Electron Configurations and the Periodic Table Multiple Choice Review

Quantum Theory

Principal Quantum Number

1. __________ orbitals are spherically symmetrical.
   A) s  
   B) p  
   C) d  
   D) f  
   E) g

2. All of the orbitals in a given electron shell have the same value of the __________ quantum number.
   A) Principal  
   B) Angular  
   C) Magnetic  
   D) Spin  
   E) Psi

Angular Quantum Number

3. The __________ quantum number defines the shape of an orbital.
   A) Spin  
   B) Magnetic  
   C) Principal  
   D) Angular  
   E) Phi

4. The n = 1 shell contains __________ p sub-orbitals. All the other shells contain __________ p sub-orbitals.
   A) 3, 6  
   B) 0, 3  
   C) 6, 2  
   D) 3, 3  
   E) 0, 6

5. There are __________ orbitals in the second shell.
   A) 1  
   B) 2  
   C) 4  
   D) 8  
   E) 9
6. The lowest energy shell that contains d orbitals is the shell with n = ______.
   A) 3
   B) 2
   C) 4
   D) 1
   E) 5

7. The principal quantum number of the first d orbital is ______.
   A) 1
   B) 2
   C) 3
   D) 4
   E) 0

8. Which of the orbitals below do not exist due to the constraints upon the angular quantum number?
   A) 3f
   B) 2s
   C) 2p
   D) all of the above
   E) none of the above

9. Which of the orbitals below do not exist due to the constraints upon the angular quantum number?
   A) 4f
   B) 4d
   C) 4p
   D) 4s
   E) none of the above

10. Which one of the following is an incorrect orbital notation?
    A) 4f
    B) 2d
    C) 3s
    D) 2p
    E) 3d
Magnetic Quantum Number

11. There are __________sub-orbitals in the 3rd shell.
   A) 25
   B) 4
   C) 9
   D) 16
   E) 1

12. All of the sub-orbitals in a given orbital have the same value of the __________ quantum number.
   A) Principal
   B) Angular
   C) Magnetic
   D) A and B
   E) B and C

Spin Quantum Number

13. The p-orbital can accommodate a maximum of __________ electrons.
   A) 6
   B) 2
   C) 10
   D) 3
   E) 5

14. How many quantum numbers are necessary to designate a particular electron in an atom?
   A) 3
   B) 4
   C) 2
   D) 1
   E) 5

Energy Level Diagram

15. At a maximum, an f-orbital can hold_____ electrons, a d-orbital can hold_____ electrons and a p-orbital can hold ________ electrons.
   A) 14, 10, 6
   B) 2, 8, 18
   C) 14, 8, 2
   D) 2, 12, 21
   E) 2, 6, 10
16. The lowest orbital energy is reached when the number of electrons with the same spin is maximized. This statement describes __________.

   A) Pauli Exclusion Principle
   B) Planck’s constant
   C) deBroglie hypothesis
   D) Heisenberg Uncertainty Principle
   E) Hund’s rule

17. Which one of the following is the correct electron configuration for a ground-state nitrogen atom?

   A) 
   
   B) 
   
   C) 
   
   D) 
   
   E) None of the above is correct.

18. Which electron configuration denotes an atom in its ground state?

   A) 
   
   B) 
   
   C)
19. Which electron configuration represents a violation of the Aufbau Principle?

A)  
B)  
C)  
D)  
E)  

20. Which electron configuration represents a violation of the Aufbau Principle?

A)  
B)  
C)  
D)  
E)  

21. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A)
22. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A) 

B) 

C) 

D) 

E) 

23. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A) 

B) 

C)
24. Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

A)  

B)  

C)  

D)  

E)  

25. Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

A)  

B)  

C)  

D)  

E)  

26. Which electron configuration represents a violation of Hund's rule for an atom in its
27. Which two elements have the same ground-state electron configuration?
   A) I and S  
   B) Cu and Ag  
   C) Li and Na  
   D) Cl and Ar  
   E) No two elements have the same ground-state electron configuration.

28. How many different principal quantum numbers can be found in the ground state electron configuration of ruthenium?
   A) 2  
   B) 3  
   C) 5  
   D) 4  
   E) 6

29. The ground state electron configuration of Fe is ______________.
   A) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁶  
   B) 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 3d⁶  
   C) 1s² 2s² 2p⁶ 3s² 3p⁶ 4s²  
   D) 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 4d⁶
30. The ground state electron configuration of Ga is __________.
   A) 1s^2 2s^2 3s^2 3p^6 3d^{10} 4s^2 4p^1
   B) 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^1
   C) 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1
   D) 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4d^1
   E) [Ar] 4s^2 3d^{11}

31. The 2p orbital in the ground state of atomic Neon contains __________ electrons.
   A) 2
   B) 6
   C) 8
   D) 10
   E) 36

32. The second shell in the ground state of atomic argon contains __________ electrons.
   A) 2
   B) 6
   C) 8
   D) 18
   E) 36

33. The ______ orbital is partially filled in Manganese atom.
   A) 3s
   B) 4s
   C) 4p
   D) 3d
   E) 4d

**Noble Gas Shortcut**

34. The ground state configuration of Ne is __________.
   A) [He] 2s^2 2p^2
   B) [He] 2s^2 2p^3
   C) [He] 2s^2 2p^4
   D) [He] 2s^2 2p^5
   E) [F] 2s^2 2p^6

