

## Chapter 12 ATOMS AND THE PERIODIC TABLE

### Chapter 12 Assessment

#### Vocabulary

Select the correct term to complete the sentences.

atomic number	electron	alkali metals
metals	atomic mass	mass number
energy level	spectrum	noble gases
thermal conductor	proton	spectrometer
conductors	periodicity	periodic table
halogens	electric charge	nonmetals
neutron	isotopes	atomic mass unit
insulator	electrical conductor	

#### Section 12.1

- The sum of protons plus neutrons in the nucleus of an atom is known as the \_\_\_\_.
- \_\_\_\_ is a fundamental property of matter that can be either positive or negative.
- A very low mass particle with a negative charge, found in atoms, is called a(n) \_\_\_\_.
- A neutral particle with nearly the same mass as the proton is the \_\_\_\_.
- A particle with a positive charge is called a(n) \_\_\_\_.
- The number of protons in an atom, unique to each element, is known as the \_\_\_\_.
- Atoms of the same element containing different numbers of neutrons are called \_\_\_\_.

#### Section 12.2

- One of the allowed energies for electrons in an atom is known as a(n) \_\_\_\_.
- A(n) \_\_\_\_ shows the characteristic colors of light given off or absorbed by an element.
- An instrument that is used to separate light into spectral lines is a(n) \_\_\_\_.

#### Section 12.3

- The elements are organized into a chart known as the \_\_\_\_.
- \_\_\_\_ are good conductors of heat and electricity.
- \_\_\_\_ are poor conductors of heat and electricity.
- The \_\_\_\_ is a unit scientists use to measure the mass of individual atoms.
- The average mass of all of the known isotopes of an element is known as its \_\_\_\_.
- Elements in the first group of the periodic table are called \_\_\_\_.
- The \_\_\_\_ include fluorine, chlorine, and bromine.
- The \_\_\_\_ do not naturally form chemical bonds with other elements.

#### Section 12.4

- The repeating pattern of chemical and physical properties of the elements is called \_\_\_\_.
- A(n) \_\_\_\_ is a material that allows electricity to flow through it easily.
- A(n) \_\_\_\_ is a material that allows heat to flow through it easily.
- A(n) \_\_\_\_ is a material that slows down or stops the flow of either heat or electricity.

## Concepts

### Section 12.1

- How did Rutherford's model of the atom differ from Thomson's model?
- What do the atomic number and mass number tell you about an atom?
- Summarize the characteristics of the electron, proton, and neutron, comparing their relative mass, charge, and location within the atom by completing the table below.

Particle	Location in Atom	Charge	Relative Mass
electron	?	?	1
proton	?	+1	?
neutron	?	?	?

### Section 12.2

- Which particle in an atom is most responsible for its chemical properties?
- Cite evidence that electrons are restricted to having only certain amounts of energy.
- How did Neils Bohr explain spectral lines?
- What is the difference between an electron in ground state and one in an excited state?
- What would occur if an electron were to move from a certain energy level to a lower energy level?
- Why can't the position of an electron be determined with certainty?

### Section 12.3

- How might a substance be tested to determine whether it is an element?

- Describe the difference between a period and a group on the periodic table.
- Describe the difference between the mass number and the atomic mass of an element.
- How does the energy level of an element on the periodic table compare to its period number?

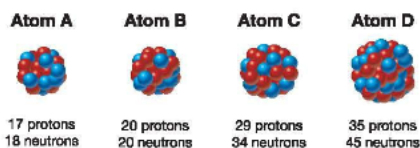
### Section 12.4

- Name two properties that display periodicity across the periodic table.
- Name three elements that are good conductors of both heat and electricity.
- Name three elements that are poor conductors but are good insulators of both heat and electricity.

## Problems

### Section 12.1

- For each of the nuclei shown below, do the following.
  - Name the element.
  - Give the atomic number.
  - Give the mass number.



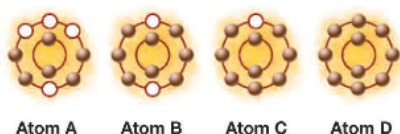
- A neutral atom has 7 protons and 8 neutrons. Determine its:
  - mass number
  - atomic number
  - number of electrons

## Chapter 12

## ATOMS AND THE PERIODIC TABLE

**Section 12.2**

3. Which diagram below represents neon?



4. An atom has an atomic number of 6. Sketch a diagram that correctly represents the electron arrangement in energy levels around the nucleus. What is the name of this atom?

**Section 12.3**

5. Identify each of the following as a metal (M), nonmetal (N), or metalloid (T).
- Includes most of the elements.
  - As solids they are dull, poor conductors, and brittle.
  - Generally located on the right side of the periodic table.
  - Ductile
  - Share properties between metals and nonmetals.

**Section 12.4**

6. Most elements occur as solids at room temperature.
- Name the two elements that are found as liquids at room temperature.
  - Name 5 elements (out of 11) that are found as gases at room temperature.
7. Name the following.
- The two most abundant gases and their approximate percentage of occurrence in Earth's atmosphere.
  - The most abundant element in Earth's crust and its percentage of occurrence.

**Applying Your Knowledge****Section 12.1**

1. Make a poster illustrating the different models of the atom that scientists have proposed since the 1800s. Explain how each model reflects the new knowledge that scientists gained through their experiments. When possible, comment on what scientists learned about charge, mass, and location of subatomic particles.

**Section 12.2**

2. The element helium is a light gas that is very rare on Earth. In fact, helium was not discovered on this planet but in the Sun. Astronomers saw a series of spectral lines in sunlight that did not match any known element on Earth. Researchers were then able to locate helium on Earth because they knew what its spectrum looked like. Research and draw the visible spectrum for helium, labeling the wavelength of each spectral line. Rank the spectral lines from highest energy to lowest energy. Also, find out where its name comes from.

**Section 12.3**

3. Create a pie graph showing the elements classified as nonmetals, metalloids, and metals.
4. List the elements of the periodic table for which the symbol does not match the name. For example, the symbol for lead is Pb. Choose any three of those elements and find out where the symbols come from.

**Section 12.4**

5. Suppose the periodic table arranged periods 1 to 4 in order of increasing average atomic mass instead of increasing atomic number. Would this arrangement show periodicity? Explain your answer.