

Atomic Concepts

- 1 Which statement describes the earliest model of the atom?
- (1) An atom is an indivisible hard sphere.
 - (2) An atom has a small, dense nucleus.
 - (3) Electrons are negative particles in an atom.
 - (4) Electrons in an atom have wave-like properties.
- 2 The results of the gold foil experiment led to the conclusion that an atom is
- (1) mostly empty space and has a small, negatively charged nucleus
 - (2) mostly empty space and has a small, positively charged nucleus
 - (3) a hard sphere and has a large, negatively charged nucleus
 - (4) a hard sphere and has a large, positively charged nucleus
- 3 The discovery of the electron as a subatomic particle was a result of
- (1) collision theory
 - (2) kinetic molecular theory
 - (3) the gold-foil experiment
 - (4) experiments with cathode ray tubes
- 4 Given a list of atomic model descriptions:
 A: electron shells outside a central nucleus
 B: hard, indivisible sphere
 C: mostly empty space
- Which list of atomic model descriptions represents the order of historical development from the earliest to most recent?
- (1) A, B, C
 - (2) A, C, B
 - (3) B, C, A
 - (4) B, A, C
- 5 Four statements about the development of the atomic model are shown below.
- A: Electrons have wavelike properties.
 - B: Atoms have small, negatively charged particles.
 - C: The center of an atom is a small, dense nucleus.
 - D: Atoms are hard, indivisible spheres.
- Which order of statements represents the historical development of the atomic model?
- (1) C → D → A → B
 - (2) C → D → B → A
 - (3) D → B → A → C
 - (4) D → B → C → A
- 6 Which conclusion was drawn from the results of the gold foil experiment?
- (1) An atom is electrically neutral.
 - (2) An atom is mostly empty space.
 - (3) The nucleus of an atom is negatively charged.
 - (4) The electrons in an atom are located in specific shells.
- 7 As a result of the gold foil experiment, it was concluded that an atom
- (1) contains protons, neutrons, and electrons
 - (2) contains a small, dense nucleus
 - (3) has positrons and orbitals
 - (4) is a hard, indivisible sphere
- 8 Which particles are found in the nucleus of an argon atom?
- (1) protons and electrons
 - (2) positrons and neutrons
 - (3) protons and neutrons
 - (4) positrons and electrons
- 9 The part of an atom that has an overall positive charge is called
- (1) an electron
 - (2) the nucleus
 - (3) the first shell
 - (4) the valence shell

10 Which statement describes the charge and location of an electron in an atom?

- (1) An electron has a positive charge and is located outside the nucleus.
- (2) An electron has a positive charge and is located in the nucleus.
- (3) An electron has a negative charge and is located outside the nucleus.
- (4) An electron has a negative charge and is located in the nucleus.

11 Which phrase describes an Al atom?

- (1) a negatively charged nucleus, surrounded by negatively charged electrons
- (2) a negatively charged nucleus, surrounded by positively charged electrons
- (3) a positively charged nucleus, surrounded by negatively charged electrons
- (4) a positively charged nucleus, surrounded by positively charged electrons

12 Which statement describes the structure of an atom?

- (1) The nucleus contains positively charged electrons.
- (2) The nucleus contains negatively charged protons.
- (3) The nucleus has a positive charge and is surrounded by negatively charged electrons.
- (4) The nucleus has a negative charge and is surrounded by positively charged electrons.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

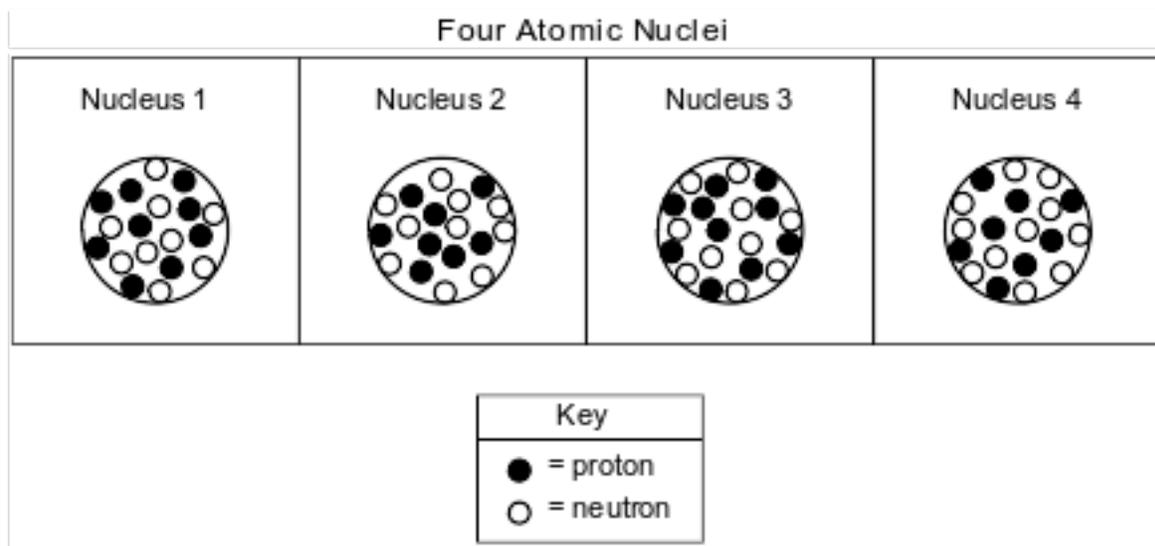
A student compares some models of the atom. These models are listed in the table below in order of development from top to bottom.

| Models of the Atom | | |
|--------------------|---|---|
| Model | Observation | Conclusion |
| Dalton model | Matter is conserved during a chemical reaction. | Atoms are hard, indivisible spheres of different sizes. |
| Thomson model | Cathode rays are deflected by magnetic/electric fields. | Atoms have small, negatively charged particles as part of their internal structure. |
| Rutherford model | Most alpha particles pass straight through gold foil but a few are deflected. | An atom is mostly empty space with a small, dense, positively charged nucleus. |
| Bohr model | Unique spectral lines are emitted by excited gaseous elements. | Packets of energy are absorbed or emitted by atoms when an electron changes shells. |

13 State one way in which the Bohr model agrees with the Thomson model.

Base your answers to questions 14 on the information below and on your knowledge of chemistry.

The diagrams below represent four different atomic nuclei.



- 14 Identify the nucleus above that is found in an atom that has a stable valence electron configuration.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

Elements with an atomic number greater than 92 can be artificially produced in nuclear reactions by bombarding a naturally occurring nuclide with a different nuclide. One of these elements is roentgenium, Rg. The equation below represents a nuclear reaction that produces Rg-272.



- 15 State the location and the total charge of the protons in a Ni-64 atom.

Answer Keys

1 1

2 2

3 4

4 3

5 4

6 2

7 2

8 3

9 2

10 3

11 3

12 3

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- Atoms have electrons.
- Atoms have small, negatively charged particles.
- Both models show an internal structure.
- Atoms are neutral.

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- nucleus 3

15 Allow 1 credit for a correct combination of the location and the total charge of the protons.

- Acceptable responses include, but are not limited to:
- Location of protons:
 - in the nucleus
 - the small, dense center of an atom
 - center of an atom
- Total charge of protons:
 - +28
 - 28+
 - 28