

# The Periodic Table and Periodic Law

## Section 6.1 Development of the Modern Periodic Table

In your textbook, read about the history of the periodic table's development.

Use each of the terms below just once to complete the passage.

octaves	atomic mass	atomic number	nine
elements	properties	Henry Moseley	eight
protons	periodic law	Dmitri Mendeleev	accepted

The table below was developed by John Newlands and is based on a relationship called the law of **(1)** \_\_\_\_\_. According to this law, the properties of the elements repeated every **(2)** \_\_\_\_\_ elements. Thus, for example, element two and element **(3)** \_\_\_\_\_ have similar properties. The law of octaves did not work for all the known elements and was not generally **(4)** \_\_\_\_\_.

1	2	3	4	5	6	7
H	Li	G	Bo	C	N	O
8	9	10	11	12	13	14
F	Na	Mg	Al	Si	P	S

The first periodic table is mostly credited to **(5)** \_\_\_\_\_. In his table, the elements were arranged according to increasing **(6)** \_\_\_\_\_. One important result of this table was that the existence and properties of undiscovered **(7)** \_\_\_\_\_ could be predicted.

The element in the modern periodic table are arranged according to increasing **(8)** \_\_\_\_\_, as a result of the work of **(9)** \_\_\_\_\_. This arrangement is based on number of **(10)** \_\_\_\_\_ in the nucleus of an atom of the element. The modern form of the periodic table results in the **(11)** \_\_\_\_\_, which states that when elements are arranged according to increasing atomic number, there is a periodic repetition of their chemical and physical **(12)** \_\_\_\_\_.

Section 6.1 *continued*

In your textbook, read about the modern periodic table.

Use the information in the box on the left taken from the periodic table to complete the table on the right.

7
N
Nitrogen
14.007
[He]2s <sup>2</sup> 2p <sup>3</sup>

Atomic Mass	13.
Atomic Number	14.
Electron Configuration	15.
Chemical Name	16.
Chemical Symbol	17.

For each item in Column A, write the letter of the matching item in Column B.

## Column A

## Column B

- |   |                            |
|---|----------------------------|
| _____ 18. A column on the periodic table                  | a. metals                  |
| _____ 19. A row on the periodic table                     | b. group                   |
| _____ 20. Elements in groups 1, 2, and 13 to 18           | c. period                  |
| _____ 21. Elements that are shiny and conduct electricity | d. representative elements |
| _____ 22. Elements in groups 3 to 12                      | e. transition elements     |

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

- \_\_\_\_\_ 23. There are *two* main classifications of elements.
- \_\_\_\_\_ 24. More than three-fourths of the elements in the periodic table are *nonmetals*.
- \_\_\_\_\_ 25. Group 1 elements (except for hydrogen) are known as the *alkali metals*.
- \_\_\_\_\_ 26. *Group 13* elements are the alkaline earth metals.
- \_\_\_\_\_ 27. Group 17 elements are highly reactive nonmetals known as *halogens*.
- \_\_\_\_\_ 28. Group 18 elements are very unreactive elements known as *transition metals*.
- \_\_\_\_\_ 29. Metalloids have properties of both metals and *inner transition metals*.

## Section 6.2 Classification of the Elements

*In your textbook, read about organizing the elements by electron configuration.*

Use the periodic table on pages 178–179 in your textbook to match each element in Column A with the element in Column B that has the most similar chemical properties.

Column A	Column B
_____ 1. arsenic (As)	a. boron (B)
_____ 2. bromine (Br)	b. cesium (Cs)
_____ 3. cadmium (Cd)	c. chromium (Cr)
_____ 4. gallium (Ga)	d. cobalt (Co)
_____ 5. germanium (Ge)	e. hafnium (Hf)
_____ 6. iridium (Ir)	f. iodine (I)
_____ 7. magnesium (Mg)	g. iron (Fe)
_____ 8. neon (Ne)	h. nitrogen (N)
_____ 9. nickel (Ni)	i. platinum (Pt)
_____ 10. osmium (Os)	j. scandium (Sc)
_____ 11. sodium (Na)	k. silicon (Si)
_____ 12. tellurium (Te)	l. strontium (Sr)
_____ 13. tungsten (W)	m. sulfur (S)
_____ 14. yttrium (Y)	n. zinc (Z)
_____ 15. zirconium (Zr)	o. xenon (Xe)

Answer the following questions.

16. Why do sodium and potassium, which belong to the same group in the periodic table, have similar chemical properties?

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17. How is the energy level of an element's valence electrons related to its period on the periodic table? Give an example.

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**CHAPTER 6** **STUDY GUIDE**

**Section 6.2** *continued*

In your textbook, read about s-, p-, d-, and f-block elements.

