Name: _____ Class: _____ Date: _____

Atoms and atomic models

PAGES 6 TO 17

CONCEPT REVIEW 1
Complete this concept review handout and keep it as a record of what you have learned.

CHAPTER 1

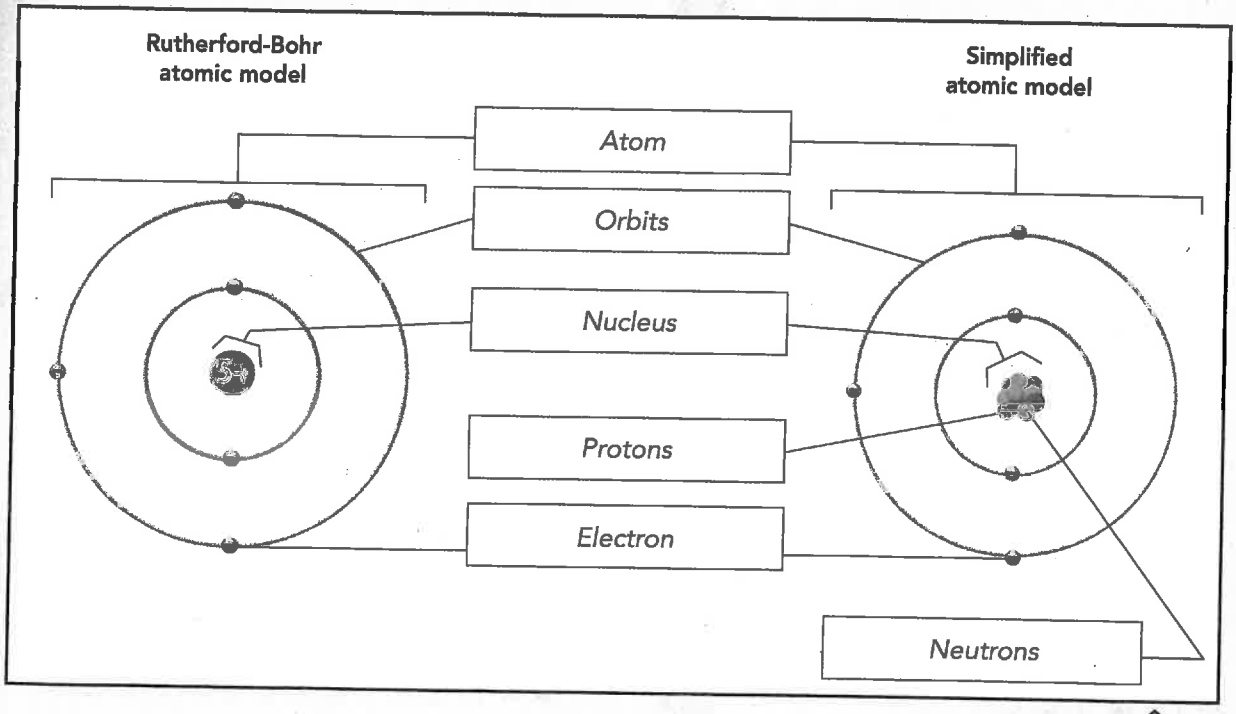
Definitions

- An atom is *the smallest particle of matter. It cannot be divided chemically.*
- The electron is *one of the particles that make up an atom. It is negatively charged.*
- The proton is *one of the particles that make up an atom. It is found in the nucleus and carries a positive charge.*
- The neutron is *one of the particles that make up an atom. With the proton, it forms the nucleus. It has no electrical charge, so it is neutral.*

Characteristics of atomic particles

Particle	Symbol	Electrical charge	Mass (g)	Mass (u)
Electron	e^-	*Negative*	9.109×10^{-28}	0.00055
Proton	p^+	*Positive*	1.673×10^{-24}	1.007
Neutron	*n*	*Neutral*	1.675×10^{-24}	1.008

