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CHAPTER 6 STUDY GUIDE

The Periodic Table and Periodic Law

Section 6.1 Development of the Modern Periodic Table

In your textbook, reads 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)** octaves. According to this law, the properties of the elements repeated every **(2)** eight elements. Thus, for example, element two and element **(3)** nine have similar properties. The law of octaves did not work for all the known elements and was not generally **(4)** Accepted.

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)** Mendeleev. In his table, the elements were arranged according to increasing **(6)** Atomic MASS. One important result of this table was that the existence and properties of undiscovered **(7)** elements could be predicted.

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

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
$[He]2s^22p^3$

Atomic Mass	**13.** 14.007
Atomic Number	**14.** 7
Electron Configuration	**15.** $[He]\ 2s^2 2p^3$
Chemical Name	**16.** nitrogen
Chemical Symbol	**17.** N

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

Column A		Column B
B	**18.** A column on the periodic table	**a.** metals
C	**19.** A row on the periodic table	**b.** group
D	**20.** Elements in groups 1, 2, and 13 to 18	**c.** period
A	**21.** Elements that are shiny and conduct electricity	**d.** representative elements
E	**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.

Three **23.** There are *two* main classifications of elements.

Metals **24.** More than three-fourths of the elements in the periodic table are *nonmetals*.

true **25.** Group 1 elements (except for hydrogen) are known as the *alkali metals.*

Group 2 **26.** *Group 13* elements are the alkaline earth metals.

True **27.** Group 17 elements are highly reactive nonmetals known as *halogens*.

Noble Gases **28.** Group 18 elements are very unreactive elements known as *transition metals.*

nonmetals **29.** Metalloids have properties of both metals and *inner transition metals.*

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

Sodium + Potassium have the same number of valence electrons

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

The energy level indicates the period. Example: Li valence electron is in the 2nd energy level + Li is found in period 2

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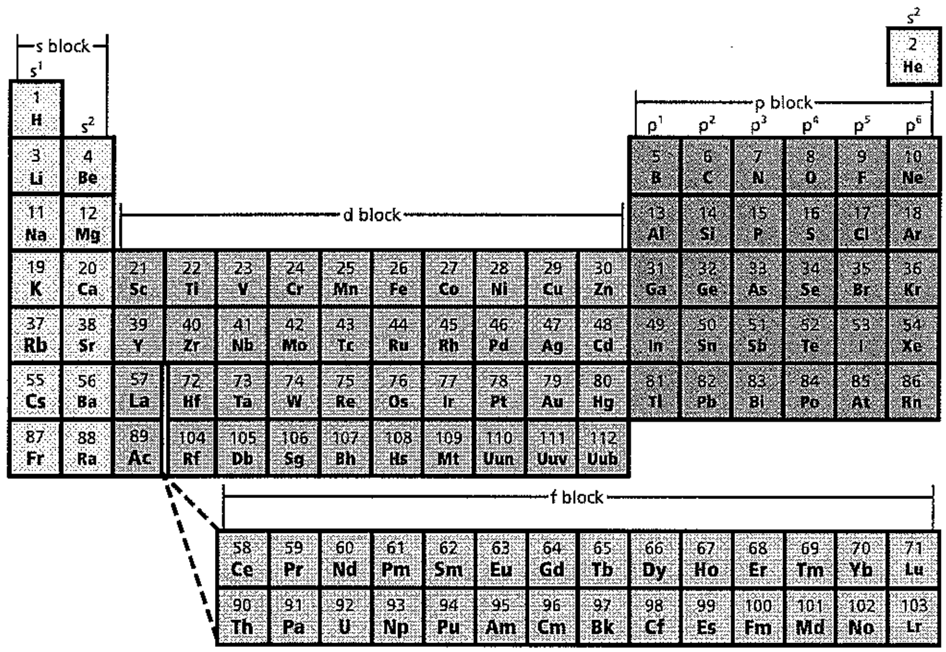
Section 6.2 *continued*

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.



