

**Chemistry: The Periodic Table and Periodicity**

*Directions: Answer each of the following questions. You need not use complete sentences.*

1. Who first published the classification of the elements that is the basis of our periodic table today?

**DMITRI MENDELEEV**

2. By what property did Mendeleev arrange the elements?

**ATOMIC MASS**

3. By what property did Moseley suggest that the periodic table be arranged?

**ATOMIC NUMBER**

4. What is the periodic law?

**THE PROPERTIES OF THE ELEMENTS REPEAT PERIODICALLY**

5. What is a period? How many are there in the periodic table?

**A HORIZONTAL ROW IN THE PERIODIC TABLE; 7**

6. What is a group (also called a family)? How many are there in the periodic table?

**A VERTICAL COLUMN IN THE PERIODIC TABLE; 18**

7. State the number of valence electrons in an atom of:

- |                |                 |                  |                 |
|----------------|-----------------|------------------|-----------------|
| a. sulfur<br>6 | b. calcium<br>2 | c. chlorine<br>7 | d. arsenic<br>5 |
|----------------|-----------------|------------------|-----------------|

8. Give the names and chemical symbols for the elements that correspond to these atomic numbers:

- |                   |                    |                      |                      |
|-------------------|--------------------|----------------------|----------------------|
| a. 10<br>Ne, NEON | b. 18<br>Ar, ARGON | c. 36<br>Kr, KRYPTON | d. 90<br>Th; THORIUM |
|-------------------|--------------------|----------------------|----------------------|

9. List, by number, both the period and group of each of these elements.

	<u>Symbol</u>	<u>Period</u>	<u>Group</u>
a. beryllium	Be	2	2
b. iron	Fe	4	8
c. lead	Pb	6	14

10. Which of the following pairs of elements belong to the same period?

- |                     |              |              |              |
|---------------------|--------------|--------------|--------------|
| <b>a. Na and Cl</b> | b. Na and Li | c. Na and Cu | d. Na and Ne |
|---------------------|--------------|--------------|--------------|

11. Which of the following pairs of elements belong to the same group?

- |             |              |                    |              |
|-------------|--------------|--------------------|--------------|
| a. H and He | b. Li and Be | <b>c. C and Pb</b> | d. Ga and Ge |
|-------------|--------------|--------------------|--------------|

12. How does an element's period number relate to the number of the energy level of its valence electrons?

**PERIOD NUMBER = ENERGY LEVEL OF VALENCE ELECTRONS**

13. What are the transition elements?

**GROUPS 3-12**

14. In what type of orbitals are the actinide and lanthanide electrons found?

**f ORBITALS**

15. Would you expect strontium to be, chemically, more similar to calcium or rubidium and WHY?

**Ca; BOTH Ca AND Sr HAVE TWO VALENCE ELECTRONS**

16. What are the coinage elements?

**GROUP 11; Cu, Ag, Au**

17. What is the heaviest noble gas? What is the heaviest alkaline earth metal?

**RADON (Rn); RADIUM (Ra)**

18. In going from top to bottom of any group, each element has ONE more occupied energy level(s) than the element above it.

