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**CHEMISTRY TEST: THE PERIODIC TABLE**

**Directions: Multiple Choice** For each of the following questions, choose the answer that **best** answers the question and place it on your answer sheet.

1. Which of the following statements is **false**?
  - a) In a family of elements, the largest atom has the lowest ionization energy.
  - b) In a row of elements, the metals have the lowest ionization energies.
  - c) Three half-filled orbitals produce an increase in the ionization energy.
  - d) It is easier to form a +2 ion than a +1 ion.
  
2. The properties of elements are periodic functions of their
  - a) atomic mass;
  - b) atomic number;
  - c) atomic diameter;
  - d) oxidation number;
  - e) atomic and ionic radii.
  
3. In its present form, the Periodic Law states that the chemical properties of elements are periodic functions of their
  - a) atomic mass;
  - b) atomic weight;
  - c) atomic number;
  - d) isotopic weight.
  
4. In the modern periodic table, the elements are arranged according to
  - a) electron structure;
  - b) symbols;
  - c) atom size;
  - d) reactivity;
  - e) the order they were discovered.
  
5. In which section of the periodic table are the most electronegative elements found?
  - a) upper left
  - b) lower left
  - c) upper right
  - d) lower right
  - e) island at bottom
  
6. The elements in the periodic table are arranged
  - a) in order of increasing atomic mass;
  - b) with all the gases first, followed by the solids;
  - c) according to the volume of the atoms;
  - d) in order of increasing atomic number.
  
7. In the Periodic Table the elements are arranged in the order of increasing
  - a) atomic weights;
  - b) atomic volumes;
  - c) atomic numbers;
  - d) atomic masses.

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8. The elements in group 2A, as compared with those in group 1A, have
  - a) higher ionization energies and higher electronegativities;
  - b) lower ionization energies and lower electronegativities;
  - c) lower ionization energies but higher electronegativities;
  - d) higher ionization energies but lower electronegativities.
  
9. Helium, neon, argon and krypton are in the same family of elements. This means that they
  - a) have similar chemical properties;
  - b) were discovered by the same person;
  - c) can be decomposed into similar substances;
  - d) have the same melting and boiling points.
  
10. The elements of the Noble Gas Family, except helium, have an outer shell of
  - a) 1 electron;
  - b) 2 electrons;
  - c) 8 electrons;
  - d) 18 electrons;
  - e) 32 electrons.
  
11. A vertical column of elements in the Periodic Table is known as a(n)
  - a) octave;
  - b) period;
  - c) series;
  - d) group;
  - e) triad.
  
12. A chemical family of elements contains elements with
  - a) identical chemical properties;
  - b) the same nuclear charge;
  - c) the same physical properties;
  - d) related chemical and physical properties.
  
13. In the same group of elements the ionization energy tends to decrease with increasing atomic number. This is due partially to the
  - a) decreasing size of the atom itself.
  - b) increasing forces of attraction.
  - c) outer electrons being closer to the nucleus.
  - d) outer electrons being farther from the nucleus.
  
14. Which group of elements in the ground (non-energized) state would have electrons with an  $s^2p^3$  configuration in the outermost shell?
  - a) VA
  - b) IIA
  - c) IIIA
  - d) IVA

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15. The element having atomic number 9 most closely resembles in physical and chemical properties the element having atomic number
- 10;
  - 11;
  - 17;
  - 35.
16. The element having atomic number 11 most closely resembles the element having atomic number
- 10;
  - 12;
  - 13;
  - 18;
  - 19.
17. Which group (family) of the Periodic Table has the elements with lowest first ionization energies?
- IA (alkali metals)
  - IIA (alkaline earths)
  - VIIIA (noble gases)
  - VA (nitrogen family)
18. A characteristic of **all** noble gases is that they all
- have eight electrons in the outer shell;
  - have low stability;
  - form many compounds;
  - have stable outer electron shells.
19. Members in the same family have similar properties because they all
- possess the same number of electrons;
  - have the same atomic radius;
  - react with non-metals;
  - readily form positive ions;
  - have identical number of valence electrons.
20. All the noble gas atoms have
- complete "s" orbitals;
  - complete "p" orbitals;
  - complete "s" and "p" orbitals;
  - half-filled orbitals.
21. Which of the following electron-energy-level distributions would belong to a noble gas?
- 2-1
  - 2-7
  - 2-8
  - 2-8-13-2
  - none of these