18. Into how many blocks is the periodic table divided? 4

19. What groups of elements does the s-block contain? Groups 1+2

20. Why does the s-block portion of the periodic table span two groups?
The S orbitals holds a max of 2 electrons

21. What groups of elements does the p-block contain? groups 13-18

22. Why are members of group 18 virtually unreactive?
Their S + p subshells are full. their configuration is very stable.

23. How many d-block elements are there? 40

24. What groups of elements does the d-block contain? groups 3-8

25. Why does the f-block portion of the periodic table span 14 groups?
The 7f orbitals hold a maximum of 14 electrons

26. What is the electron configuration of the element in period 3, group 16? $1s^2 2s^2 2p^6 3s^2 3p^4$

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Section 6.3 Periodic Trends

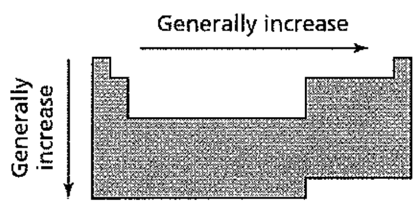
In your textbook, read about atomic radius and ionic radius.

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

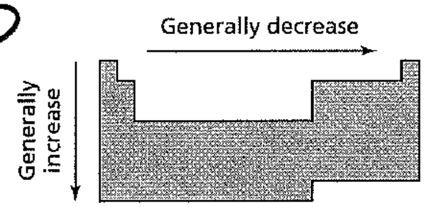
1. Atomic radii cannot be measured directly because the electron cloud surrounding the nucleus does not have a clearly defined
   a. charge. **b.** mass. **c.** outer edge. **d.** probability.

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

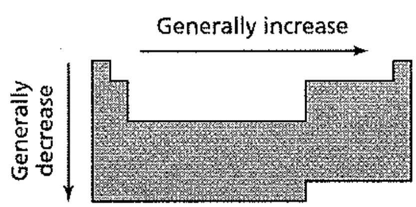
a.



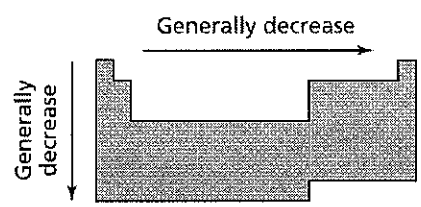
c.



b.



d.



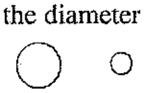
3. The general trend in the radius of an atom moving down a group is partially accounted for by the
   a. decrease in the mass of the nucleus. **c.** increase in the charge of the nucleus.
   b. fewer number of filled orbitals. **d.** shielding of the outer electrons by inner electrons.

4. A(n) ______ is an atom, or bonded group of atoms, that has a positive or negative charge.
   a. halogen **b.** ion **c.** isotope **d.** molecule

5. An atom becomes negatively charged by
   a. gaining an electron. **b.** gaining a proton. **c.** losing an electron. **d.** losing a neutron.

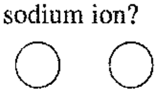
6. Which diagram best represents the relationship between the diameter of a sodium atom and the diameter of a positive sodium ion?

a.



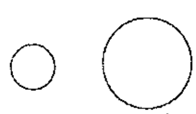
Na Na^+

b.



Na Na^+

c.



Na Na^+

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Section 6.3 *continued*

In your textbook, read about ionization energy and electronegativity.

Answer the following questions.

7. What is ionization energy?

The energy required to remove an electron from a gaseous Atom

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

A high ionization-energy value indicates that the atom has a strong hold on its electrons & is not likely to lose an outer electron & form a positive ion.

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

1st Ionization increases As you move left to right Across a period. The increase nuclear charge of each successive element produces an increased hold on the valence electrons

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

1st ionization energies generally decreases As you move down a group. Atomic size increases down a group, the valence electrons Are farther from the nucleus, & therefore, less strongly Attracted to the nucleus.

11. State the octet rule.

Atoms tend to gain, lose, or share electrons to Acquire a full set of 8 valence electrons

12. What does the electronegativity of an element indicate?

Atom's Ability to Attract electrons in a Chemical Bond.

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

Electronegativities increase As you move left to Right Across a period & decrease As you move down a group.