

***Chemistry An Atoms First Approach 3rd edition
Zumdahl Test Bank***

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Chapter 01 – Chemical Foundations

1. Which of the following is NOT a practice that would be employed by a scientist?
- a. testing ideas by experimentation
 - b. organizing findings in specific ways
 - c. predicting the outcome of an experiment and then not testing the prediction
 - d. trying to explain how nature works
 - e. making physical models to explain the behavior of matter

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

2. Which of the following is NOT normally a part of scientific inquiry?
- a. making observations
 - b. philosophizing
 - c. suggesting an explanation
 - d. testing hypotheses
 - e. performing experiments

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

3. Which of the following statements is incorrect?
- a. The scientific method is a way of looking at the world that is different from nonscientific forms of inquiry.
 - b. The scientific method does not allow for the use of inferences, and everything must be proven by direct observation.
 - c. A theory is a guess about the behavior or properties of matter.
 - d. Scientists must isolate and study one variable at a time when performing experiments.
 - e. A behavior of matter that has universal validity is called a natural law.

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

4. Which of the following observations does NOT relate specifically to the law of definite proportions?
- a. Pure water is composed of the elements oxygen and hydrogen in a mass ratio of 8 to 1.
 - b. Any sample of a given compound always contains the same proportions by mass of the component elements.

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- c. The mass of the products of a chemical reaction is equal to the mass of the starting materials of the reaction.
- d. When a metal reacts with oxygen, the oxygen content of the products is fixed at one or two values.
- e. When water is broken down into its elements by electrolysis, elemental oxygen and hydrogen are formed in an 8 to 1 mass ratio.

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

5. Which of the following statements regarding fundamental chemical laws is incorrect?
- a. John Dalton's experimental results led to the law of conservation of mass.
 - b. Antoine Lavoisier's experiments showed that the mass of the products of a chemical reaction equals the mass of the reacting substances.
 - c. When wood is burned, the ashes weigh less than the original wood, but this is not a violation of the law of conservation of matter.
 - d. John Dalton observed that carbon and oxygen can form two compounds, one of which has twice as much oxygen per gram of carbon as the other.
 - e. Joseph Proust's findings regarding the composition of various compounds led to the law of definite proportions.

ANSWER: a

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

6. Which of the following statements regarding atoms and atomic theory is incorrect?
- a. Elements are made of tiny particles called atoms.
 - b. The atoms of different elements are different in some fundamental way.
 - c. Chemical compounds are formed when atoms of different elements combine with each other.
 - d. An element is a substance that cannot be broken down into simpler substances.
 - e. By the 1700s, all chemists believed that elements were made of atoms.

ANSWER: e

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton's Atomic Theory

7. Which of the following statements regarding atoms and atomic theory is incorrect?
- a. Antoine Lavoisier discovered that matter is not gained or lost in a chemical reaction.
 - b. Joseph Proust showed that when elements combine to form new substances, they do so in specific

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mass ratios.

- c. According to John Dalton's observations, when water forms, the mass ratio of hydrogen to oxygen is variable.
- d. John Dalton's atomic theory stated that all atoms of a given element are identical.
- e. John Dalton discovered that in two different compounds of carbon and oxygen, the ratio of oxygen to carbon was two times higher in one compound than the other.

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton's Atomic Theory

8. Which of the following is NOT part of Dalton's atomic theory?

- a. Elements are made of tiny particles called atoms.
- b. All atoms of a given element are identical to each other.
- c. Atoms of one element can be changed to atoms of another element in a chemical reaction.
- d. Atoms combine in fixed ratios to form chemical compounds.
- e. Chemical reactions involve a reorganization of the atoms in the starting materials.

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton's Atomic Theory

9. Which of the following statements regarding early atomic experiments is incorrect?

- a. J. J. Thomson postulated that the "ray" that was observed in cathode ray tubes was a stream of negatively charged particles.
- b. J. J. Thomson reasoned that since electrons could be produced from electrodes made of different metals, that all atoms must contain electrons.
- c. J. J. Thomson postulated that an atom consists of a diffuse cloud of positive charge with negative electrons randomly embedded in it.
- d. Ernest Rutherford's experiment necessitated a revision of Thomson's plum pudding model of the atom.
- e. All of these statements are correct.

ANSWER: e

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.4 - Early Atomic Experiments and Models

10. Which of the following statements regarding early atomic experiments is incorrect?

- a. J. J. Thomson postulated that the "ray" that was observed in cathode ray tubes was a stream of

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negatively charged particles.

- b. Ernest Rutherford was not surprised by the result of his experiment with the metal foil and α -particles.
- c. J. J. Thomson postulated that an atom consists of a diffuse cloud of positive charge with negative electrons randomly embedded in it.
- d. Ernest Rutherford's experiment necessitated a revision of Thomson's plum pudding model of the atom.
- e. Henri Becquerel's discovery of radioactivity was critical to the experiments that helped elucidate the structure of the atom.

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.4 - Early Atomic Experiments and Models

11. The subatomic particles studied by chemists that make up the atom include all of the following except the _____.

- a. proton
- b. All of these choices are part of the atom.
- c. electron
- d. neutron
- e. phlogiston

ANSWER: e

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

12. In any neutral atom,

- a. the number of electrons equals the number of protons.
- b. the number of electrons is less than the number of protons.
- c. the number of electrons is greater than the number of protons.
- d. the number of electrons is equal to the number of neutrons.
- e. the number of neutrons is always equal to the number of protons.