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22. Francium, in group 1A, is
- a very strong oxidizing agent;
  - the most electronegative element in its family;
  - amphoteric;
  - the most metallic element in the periodic table.
23. The most active of the following elements of the Sodium Family is
- ${}_{11}\text{Na}$ ;
  - ${}_{20}\text{Ca}$ ;
  - ${}_{37}\text{Rb}$ ;
  - ${}_{55}\text{Cs}$ ;
  - ${}_{87}\text{Fr}$ .
24. Of the following, the pair that contains two metals most similar to each other in chemical activity is:
- aluminum and silver;
  - aluminum and potassium;
  - calcium and magnesium;
  - copper and iron.
25. Members of the lithium family get a stable electron structure by
- losing a "p" electron;
  - completing a "p" orbital;
  - losing a "s" electron;
  - completing a "s" orbital.
26. Which of the following is a structural characteristic of the atoms of alkali metals?
- They possess one s electron in the valence shell.
  - Their number of valence electrons can vary.
  - They possess half-filled p orbitals.
  - Their electron structures have maximum stability.
27. The size of halide ions:
- increases from  $\text{F}^-$  to  $\text{I}^-$ .
  - increases from  $\text{I}^-$  to  $\text{F}^-$ .
  - is the same for all halides.
  - is smaller than the size of the corresponding atom.
  - depends mainly on which isotope forms the ion.
28. Which is characteristic of Group VIIA elements in the Periodic Table?
- All are easily oxidized.
  - All tend to gain one electron.
  - All are found free in nature.
  - The attraction for electrons increases with increasing atomic number.
  - The first ionization potential increases with increasing atomic number.

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29. Which trend is observed as the atomic numbers of Group IIA, the alkaline earth metals, increase?
- atomic size decreases
  - metallic properties decrease
  - ionization potential increases
  - the tendency to lose electrons increases
30. Elements which are most closely similar in chemical properties
- occur in only one period in the Periodic Table.
  - have the same number of protons.
  - have identical numbers of neutrons.
  - have the same number of electrons in their outer shells.
31. The most active non-metal in a group is found
- at the bottom;
  - at the top;
  - in the middle;
  - in different places depending on the group.
32. Since Na and K are both members of Group IA in the Periodic Table, a Na and a K atom have the same
- atomic mass;
  - number of protons in their nuclei;
  - atomic number and the same nuclear charge;
  - characteristic of losing one electron per atom to form an ion.
33. As the atomic number of the halogens decreases, the relative activity
- decreases;
  - increases steadily;
  - increases then decreases;
  - remains the same.
34. Members of the fluorine family get a stable electron structure by
- losing an "s" electron;
  - completing an "s" orbital;
  - losing a "p" electron;
  - completing a "p" orbital.
35. With increase of atomic number in a given family,
- electronegativity and ionization energy decrease;
  - electronegativity and ionization energy increase;
  - electronegativity decreases while ionization energy increases;
  - electronegativity increases while ionization energy decreases.
36. Which characteristic is typical of the elements in Group IIA of the Periodic Table?
- They form +2 ions.
  - They are strongly electronegative elements.
  - The oxides dissolve in water to yield acids.
  - The ionic radius is greater than the atomic radius.
  - The atomic radius decreases with increasing atomic number.

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37. Comparing electronegativities of 3A and 5A elements, we find that
- both groups show increasing values, going from top to bottom;
  - they are the same;
  - they are generally higher in group 5A;
  - they indicate greater nonmetallic character in group 3A elements.
38. Which of the following is **incorrect** as we go from the top to the bottom of Group IA?
- Electronegativities decrease.
  - Ionization energies increase.
  - Oxidation states are the same.
  - Ionic radii are less than their atomic radii.
  - The last "s" orbital has one electron.
39. As one proceeds from fluorine to astatine in Group VIIA, the **electronegativity**
- increases as the atomic radius decreases.
  - decreases as the atomic radius decreases.
  - decreases as the atomic radius increases.
  - increases as the atomic radius increases.
40. The fact that the melting points of the noble gases are close to their boiling indicates the presence of
- strong forces between the molecules;
  - weak forces between the atoms;
  - ionic forces;
  - polyatomic molecules.
41. The **ions** of the elements of the Sodium Family have all the following properties **except**
- electron configuration similar to that of the **preceding** noble gas;
  - oxidation number of +1;
  - low stability;
  - formation of ionic compounds;
  - none of these.
42. Which group of elements have all three states (phases) of matter represented at room temperature?
- IIA
  - IVA
  - VA
  - VIIA
43. As the group VA elements increase in atomic number from nitrogen to bismuth, members of the group become
- less dense;
  - less lustrous;
  - more metallic;
  - more acidic.

