(g)} + \text{H}_2\text{O(g)} \rightarrow \text{CH}_3\text{CH}_2\text{OH(g)}$  The reaction isn't balanced!!!!  
 $\text{CH}_2\text{CH}_2\text{(g)} + \text{H}_2\text{O(g)} \rightarrow \text{CH}_3\text{CH}_2\text{OH(g)}$  For this reaction I get -29.  
A. -22  
B. -33  
C. -45  
D. -56
25. Calculate the  $H_o$  for the following reaction using the given bond energies. (C - H = 414 kJ; F - F = 155 kJ; H - F = 431, C - F = 485).  
 $\text{CH}_4\text{(g)} + 4 \text{F}_2\text{(g)} \rightarrow \text{CF}_4\text{(g)} + 4 \text{HF(g)}$   
A. -1388  
B. -1422  
C. -1542  
D. -1598