Parts of the atom

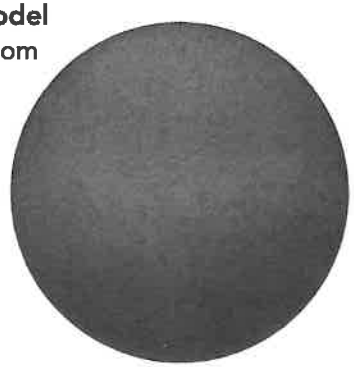


Name _____ Class _____ Date _____

Evolution of the atomic model

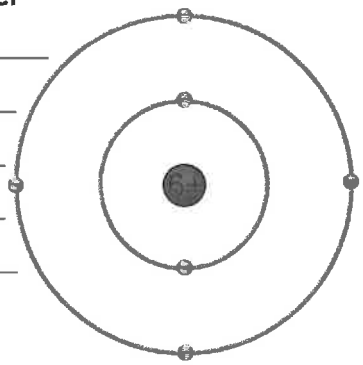
1808 Dalton's atomic model

According to Dalton, the atom is like a billiard ball—solid and indivisible.



1913 Rutherford-Bohr atomic model

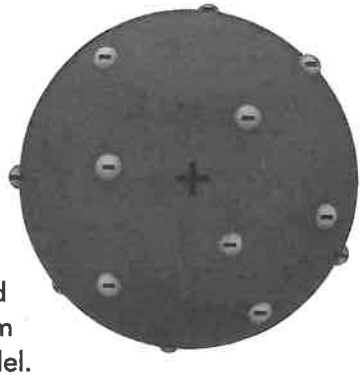
Bohr modified Rutherford's atomic model by describing the orbits in which electrons move.



1800 1810 1820 1830 1840 1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

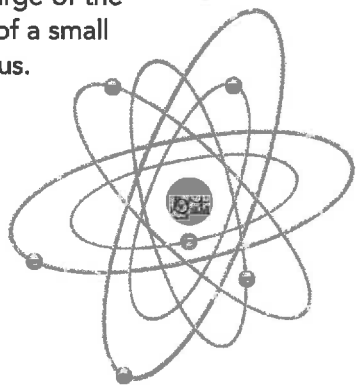
1897 Thomson's atomic model

Thomson modified Dalton's atomic model by describing the atom as a positively charged ball embedded with small negatively charged particles, namely, electrons. Thomson's version is often referred to as the plum pudding model.



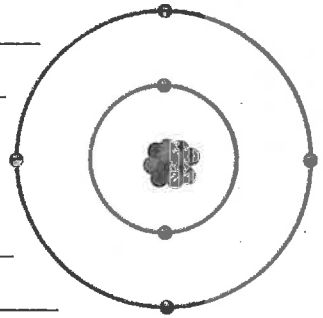
1911 Rutherford's atomic model

Rutherford modified Thomson's atomic model by imagining the entire positive charge of the atom in the form of a small but massive nucleus. The negatively charged electrons circle the nucleus.



After 1932 Simplified atomic model

The simplified atomic model refines the Rutherford-Bohr model by adding the neutron, discovered by Chadwick.



Name: _____ Class: _____ Date: _____

The periodic table

PAGES 17 TO 26

CONCEPT REVIEW 2
Complete this concept review handout and keep it as a record of what you have learned.

CHAPTER 1

Definitions

- The periodic table of the elements is *a visual presentation of the elements in groups according to their physical and chemical properties.*
- A valence electron is *an electron in the outermost shell of an atom.*
- A group corresponds *to a column of the periodic table. The elements in a particular group have similar chemical properties because they all have the same number of valence electrons.*
- A period corresponds *to a row of the periodic table. All the elements in a period have the same number of electron shells.*
- The periodicity of properties is *the repetition of patterns in properties from one period to another.*
- The atomic number represents *the number of protons in the nucleus of an atom. It distinguishes one element from another.*

  Symbol: *Z*
- The relative atomic mass is *the mass of an atom measured by comparison with a reference element, carbon-12.*

  Unit of measurement: *Atomic mass unit.* Symbol of the unit of measurement: *u*
- An isotope is *an atom of an element with the same number of protons as another atom of the same element but with a different number of neutrons.*

Representing atoms with the $^{A}_{Z}E$ notation

Name: *Mass number*
Whole number indicating the sum of the numbers of protons and neutrons in an atom. It is found by rounding the relative atomic mass to the nearest whole number.