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44. There are two completely filled subshells in the outermost shell of most of the members of the
- halogen family;
  - alkali metal family;
  - noble gas family;
  - oxygen family.
45. A horizontal row of elements in the Periodic Table is known as a
- group;
  - series;
  - family;
  - octave;
  - none of these.
46. In a given period of the Periodic Table, the element with the lowest first ionization energy is always
- an alkaline earth metal;
  - an alkali metal;
  - a halogen;
  - a noble gas.
47. The number of 2nd shell electrons present in the last element of the second series is
- 6;
  - 2;
  - 8;
  - 4;
  - none of these.
48. What element in the fourth period has 2 valence electrons?
- calcium
  - iron
  - arsenic
  - selenium
  - none of these
49. Which **period** in the Periodic Table contains the most metals?
- VI
  - II
  - III
  - IV
  - VIII
50. As the elements in Period 3 are considered in order of increasing atomic number, the number of principal **energy levels** in each successive element
- decreases;
  - increases;
  - remains the same;
  - none of these.

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51. As the elements of Period 2 are considered from left to right, there is a decrease in
- ionization energy;
  - atomic mass;
  - metallic character;
  - nonmetallic character;
  - activity.
52. In Period 3, as the atomic numbers increase, the properties of the elements change in what order?
- metal to non-metal to noble gas to metalloid
  - metal to metalloid to non-metal to noble gas
  - non-metal to metalloid to metal to noble gas
  - non-metal to metal to noble gas to metalloid
53. What is the total number of elements in Period 2 that are gases at room temperature and standard pressure?
- 1
  - 2
  - 3
  - 4
  - 5
54. An atom in fourth period whose outermost structure most closely resembles that of sodium (atomic number 11) has the atomic number
- 19;
  - 20;
  - 21;
  - 22;
  - 31.
55. An atom in the fourth series whose two outermost shells contain the same number of electrons as the two outermost shells of magnesium (at. no. 12) has the atomic number
- 19;
  - 20;
  - 21;
  - 22.
56. There are only two elements in the first period of the periodic table because:
- these elements are both gases.
  - the first energy level has a maximum of two electrons.
  - these elements are the lightest elements in the periodic table.
  - the maximum number of elements in each period is two.
57. Going from left to right in period 3, electronegativity and ionization energy change as follows:
- both decrease;
  - both increase;
  - the former increases while the latter decreases;
  - the reverse of choice 3 happens.



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58. The number of the row of elements is the same as the number of
- the energy level of the valence electrons.
  - electrons in an atom of that element.
  - protons and neutrons in an atom of that element.
  - elements in that particular row of the table.
59. Which Period contains four elements which are gases at S.T.P.?
- 1
  - 2
  - 3
  - 4
  - 6
60. In a given period of the Periodic Table, the element with the highest first ionization energy is always
- an alkaline earth metal;
  - an alkali metal;
  - a halogen;
  - a noble gas.
61. Which of the following is the atomic number of a transition metal?
- 20
  - 27
  - 33
  - 35
  - 92
62. The first of the transition elements is number
- 5;
  - 21;
  - 31;
  - 58.
63. The transition elements are those
- that decay by radioactivity;
  - with atomic numbers greater than 92;
  - that have incomplete inner electron shells;
  - that have positive and negative oxidation numbers.
64. In most cases, the successive electrons of the transition elements of the fourth series enter the
- 1st shell;
  - 2nd shell;
  - 3rd shell;
  - 4th shell.

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65. The transition elements
- are nonmetallic;
  - have incomplete valence shells;
  - have half-filled orbitals;
  - have incomplete shells next to the valence shells.
66. Zinc is a transition element, but it does not show the properties usually associated with the transition elements (multiple charges) because zinc:
- is more active metal than the other transition elements.
  - its oxide is amphoteric.
  - is actually a metalloid.
  - is more abundant in the earth's crust than the other transition elements.
  - has its 3d orbitals completed.
67. Which set contains only transition elements?
- elements 11, 12 and 13
  - elements 15, 16 and 17
  - elements 26, 27 and 28
  - elements 48, 49 and 50
68. In the periodic table, metallic properties increase as one goes from:
- top to bottom in the table;
  - left to right in the table;
  - bottom to top in the table;
  - none of these.
69. A characteristic of all metals is that they
- are solids;
  - are silver-gray in color;
  - have low ionization energies;
  - cannot be vaporized.
70. The majority of the elements in the Periodic Table are
- metals;
  - non-metals;
  - metalloids;
  - noble gases.
71. In the Periodic Table, the metallic character of the elements generally increases reading from
- right to left and top to bottom;
  - left to right and top to bottom;
  - left to right;
  - left to right and bottom to top.
72. In the periodic table, the metallic character of the elements increases as you move
- down and to the right;
  - down and to the left;
  - up and to the right;
  - up and to the left.