19. What are the Group 1 elements called? **ALKALI METALS**

20. What are the Group 2 elements called? **ALKALINE EARTH METALS**

21. What are the Group 17 elements called? **HALOGENS**

22. What are the Group 18 elements called? **NOBLE GASES**

23. What is the name given to the group of elements that have the following valence shell electron configurations?

a.  $s^2$

**ALKALINE EARTH METALS**

b.  $s^2p^6$

**NOBLE GASES**

c.  $s^2p^5$

**HALOGENS**

d.  $s^1$

**ALKALI METALS**

24. List the three lightest members of the noble gases.

**He, Ne, Ar**

25. List all of the alkali metals.

**Li, Na, K, Rb, Cs, Fr**

26. Which alkali metal belongs to the sixth period? **Cs**

27. Which halogen belongs to the fourth period? **Br**

28. What element is in the fifth period and the eleventh group? **Ag**

29. Why do all the members of a group have similar properties?

**THEY HAVE THE SAME NUMBER OF VALENCE ELECTRONS**

30. What do we mean by the "atomic radius?" **THE SIZE OF A NEUTRAL ATOM**

31. Within a group, what happens to the atomic radius as you go down the column?

**INCREASES**

32. Explain your answer to Question 31: Why does the atomic radius change?

**ELEMENT BELOW HAS ONE MORE ENERGY LEVEL THAN ELEMENT ABOVE**

33. What is coulombic attraction?

**ATTRACTION OF (+) AND (-) CHARGES**

34. Within a period, what happens to the atomic radius as the atomic number increases?

**DECREASES**

35. Explain your answer to Question 34: Why does the atomic radius change?

**NO ADDITIONAL ENERGY LEVELS, BUT MORE (+) AND (-) CHARGES = MORE PULL**

36. What two factors determine the strength of coulombic attraction?

**AMOUNT OF CHARGE; DISTANCE BETWEEN CHARGES**

37. What is the shielding effect? **KERNEL ELECTRONS "SHIELD" VALENCE ELECTRONS FROM ATTRACTIVE FORCE OF THE NUCLEUS; CAUSED BY KERNEL AND VALENCE ELECTRONS REPELLING EACH OTHER**

38. How are the shielding effect and the size of the atomic radius related?

**AS RADIUS INCREASES, SHIELDING EFFECT INCREASES  
(MORE SHELLS OF KERNEL  $e^-$  TO REPEL VALENCE  $e^-$ )**

39. How are neutral atoms converted into cations?

**LOSE ELECTRONS**

How are neutral atoms converted into anions?

**ACQUIRE ELECTRONS**

40. Metals usually form what type of ions?

**CATIONS**

Nonmetals usually form what type of ions?

**ANIONS**

41. What is ionization energy?

**THE ENERGY REQUIRED TO REMOVE AN ELECTRON FROM AN ATOM**

42. What is the equation that illustrates ionization energy, and what does each symbol represent?



43. What do we mean by the first, second, and third ionization energies for a particular atom?

**ENERGY REQ'D TO REMOVE THE 1<sup>ST</sup>, 2<sup>ND</sup>, AND 3<sup>RD</sup> ELECTRONS**

44. Why does each successive ionization require more energy than the previous one?

**(+) NUCLEUS HOLDS ON TIGHTER TO THE FEWER REMAINING ELECTRONS**

45. What is the general trend of ionization energy as you go from left to right across the periodic table?

**INCREASES**

46. What is the general trend of ionization energy as you go down a group on the periodic table?

**DECREASES**

47. Which of these elements has the highest first ionization energy: Sn, As, or S?

S

48. When an atom becomes an anion, what happens to its radius?

**BECOMES LARGER**

49. When an atom becomes a cation, what happens to its radius?

**BECOMES SMALLER**

50. For each of the following pairs, circle the atom or ion having the larger radius.

a. **S** or O

c. Na<sup>1+</sup> or **K<sup>1+</sup>**

e. **S<sup>2-</sup>** or O<sup>2-</sup>

b. **Ca** or Ca<sup>2+</sup>

d. Na or **K**

f. F or **F<sup>1-</sup>**

51. For each of the following pairs, identify the smaller ion.

a. K<sup>1+</sup> or **Ca<sup>2+</sup>**

c. **C<sup>4+</sup>** or C<sup>4-</sup>

e. O<sup>2-</sup> or **F<sup>1-</sup>**

b. **F<sup>1-</sup>** or Cl<sup>1-</sup>

d. S<sup>2-</sup> or **F<sup>1-</sup>**

f. Fe<sup>2+</sup> or **Fe<sup>3+</sup>**

52. Where, generally, are the metals located on the periodic table?

**ON THE LEFT**

53. Where, generally, are the nonmetals located on the periodic table?

**ON THE RIGHT**

54. A. List some properties of metals.

**GOOD CONDUCTORS; MALLEABLE; DUCTILE; LUSTROUS SOLIDS**

B. List some properties of nonmetals.

**GOOD INSULATORS; DULL, BRITTLE SOLIDS (OR GASES)**

C. What kinds of properties do metalloids have?

**PROPERTIES OF BOTH METALS AND NONMETALS**

55. What is electronegativity?

**THE TENDENCY FOR AN ATOM TO ATTRACT ELECTRONS TO ITSELF**

56. Who determined the scale of electronegativity most often used today?

**LINUS PAULING**

57. List the following atoms in order of increasing electronegativity: O, Al, Ca

**Ca < Al < O**

58. List the following atoms in order of decreasing electronegativity: Cl, K, Cu

**Cl > Cu > K**

59. What is the general trend of electronegativity as you go down the periodic table?

**DECREASES**

60. What is the general trend of electronegativity as you go left to right across the periodic table?

**INCREASES**