$^{A}_{Z}E$

Name: *Symbol of an element*

Name: *Atomic number*

To find the number of neutrons in an atom: *subtract Z from A.*

Name: _____ Class: _____ Date: _____

Properties of the categories of elements

Category (location)	Properties
Metals (to the left of the staircase)	• Good conductors of electricity and heat. • Ductile and malleable. • Usually shiny. • Solid at room temperature (except mercury). • Many react with acids.
Nonmetals (to the right of the staircase, except hydrogen)	• Generally poor conductors of electricity and heat. • Many are gases at room temperature. • When solid, they can easily be reduced to powder.
Metalloids (or semimetals) (on both sides of the staircase)	• Properties depend on conditions.

Properties of certain groups of elements

Group (location)	Properties
Alkali metals (1st column)	• Soft and highly reactive metals. • In their pure state, they must be stored in oil. • They do not exist in their elemental state in nature.
Alkaline earth metals (2nd column)	• Highly malleable and reactive metals. They burn easily. • They can be exposed to air. • They form many compounds found in rocks or earth. • They do not exist in their elemental state in nature.
Halogens (penultimate column)	• Nonmetals. • Many are powerful disinfectants. • They react easily to form compounds, including salts.
Noble gases (last column)	• Nonmetals. • Very stable gases: they react minimally with other elements. • They exist in their elemental state in nature.

Name: _____ Class: _____ Date: _____

Representing atoms

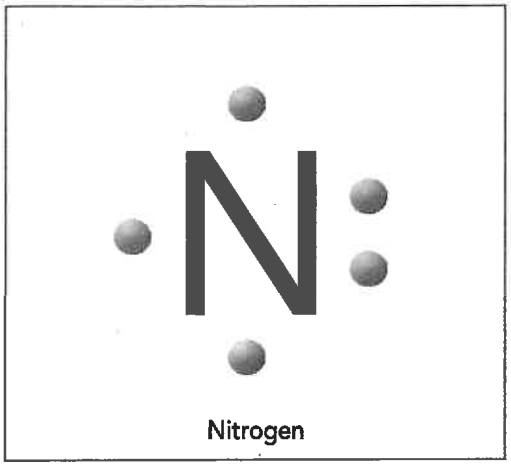
PAGES 26 TO 29

CONCEPT REVIEW 3
Complete this concept review handout and keep it as a record of what you have learned.

Four ways of representing atoms

- *Lewis notation*

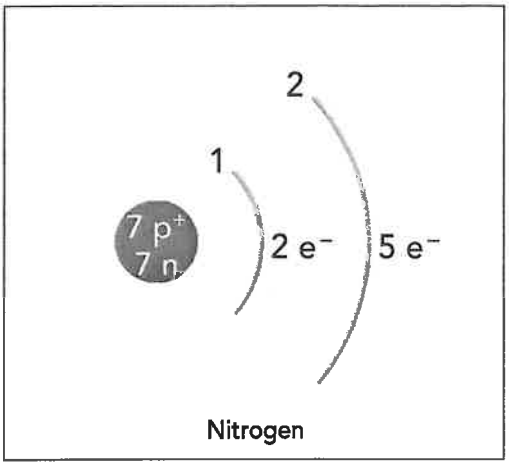
Simplified representation of the atom, in which only the valence electrons are illustrated.



Nitrogen

- *Simplified atomic model*

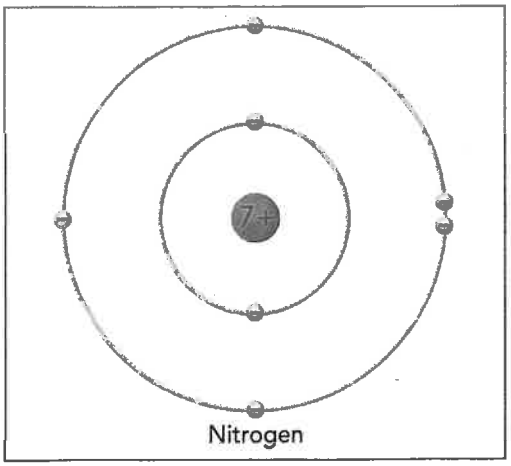
Representation of the atom showing the number of protons and neutrons. It also shows the number of electrons in each shell.



