

## Elements In The Periodic Table

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| <p>1 The elements on the Periodic Table of the Elements are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) atomic number</li> <li>(2) mass number</li> <li>(3) number of neutrons</li> <li>(4) number of valence electrons</li> </ul> <p>2 The elements on the Periodic Table of the Elements are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) atomic mass                      (3) atomic number</li> <li>(2) formula mass                      (4) oxidation number</li> </ul> <p>3 On the Periodic Table, the number of protons in an atom of an element is indicated by its</p> <ul style="list-style-type: none"> <li>(1) atomic mass</li> <li>(2) atomic number</li> <li>(3) selected oxidation states</li> <li>(4) number of valence electrons</li> </ul> <p>4 The arrangement of the elements from left to right in Period 4 on the Periodic Table is based on</p> <ul style="list-style-type: none"> <li>(1) atomic mass</li> <li>(2) atomic number</li> <li>(3) the number of electron shells</li> <li>(4) the number of oxidation states</li> </ul> <p>5 The elements in Period 4 on the Periodic Table are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) atomic radius</li> <li>(2) atomic number</li> <li>(3) number of valence electrons</li> <li>(4) number of occupied shells of electrons</li> </ul> | <p>6 The elements on the Periodic Table are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) mass number</li> <li>(2) atomic number</li> <li>(3) number of isotopes</li> <li>(4) number of valence electrons</li> </ul> <p>7 All elements on the modern Periodic Table are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) atomic mass</li> <li>(2) molar mass</li> <li>(3) number of neutrons per atom</li> <li>(4) number of protons per atom</li> </ul> <p>8 The elements on the Periodic Table are arranged in order of increasing</p> <ul style="list-style-type: none"> <li>(1) atomic mass                      (3) molar mass</li> <li>(2) atomic number                      (4) oxidation number</li> </ul> <p>9 The element in Group 14, Period 3, of the Periodic Table is classified as a</p> <ul style="list-style-type: none"> <li>(1) metal                                  (3) metalloid</li> <li>(2) noble gas                              (4) nonmetal</li> </ul> <p>10 Which element is classified as a metalloid?</p> <ul style="list-style-type: none"> <li>(1) boron                                  (3) sulfur</li> <li>(2) potassium                              (4) xenon</li> </ul> <p>11 Which element is malleable at STP?</p> <ul style="list-style-type: none"> <li>(1) chlorine                              (3) helium</li> <li>(2) copper                                  (4) sulfur</li> </ul> <p>12 Which element is classified as a metalloid?</p> <ul style="list-style-type: none"> <li>(1) Te                                      (3) Hg</li> <li>(2) S                                        (4) I</li> </ul> |
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Base your answers to questions 13 on the information below and on your knowledge of chemistry.

In the late 1800s, Dmitri Mendeleev developed a periodic table of the elements known at that time. Based on the pattern in his periodic table, he was able to predict properties of some elements that had not yet been discovered. Information about two of these elements is shown in the table below.

Some Element Properties Predicted by Mendeleev

Predicted Elements	Property	Predicted Value	Actual Value
eka-aluminum (Ea)	density at STP	5.9 g/cm <sup>3</sup>	5.91 g/cm <sup>3</sup>
	melting point	low	30. °C
	oxide formula	Ea <sub>2</sub> O <sub>3</sub>	
	approximate molar mass	68 g/mol	
eka-silicon (Es)	density at STP	5.5 g/cm <sup>3</sup>	5.3234 g/cm <sup>3</sup>
	melting point	high	938 °C
	oxide formula	EsO <sub>2</sub>	
	approximate molar mass	72 g/mol	

13 Identify the element that Mendeleev called eka-silicon, Es.

Base your answers to questions 14 on the information below and on your knowledge of chemistry.

Many scientists made observations of the elements that led to the modern Periodic Table. In 1829, Dobereiner found groups of three elements that have similar properties and called each of these groups a triad. Dobereiner noticed a relationship between the atomic masses of the elements in each triad. Triad 1, shown in the table below, consists of sulfur, selenium, and tellurium. The middle element, selenium, has an atomic mass that is close to the sum of the atomic masses of sulfur and tellurium, divided by 2.

For example:  $\frac{32 \text{ u} + 128 \text{ u}}{2} = 80. \text{ u}$ , which is close to the 79 u value in the table.

The other triads shown in the table below demonstrate the same mathematical relationship.

Dobereiner's Triads

Triad	Triad	Dobereiner's Atomic Masses (u)
1	sulfur selenium tellurium	32 79 128
2	calcium strontium barium	40. 88 137
3	chlorine bromine iodine	35.5 80. 127
4	lithium sodium potassium	7 23 39

14 Show a numerical setup that demonstrates Dobereiner's mathematical relationship for triad 2.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

Before atomic numbers were known, Mendeleev developed a classification system for the 63 elements known in 1872, using oxide formulas and atomic masses. He used an R in the oxide formulas to represent any element in each group. The atomic mass was listed in parentheses after the symbol of each element. A modified version of Mendeleev's classification system is shown in the table below.

Modified Version of Mendeleev's Table								
Group →	I	II	III	IV	V	VI	VII	
Oxide formulas	$R_2O$	$RO$	$R_2O_3$	$RO_2$	$R_2O_5$	$RO_3$	$R_2O_7$	
Series	1	H(1)						
	2	Li(7)	Be(9.4)	B(11)	C(12)	N(14)	O(16)	F(19)
	3	Na(23)	Mg(24)	Al(27.3)	Si(28)	P(31)	S(32)	Cl(35.5)
	4	K(39)	Ca(40)		Ti(48)	V(51)	Cr(52)	Mn(55)
	5	Cu(63)	Zn(65)			As(75)	Se(78)	Br(80)
	6	Rb(85)	Sr(87)	Yt(88)	Zr(90)	Nb(94)	Mo(96)	
	7	Ag(108)	Cd(112)	In(113)	Sn(118)	Sb(122)	Te(125)	I(127)
	8	Cs(133)	Ba(137)	Di(138)	Ce(140)			

- 15 Identify one characteristic used by Mendeleev to develop his classification system of the elements.

## Answer Keys

1 1

2 3

3 2

4 2

5 2

6 2

7 4

8 2

9 3

10 1

11 2

12 1

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- Ge
- germanium

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- $$\frac{40. \text{ u} + 137 \text{ u}}{2}$$

$$\frac{40 + 137}{2}$$

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- increasing atomic mass
- atomic mass
- oxide formulas