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73. In any group of metals in the Periodic Table, the most active metal in the group is found
- at the top;
  - in the middle;
  - at the bottom;
  - in different places depending on the group.
74. In the periodic table, elements known as metals are
- in one row;
  - in one column;
  - on the left side;
  - on the right side;
  - scattered evenly throughout.
75. The number of electrons generally present in the outer shell of **metals** is
- 1, 2 or 3;
  - 0;
  - 6 or 7;
  - 8;
  - 3, 4, 7 or 8.
76. The characteristic properties of metals are associated with
- strongly held valence electrons.
  - completely filled energy levels.
  - partially filled p orbitals.
  - loosely held valence electrons.
77. Which element in Period 3 has both metallic and non-metallic properties?
- Na
  - Mg
  - Si
  - Ar
  - B
78. The atomic number of a metalloid in Period 4 is
- 19;
  - 26;
  - 33;
  - 36;
  - 82.
79. An element which is definitely metallic has the atomic number
- 8;
  - 10;
  - 15;
  - 17;
  - none of these.

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80. The most metallic member of the Nitrogen Family is
- phosphorus;
  - arsenic;
  - antimony;
  - bismuth;
  - gold.
81. Which of the following has the most metallic character?
- bromine
  - chlorine
  - fluorine
  - iodine
  - helium
82. In the Periodic Table, the element that exhibits the strongest non-metallic properties is found
- on the upper left side;
  - on the lower left side;
  - on the right side;
  - in the middle.
83. Two properties of most nonmetals are
- low ionization energy and electrical conductivity;
  - high ionization energy and poor electrical conductivity;
  - low ionization energy and poor electrical conductivity;
  - high ionization energy and good electrical conductivity.
84. Which electron configuration is most characteristic of an active non-metallic element?
- 2-8-1
  - 2-8-7
  - 2-8-4
  - 2-8-8
  - 2-8-3
85. An element which is definitely nonmetallic has the atomic number
- 11;
  - 9;
  - 3;
  - 4;
  - 20.
86. Which of the following statements would **not** be true when an atom gains an electron?
- The atom is acting as a nonmetal.
  - The atom has less than 4 valence electrons.
  - The atom increases in size.
  - Some other atom has lost an electron.

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87. The chemical activity of an atom is most closely related to the number and arrangement of its
- protons;
  - neutrons;
  - isotopes;
  - electrons.
88. The best explanation of the extreme activity of fluorine as compared to other halogens is that the fluorine atom
- has the smallest atomic radius;
  - has the smallest nuclear charge;
  - has seven valence electrons;
  - is the strongest reducing agent.
89. Compared with the alkali metals, the alkaline earth metals are
- much more reactive;
  - slightly more reactive;
  - slightly less reactive;
  - very inactive.
90. As the atomic numbers of the halogens increase, the relative activity:
- increases steadily;
  - increases, then decreases;
  - remains the same;
  - decreases.
91. Consider the following electron configurations:
- |                              |                                     |
|------------------------------|-------------------------------------|
| A) $1s^2 2s^1$               | C) $1s^2 2s^2 2p_x^2 2p_y^2 2p_z^1$ |
| B) $1s^2 2s^2 2p_x^1 2p_y^1$ | D) $1s^2 2s^2 2p_x^2 2p_y^2 2p_z^2$ |
- According to the above diagrams, the atoms with the greatest chemical activity are atoms
- A and B;
  - A and C;
  - B and D;
  - C and D.
92. The most chemically active member of the Calcium Family is:
- calcium;
  - barium;
  - radium;
  - strontium;
  - aluminum.
93. Which characteristic of fluorine causes it to be the most active member of the halogen family, Group VIIA?
- It forms diatomic molecules.
  - It has the smallest atomic radius.
  - It has no naturally occurring isotopes.
  - It has seven electrons in its outer shell.

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94. Which element will have the most vigorous reaction with water?
- sodium, Na
  - magnesium, Mg
  - potassium, K
  - cesium, Cs
95. The **least** active of the following five elements in the Halogen Family is
- $_{17}\text{Cl}$ ;
  - $_{9}\text{F}$ ;
  - $_{53}\text{I}$ ;
  - $_{85}\text{At}$ ;
  - $_{35}\text{Br}$ .
96. Which element in Period 4 is the most active metal?
- potassium
  - copper
  - bromine
  - krypton
97. Which element in Period 3 is the most active non-metal?
- sodium
  - magnesium
  - chlorine
  - argon
98. The **most** active of the following elements of the Halogen Family is
- $_{9}\text{F}$ ;
  - $_{35}\text{Br}$ ;
  - $_{53}\text{I}$ ;
  - $_{85}\text{At}$ ;
  - $_{92}\text{U}$ .
99. Element 19 is more active than element 11 because element 19
- is amphoteric;
  - is a metal;
  - has its valence electrons farther from the nucleus;
  - has its valence electrons nearer the nucleus.
100. Most elements with nearly-filled outer energy levels are
- non-reactive;
  - stable;
  - metals;
  - noble;
  - very reactive.