Use the periodic table on pages 178–179 in your textbook and the periodic table below to answer the following questions.

s block												p block						s <sup>2</sup>																	
s <sup>1</sup>												p <sup>1</sup> p <sup>2</sup> p <sup>3</sup> p <sup>4</sup> p <sup>5</sup> p <sup>6</sup>						2																	
1	H											5	6	7	8	9	10	He																	
3	Li	4	Be											13	14	15	16	17	18																
11	Na	12	Mg	d block										31	32	33	34	35	36																
19	K	20	Ca	21	Sc	22	Ti	23	V	24	Cr	25	Mn	26	Fe	27	Co	28	Ni	29	Cu	30	Zn	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr
37	Rb	38	Sr	39	Y	40	Zr	41	Nb	42	Mo	43	Tc	44	Ru	45	Rh	46	Pd	47	Ag	48	Cd	49	In	50	Sn	51	Sb	52	Te	53	I	54	Xe
55	Cs	56	Ba	57	La	72	Hf	73	Ta	74	W	75	Re	76	Os	77	Ir	78	Pt	79	Au	80	Hg	81	Tl	82	Pb	83	Bi	84	Po	85	At	86	Rn
87	Fr	88	Ra	89	Ac	104	Rf	105	Db	106	Sg	107	Bh	108	Hs	109	Mt	110	Uun	111	Uuv	112	Uuh												
		f block																																	
58	Ce	59	Pr	60	Nd	61	Pm	62	Sm	63	Eu	64	Gd	65	Tb	66	Dy	67	Ho	68	Er	69	Tm	70	Yb	71	Lu								
90	Th	91	Pa	92	U	93	Np	94	Pu	95	Am	96	Cm	97	Bk	98	Cf	99	Es	100	Fm	101	Md	102	No	103	Lr								

18. Into how many blocks is the periodic table divided? \_\_\_\_\_
19. What groups of elements does the s-block contain? \_\_\_\_\_
20. Why does the s-block portion of the periodic table span two groups?  
\_\_\_\_\_
21. What groups of elements does the p-block contain? \_\_\_\_\_
22. Why are members of group 18 virtually unreactive?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
23. How many d-block elements are there? \_\_\_\_\_
24. What groups of elements does the d-block contain? \_\_\_\_\_
25. Why does the f-block portion of the periodic table span 14 groups?  
\_\_\_\_\_
26. What is the electron configuration of the element in period 3, group 16? \_\_\_\_\_

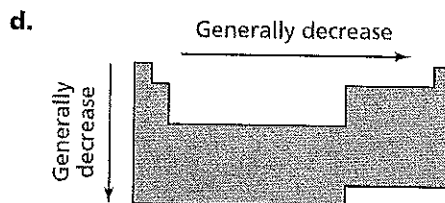
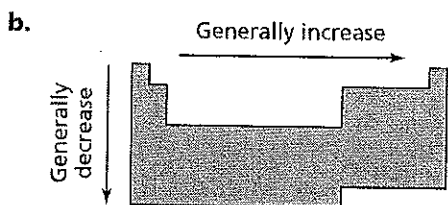
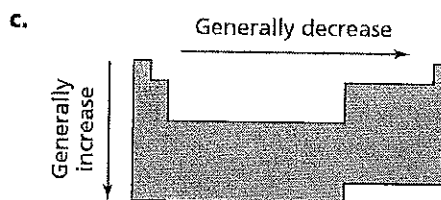
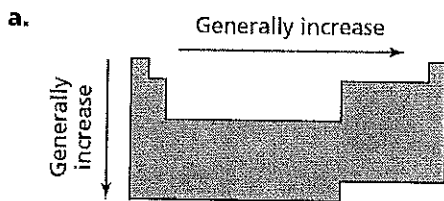
### Section 6.3 Periodic Trends

In your textbook, read about atomic radius and ionic radius.

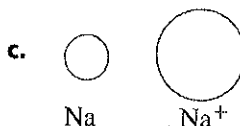
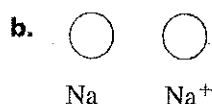
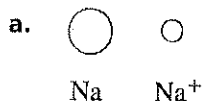
Circle the letter of the choice that best completes the statement or answers the question.

- Atomic radii cannot be measured directly because the electron cloud surrounding the nucleus does not have a clearly defined
  - charge.
  - mass.
  - outer edge.
  - probability.

- Which diagram best represents the group and period trends in atomic radii in the periodic table?



- The general trend in the radius of an atom moving down a group is partially accounted for by the
  - decrease in the mass of the nucleus.
  - fewer number of filled orbitals.
  - increase in the charge of the nucleus.
  - shielding of the outer electrons by inner electrons.
- A(n) \_\_\_\_\_ is an atom, or bonded group of atoms, that has a positive or negative charge.
  - halogen
  - ion
  - isotope
  - molecule
- An atom becomes negatively charged by
  - gaining an electron.
  - gaining a proton.
  - losing an electron.
  - losing a neutron.
- Which diagram best represents the relationship between the diameter of a sodium atom and the diameter of a positive sodium ion?



**CHAPTER 6** **STUDY GUIDE**

**Section 6.3** *continued*

*In your textbook, read about ionization energy and electronegativity.*

Answer the following questions.

7. What is ionization energy?

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8. Explain why an atom with a high ionization-energy value is not likely to form a positive ion.

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9. What is the period trend in the first ionization energies? Why?

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10. What is the group trend in the first ionization energies? Why?

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11. State the octet rule.

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12. What does the electronegativity of an element indicate?

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13. What are the period and group trends in electronegativities?

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