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 <u>not</u> 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 <u>not</u> 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

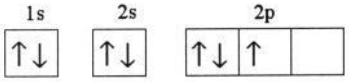
14. How many quantum numbers are necessary to designate a particular electron in an atom?
    A) 3
    B) 4
    C) 2
    D) 1
    E) 5

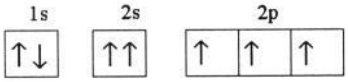
Energy Level Diagram

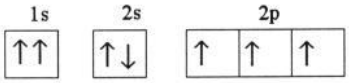
15. At a maximum, an f-orbital can hold_____ electrons, a d-orbital can hold_____ electrons and a p-orbital can hold _____ electrons.
    A) 14, 10, 6
    B) 2, 8, 18
    C) 14, 8, 2
    D) 2, 12, 21
    E) 2, 6, 10

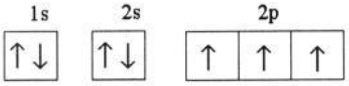
16. The lowest orbital energy is reached when the number of electrons with the same spin is maximized. This statement describes _____.
    A) Pauli Exclusion Principle
    B) Planck's constant
    C) deBroglie hypothesis
    D) Heisenberg Uncertainty Principle
    E) Hund's rule

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

A) 

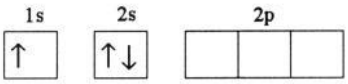
B) 

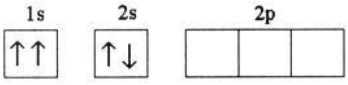
C) 

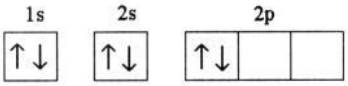
D) 

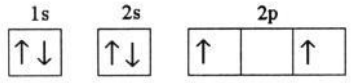
    E) None of the above is correct.

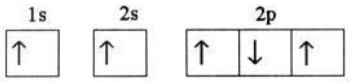
18. Which electron configuration denotes an atom in its ground state?

A) 

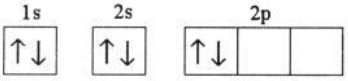
B) 

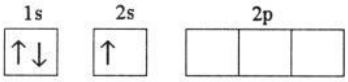
C) 

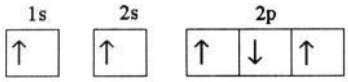
D) 

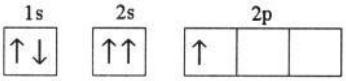
E) 

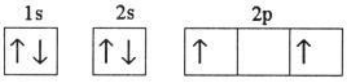
19. Which electron configuration represents a violation of the Aufbau Principle?

A) 

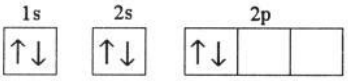
B) 

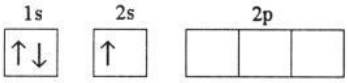
C) 

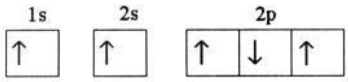
D) 

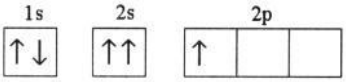
E) 

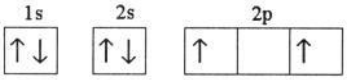
20. Which electron configuration represents a violation of the Aufbau Principle?

A) 

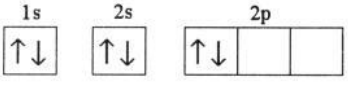
B) 

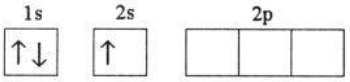
C) 

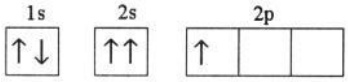
D) 

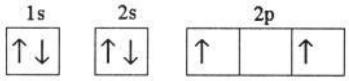
E) 

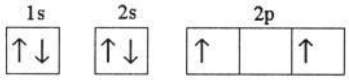
21. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A) 

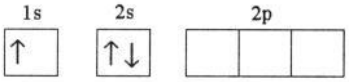
B) 

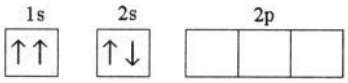
C) 

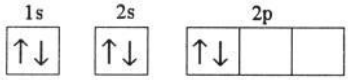
D) 

