

Name: _____
Hour: _____ Date: _____

Chemistry: *The Periodic Table and Periodicity*

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

- Who first published the classification of the elements that is the basis of our periodic table today?
- By what property did Mendeleev arrange the elements?
- By what property did Moseley suggest that the periodic table be arranged?
- What is the periodic law?
- What is a period? How many are there in the periodic table?
- What is a group (also called a family)? How many are there in the periodic table?
- State the number of valence electrons in an atom of:
a. sulfur b. calcium c. chlorine d. arsenic
- Give the names and chemical symbols for the elements that correspond to these atomic numbers:
a. 10 b. 18 c. 36 d. 90
- 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 | | |
| b. iron | Fe | | |
| c. lead | Pb | | |
- Which of the following pairs of elements belong to the same period?
a. Na and Cl b. Na and Li c. Na and Cu d. Na and Ne
- Which of the following pairs of elements belong to the same group?
a. H and He b. Li and Be c. C and Pb d. Ga and Ge
- How does an element's period number relate to the number of the energy level of its valence electrons?

13. What are the transition elements?
14. In what type of orbitals are the actinide and lanthanide electrons found?
15. Would you expect strontium to be, chemically, more similar to calcium or rubidium and WHY?
16. What is the heaviest noble gas? What is the heaviest alkaline earth metal?
17. In going from top to bottom of any group, each element has _____ more occupied energy level(s) than the element above it.
18. What are the Group 1 elements called?
19. What are the Group 2 elements called?
20. What are the Group 17 elements called?
21. What are the Group 18 elements called?
22. What is the name given to the group of elements that have the following valence shell electron configurations?
 - a. s^2
 - b. s^2p^6
 - c. s^2p^5
 - d. s^1
23. List the three lightest members of the noble gases.
24. List all of the alkali metals.
25. Which alkali metal belongs to the sixth period?
26. Which halogen belongs to the fourth period?
27. What element is in the fifth period and the eleventh group?
28. Why do all the members of a group have similar properties?
29. What do we mean by the "atomic radius?"
30. Within a group, what happens to the atomic radius as you go down the column?
31. Explain your answer to Question 30: Why does the atomic radius change?

33. What is coulombic (nuclear charge) attraction?
34. Within a period, what happens to the atomic radius as the atomic number increases?
35. Explain your answer to Question 34: Why does the atomic radius change?
36. What two factors determine the strength of coulombic attraction?
37. What is the shielding effect?
38. How are the shielding effect and the size of the atomic radius related?
39. How are neutral atoms converted into cations? How are neutral atoms converted into anions?
40. Metals usually form what type of ions? Nonmetals usually form what type of ions?
41. What is ionization energy?
42. What do we mean by the first, second, and third ionization energies for a particular atom?
43. Why does each successive ionization require more energy than the previous one?
44. What is the general trend of ionization energy as you go from left to right across the periodic table?
45. What is the general trend of ionization energy as you go down a group on the periodic table?
46. Which of these elements has the highest first ionization energy: Sn, As, or S?
47. When an atom becomes an anion, what happens to its radius?

48. When an atom becomes a cation, what happens to its radius?
49. For each of the following pairs, circle the atom or ion having the larger radius.
- | | | |
|---------------------------|--|---------------------------------------|
| a. S or O | c. Na^{1+} or K^{1+} | e. S^{2-} or O^{2-} |
| b. Ca or Ca^{2+} | d. Na or K | f. F or F^{1-} |
50. For each of the following pairs, identify the smaller ion.
- | | | |
|--|---------------------------------------|---|
| a. K^{1+} or Ca^{2+} | c. C^{4+} or C^{4-} | e. O^{2-} or F^{1-} |
| b. F^{1-} or Cl^{1-} | d. S^{2-} or F^{1-} | f. Fe^{2+} or Fe^{3+} |
51. Where, generally, are the metals located on the periodic table?
52. Where, generally, are the nonmetals located on the periodic table?
53. A. List some properties of metals.
- B. List some properties of nonmetals.
- C. What kinds of properties do metalloids have?
54. What is electronegativity?
55. Who determined the scale of electronegativity most often used today?
56. List the following atoms in order of increasing electronegativity: O, Al, Ca
57. List the following atoms in order of decreasing electronegativity: Cl, K, Cu
58. What is the general trend of electronegativity as you go down the periodic table?
60. What is the general trend of electronegativity as you go left to right across the periodic table?

Name: KEY
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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 | b. calcium | c. chlorine | d. arsenic |
| 6 | 2 | 7 | 5 |

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

| | | | |
|-----------------|------------------|--------------------|--------------------|
| a. 10 | b. 18 | c. 36 | d. 90 |
| Ne, NEON | Ar, ARGON | Kr, KRYPTON | 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?

| | | | |
|---------------------|--------------|--------------|--------------|
| a. Na and Cl | 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 | c. C and Pb | 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?

$M + \text{ionization energy} \rightarrow M^{1+} + e^-$

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

ENERGY REQ'D TO REMOVE THE 1ST, 2ND, AND 3RD 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. Na¹⁺ or **K¹⁺**

e. **S²⁻** or O²⁻

b. **Ca** or Ca²⁺

d. Na or **K**

f. F or **F¹⁻**

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

a. K¹⁺ or **Ca²⁺**

c. **C⁴⁺** or C⁴⁻

e. O²⁻ or **F¹⁻**

b. **F¹⁻** or Cl¹⁻

d. S²⁻ or **F¹⁻**

f. Fe²⁺ or **Fe³⁺**

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