



## Section 7.1

# Atomic Theory, Isotopes, and Radioactive Decay

### Study Notes

By the end of section 7.1 you should be able to understand the following:

- Radiation is a term used to describe the high energy rays and particles given off by radioactive substances.
- An isotope is an atom of an element that has a slight difference in the number of neutrons as compared to other isotopes of the same element.
- Radioisotopes decay into normal isotopes, releasing radiation.
- The three main types of radiation are alpha particles, beta particles and gamma rays.
- Nuclear reactions occur when the number of protons or neutrons in a nucleus change, or when energy is released from a nucleus.
- Radioactivity results from a nucleus decaying. If a proton is released, a new element is formed. If a neutron is released, it changes into a proton, and an electron is released from the atom.

### NOTES

Define natural background radiation, radioactivity and radiation.

1.

2.

3.

What is an isotope? What is the mass number of an isotope? How do you determine the mass number of an isotope?

1.

2.

3.

## NOTES

What is the system used for representing isotopes? What are the symbols for the isotopes of magnesium, which may have 12, 13 or 14 neutrons?

1.

2.

3.

4.

Why is the atomic mass of magnesium listed as being 24.3 on your periodic table?

1.

**Do the Reading Check on page 291**

What is radioactive decay? How is radioactive decay different from all other chemical reactions observed by scientists? What is the name of an isotope that decays by losing energy by radiation?

1.

2.

3.

What are the three types of radiation?

1.

2.

3.

## NOTES

What is alpha radiation?  
What is the symbol for alpha particles? What is an alpha particle composed of?

1.

2.

3.

Show the chemical equation for an atom of radioactive uranium giving off an alpha particle to become thalium.

1.

What is beta radiation? What is the symbol for beta particles? What is an beta particle composed of?

1.

2.

3.

Show the chemical equation for an atom of radioactive cesium undergoing beta decay to become barium.

1.

## NOTES

What is gamma radiation?  
What is the symbol for gamma particles? What is an gamma particle composed of?

1.

2.

3.

Show the chemical equation for an atom of radioactive helium undergoing gamma decay.

1.

Do the Reading Check on page 297

Which type of radiation has the highest relative penetrating power? What is needed to block each type of radiation?

1.

2.

3.

4.

What are the rules for writing a nuclear equation? Provide an example that illustrates these rules.

1.

2.

3.