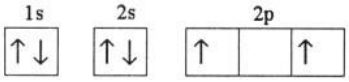
E) 

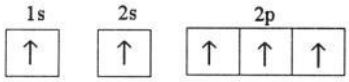
22. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A) 

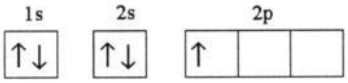
B) 

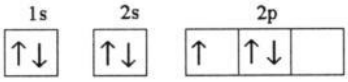
C) 

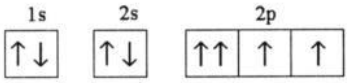
D) 

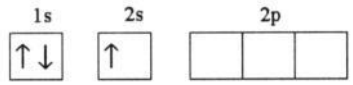
E) 

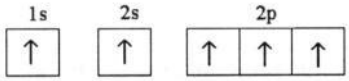
23. Which electron configuration represents a violation of the Pauli Exclusion Principle?

A) 

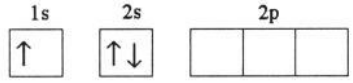
B) 

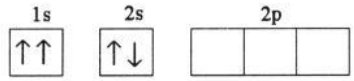
C) 

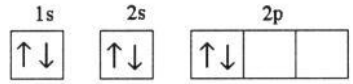
D) 

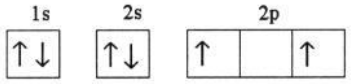
E) 

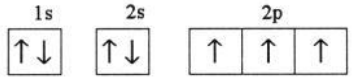
24. Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

A) 

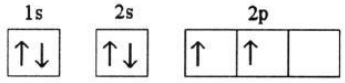
B) 

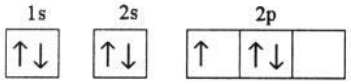
C) 

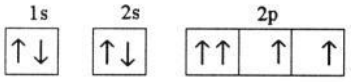
D) 

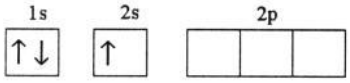
E) 

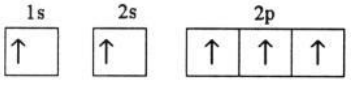
25. Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

A) 

B) 

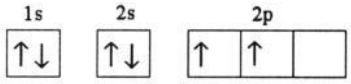
C) 

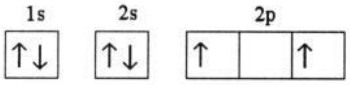
D) 

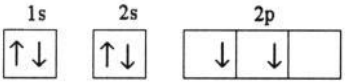
E) 

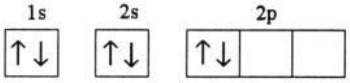
26. Which electron configuration represents a violation of Hund's rule for an atom in its

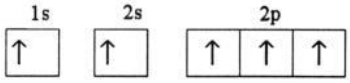
ground state?

A) 

B) 

C) 

D) 

E) 

Aufbau

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) $1s^2\ 2s^2\ 3s^2\ 3p^6\ 3d^6$
    B) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$
    C) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
    D) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 4d^6$

E) $1s^2\ 2s^2\ 3s^2\ 3p^{10}$

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] $2s^2\ 2p^6$
    E) [F] $2s^2\ 2p^6$

35. The ground state configuration of iodine is _____.

A) [Ar] $4s^2\ 3d^3$
B) [Xe] $6s^2\ 4f^{14}\ 5d^4$
C) [Ne] $3s^1$
D) [Xe] $6s^2\ 4f^7$
E) [Kr] $5s^2\ 4d^{10}\ 5p^5$

36. Which is the correct ground-state electron configuration for silver?

A) [Kr] $5s^2\ 4d^9$
B) [Kr] $5s^1\ 4d^{10}$
C) [Kr] $5s^2\ 4d^{10}$
D) [Xe] $5s^2\ 4d^9$
E) [Xe] $5s^1\ 4d^{10}$

37. The ground-state electron configuration of the element _____ is [Kr] $5s^1\ 4d^5$.

A) Nb
B) Mo
C) Cr
D) Mn
E) Tc

38. The ground-state electron configuration of _____ is [Ar] $4s^1\ 3d^5$.

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

a.