Nitrogen

- *Rutherford-Bohr atomic model*

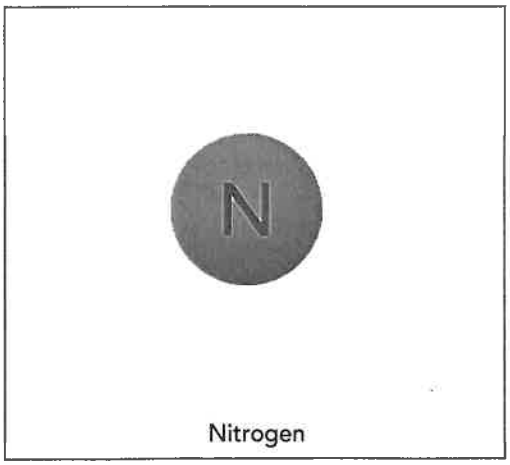
Representation of the atom showing the number of protons, electrons and electron shells.



Nitrogen

- *"Ball-and-stick" atomic model*

Representation in which the atom is depicted as a ball, and its bonds with other atoms are shown with sticks. The size of the ball is generally proportional to the number of electron shells in the atom.



Nitrogen

Name: _____ Class: _____ Date: _____

CHAPTER 1

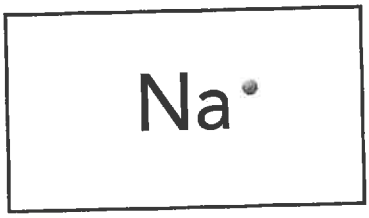
INTEGRATION QUESTIONS

Representing atoms

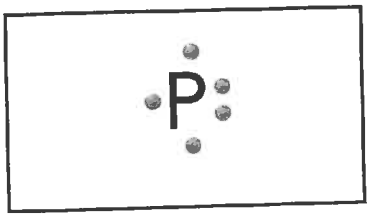
You will need the periodic table on the inside cover of this book to answer some of the following questions.

1. Draw a Lewis structure for each of the elements below.

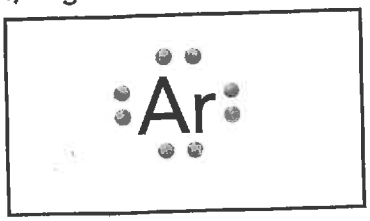
a) Sodium.



b) Phosphorous.

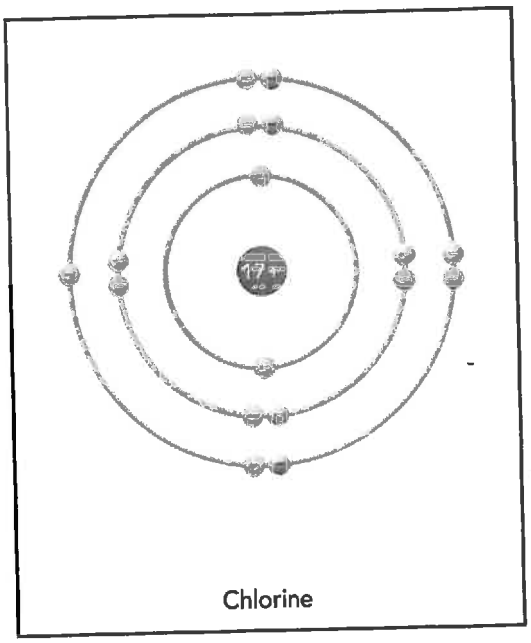


c) Argon.



2. Explain the stages involved in representing a chlorine atom according to the Rutherford-Bohr atomic model. Draw it.

- *Chlorine has three electron shells because it is in the third period of the periodic table.*
- *Chlorine has seven valence electrons because it belongs to Group VII A.*
- *The atomic number of chlorine is 17; it therefore has 17 protons and 17 electrons.*



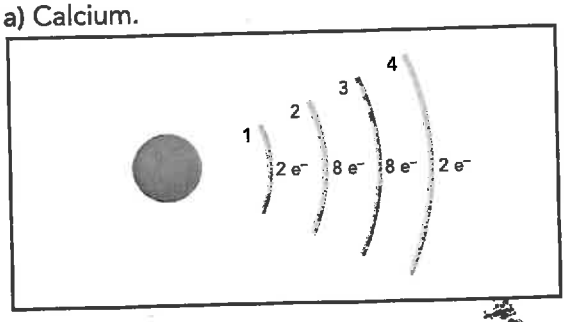
Chlorine

3. Name the atoms and molecule below.

a) *Helium.* b) *Phosphorous.* c) *Hydrogen (H_2).*

4. Represent the following elements using the simplified atomic model.

a) Calcium.



b) Beryllium.