E) 1s^2 2s^2 3s^2 3p^10
35. The ground state configuration of iodine is _________.
   A) [Ar] 4s² 3d³
   B) [Xe] 6s² 4f¹⁴ 5d⁴
   C) [Ne] 3s¹
   D) [Xe] 6s² 4f⁷
   E) [Kr] 5s² 4d¹⁰ 5p⁵

36. Which is the correct ground-state electron configuration for silver?
   A) [Kr] 5s² 4d⁹
   B) [Kr] 5s¹ 4d¹⁰
   C) [Kr] 5s² 4d¹⁰
   D) [Xe] 5s² 4d⁹
   E) [Xe] 5s¹ 4d¹⁰

37. The ground-state electron configuration of the element __________ is [Kr] 5s¹ 4d⁵.
   A) Nb
   B) Mo
   C) Cr
   D) Mn
   E) Tc

38. The ground-state electron configuration of __________ is [Ar] 4s¹ 3d⁵.
   A) V
   B) Mn
   C) Fe
   D) Cr
   E) K

39. The principal quantum number for the outermost electrons in a iodine atom in the ground state is
   A) 2
   B) 3
   C) 5
   D) 4
   E) 1
Exceptions

40. Which of the following elements has a ground-state electron configuration different from the predicted one?
   A) Cu
   B) Ca
   C) Xe
   D) Cl
   E) Ti

Periodic Table

41. Horizontal rows of the periodic table are known as __________.
   A) Periods
   B) Groups
   C) Metalloids
   D) Metals
   E) Nonmetals

42. Vertical columns of the periodic table are known as __________.
   A) Metals
   B) Periods
   C) Nonmetals
   D) Groups
   E) Metalloids

43. Elements __________ exhibit similar physical and chemical properties.
   A) with similar chemical symbols
   B) with similar atomic masses
   C) in the same period of the periodic table
   D) on opposite sides of the periodic table
   E) in the same group of the periodic table

44. Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties?
   A) H, Li
   B) Cs, Sr
   C) C, Si
   D) Ga, Ge
   E) C, O

45. Which pair of elements would you expect to exhibit the greatest similarity in their
physical and chemical properties?
A) As, Sb
B) C, N
C) K, Ca
D) H, He
E) Si, P

46. Which pair of elements below should be the most similar in chemical properties?
A) C and O
B) B and As
C) I and Br
D) K and Kr
E) Cs and He

47. In the periodic table, the elements are arranged in __________.
A) alphabetical order
B) order of increasing atomic number
C) order of increasing metallic properties
D) order of increasing neutron content
E) reverse alphabetical order

Periodic Families

48. Elements in Group 1 are known as the __________.
A) Oxygen Family
B) Alkaline Earth Metals
C) Alkali Metals
D) Halogens
E) Noble Gases

49. Elements in Group 2 are known as the __________.
A) Alkaline Earth Metals
B) Alkali Metals
C) Oxygen Family
D) Halogens
E) Noble Gases
50. Elements in Group 17 are known as the __________.
   A) Oxygen Family
   B) Alkali Metals
   C) Alkaline Earth Metals
   D) Halogens
   E) Noble Gases

51. Elements in Group 18 are known as the __________.
   A) Halogens
   B) Alkali Metals
   C) Alkaline Earth Metals
   D) Oxygen Family
   E) Noble Gases

52. The elements in groups 1, 16, and 17 are called, __________, respectively.
   A) Alkaline Earth Metals, Halogens, and Oxygen Family
   B) Alkali Metals, Oxygen Family, and Halogens
   C) Alkali Metals, Halogens, and Noble Gases
   D) Alkaline Earth Metals, Transition Metals, and Halogens
   E) Halogens, Transition Metals, and Alkali Metals

53. Which of the following elements is a metalloid?
   A) B
   B) C
   C) Ga
   D) Se
   E) In

54. Copper is a __________ and helium is a __________.
   A) Metal, Nonmetal
   B) Metal, Metal
   C) Metal, Metalloid
   D) Metalloid, Nonmetal
   E) Nonmetal, Metal

55. Sulfur is a __________ and nitrogen is a __________.
   A) Metal, Metalloid
   B) Nonmetal, Metal
   C) Metalloid, Metalloid
D) Nonmetal, Nonmetal
E) Nonmetal, Metalloid

56. Calcium is a _________ and silver is a _________.
   A) Nonmetal, Metal
   B) Metal, Metal
   C) Metalloid, Metal
   D) Metal, Metalloid
   E) Nonmetal, Metalloid

57. Elements in group _________ have an ns^2 np^6 electron configuration in the outer shell.
   A) 1
   B) 2
   C) 17
   D) 18
   E) 12

58. Which group in the periodic table contains elements with the valence electron configuration of ns^2 np^1?
   A) 1
   B) 2
   C) 12
   D) 13
   E) 17
MC Answer Key

1) A
2) A
3) D
4) B
5) B
6) A
7) C
8) A
9) E
10) B
11) C
12) D
13) A
14) B
15) A
16) E
17) D
18) D
19) C
20) C
21) D
22) B
23) C
24) C
25) B
26) D
27) E
28) C
29) B
30) C
31) B
32) C
33) D
34) D
35) E
36) B
37) B
38) D
39) C
40) A
41) A
42) D
43) E
44) C
45) A
46) C
47) B
48) C
49) A
50) D
51) E
52) B
53) A
54) A
55) D
56) B
57) D
58) D
59) A
60) A

a.  

1s  2s  2p
  ↑↓  ↑↑  ↑↓