

Unit 2 Structure and Properties

ARE YOU READY?

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Safety and Technical Skills

1. Before using an electrical device, check that your hands are dry and that there are no water sources or wet areas nearby; and that the equipment is in good condition, with no frayed cords or damaged plugs.
2. To handle a hazardous chemical safely:
 - (a) wear safety glasses/goggles and a lab apron.
 - (b) wash with water immediately when your skin comes in contact with the chemical.
 - (c) always dispose of a chemical according to correct procedures/instructions as specified in the lab instructions or in the MSD sheets.

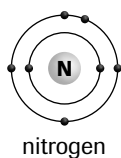
Knowledge and Understanding

3.
 - (a) Statements i and iv apply only to elements.
 - (b) Statements ii and iii apply only to compounds.
 - (c) Statements i and iii are empirical—based on observation.
 - (d) Statements ii and iv are theoretical—based on ideas/concepts.
4.
 - (a) J. J. Thomson described an atom as a sphere of matter with a uniform positive charge, in which smaller negative particles were embedded—the classic “raisin bun” analogy.
 - (b) Ernest Rutherford described an atom as a sphere that had virtually all of the mass and positive charge in a very tiny part of the volume (the nucleus), with the negative charges somehow occupying nearly all of the volume by moving around the nucleus.
 - (c) John Dalton described an atom that was a solid, neutral, indivisible sphere, with all atoms of an element identical, and different atoms for each element.
5.
 - (a) electron orbits
 - (b) nucleus
 - (c) electron, e^-
 - (d) proton, p^+
 - (e) neutron, n
- 6.

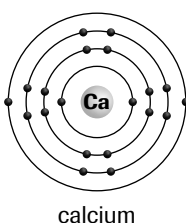
Table 1 Components of Atoms and Ions

Atom/ion	Number of protons	Number of electrons	Net charge
hydrogen atom	1	1	0
sodium atom	11	11	0
chlorine atom	17	17	0
hydrogen ion	1	0	1+
sodium ion	11	10	1+
chloride ion	17	18	1–

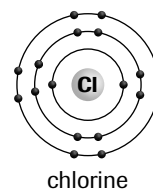
7. (a)



(b)



(c)



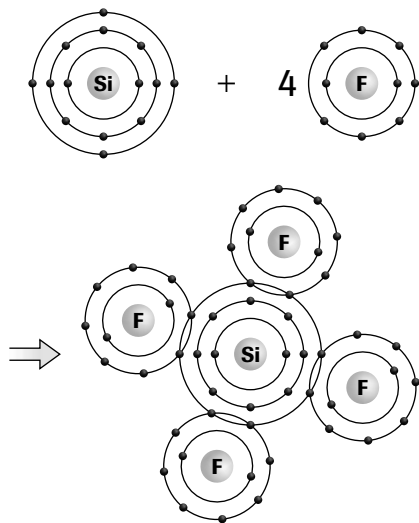
8.

Table 2 Properties of Ionic and Molecular Compounds

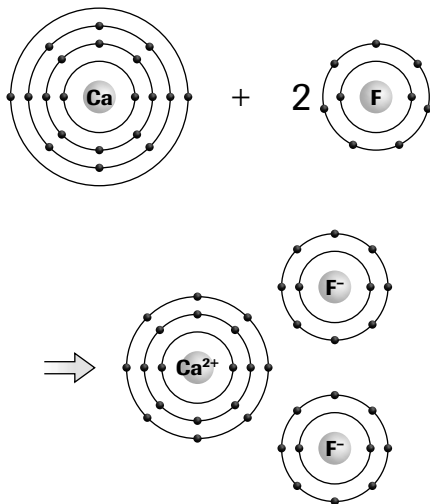
Class of compound	Classes of elements involved	Properties		
		Melting point (high/low)	State at SATP (s, l, g)	Electrolytes (yes/no)
ionic	metals and nonmetals	high	s	yes
molecular	nonmetals	low	s, l, or g	no

9. (a) ionic
(b) either
(c) molecular

10. (a)



(b)



- (c) In (a), the rearrangement involves “sharing” of electrons by different atoms. In (b), the rearrangement involves loss of electrons by one atom, and gain of electrons by another.
- (d) All atoms attract electrons, but with very different strengths—depending on the atom’s structure. When the attraction (electronegativity) of two different atoms for electrons is very different in strength, electrons may be pulled completely away from one atom and held by another, creating positive and negative ions.

Inquiry and Communication

- 11. A scientific law is empirical, based on observable “facts.” A scientific theory is theoretical, based on unobservable concepts.
- 12. Scientific laws usually precede scientific theories.