ANSWER: a

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

13. Which of the following statements regarding the nucleus of the atom is incorrect?

- a. The nucleus is the central core of the atom.

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- b. The nucleus contains the electrons and the protons.
- c. The nucleus contains most of the mass of the atom.
- d. The nucleus contains the neutrons.
- e. The nucleus contains the neutrons and protons, as well as most of the mass of the atom.

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

14. The number of _____ determines the identity of an element.
- a. electrons
 - b. protons
 - c. neutrons
 - d. neutrons plus protons
 - e. protons plus electrons

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

15. Consider the element indium, atomic number 49. The nucleus of an atom of indium-112 contains
- a. 49 protons, 63 neutrons, 49 electrons.
 - b. 49 protons, 49 neutrons.
 - c. 49 protons, 49 alpha particles.
 - d. 49 protons, 63 neutrons.
 - e. 49 protons, 112 neutrons.

ANSWER: d

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

16. $^{40}_{20}\text{Ca}^{2+}$ has _____.

- a. 20 protons, 20 neutrons, and 18 electrons
- b. 22 protons, 20 neutrons, and 20 electrons
- c. 20 protons, 22 neutrons, and 18 electrons
- d. 22 protons, 18 neutrons, and 18 electrons
- e. 20 protons, 20 neutrons, and 22 electrons

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ANSWER: a

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

17. Which of the following statements is (are) true?

- a. $^{18}_8\text{O}$ and $^{19}_9$ have the same number of neutrons.
- b. $^{14}_6\text{C}$ and $^{14}_7$ are isotopes of each other because their mass numbers are the same.
- c. $^{18}_8\text{O}^{2-}$ has the same number of electrons as $^{20}_{10}\text{Ne}$.
- d. Two of the statements are true.
- e. All of the statements are true.

ANSWER: e

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

18. A species with 12 protons and 10 electrons is _____.

- a. Ne^{2+}
- b. Ti^{2+}
- c. Mg^{2+}
- d. Mg
- e. Ne^{2-}

ANSWER: c

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

19. The numbers of protons, neutrons, and electrons in $^{39}_{19}\text{K}^+$ are

- a. 20 p, 19 n, 19 e.
- b. 20 p, 19 n, 20 e.
- c. 19 p, 20 n, 20 e.
- d. 19 p, 20 n, 19 e.
- e. 19 p, 20 n, 18 e.

ANSWER: e

POINTS: 1

QUESTION TYPE: Multiple Choice

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HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

20. An ion is formed

- a. by either adding or subtracting protons from the atom.
- b. by either adding or subtracting electrons from the atom
- c. by either adding or subtracting neutrons from the atom.
- d. all of these are true.
- e. two of these are true.

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

21. All of the following are true EXCEPT

- a. ions are formed by adding electrons to a neutral atom.
- b. ions are formed by changing the number of protons in an atom's nucleus.
- c. ions are formed by removing electrons from a neutral atom.
- d. an ion has a positive or negative charge.
- e. metals tend to form positive ions.

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.5 - Atomic Structure

22. The formula of water, H₂O, suggests

- a. there is twice as much mass of hydrogen as oxygen in each molecule.
- b. there are two hydrogen atoms and one oxygen atom per water molecule.
- c. there is twice as much mass of oxygen as hydrogen in each molecule.
- d. there are two oxygen atoms and one hydrogen atom per water molecule.
- e. none of these are correct.

ANSWER: b

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

23. A natural law summarizes what happens in a set of experiments.

- a. True

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b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

24. Scientific thinking is useful only for science and has no application in everyday life.

a. True

b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

25. A theory (model) is an attempt to explain some aspect of natural behavior.

a. True

b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.6 - Models (Theories) Are Explanations of Why Nature Behaves in a Particular Way.

26. The law of conservation of mass is an example of a scientific theory.

a. True

b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.6 - Models (Theories) Are Explanations of Why Nature Behaves in a Particular Way.

27. Once a scientific theory (model) is formulated, it can never be changed.

a. True

b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

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HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.6 - Models (Theories) Are Explanations of Why Nature Behaves in a Particular Way.

28. A natural law is a rule that is enacted by a group of influential scientists.

- a. True
- b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

29. The law of conservation of mass states that mass is neither created nor destroyed in a chemical reaction.

- a. True
- b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

30. Scientific theories are explanations of natural behavior.

- a. True
- b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.6 - Models (Theories) Are Explanations of Why Nature Behaves in a Particular Way.

31. The first “chemist” to perform truly quantitative experiments was J. J. Thomson.

- a. True
- b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton’s Atomic Theory

32. John Dalton’s atomic theory accounted for the existence of different isotopes of elements.

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- a. True
- b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton's Atomic Theory

33. John Dalton's atomic theory stated that chemical compounds are formed when atoms of different elements combine with each other.

- a. True
- b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.3 - Dalton's Atomic Theory

34. J. J. Thomson reasoned that since electrons could be produced from electrodes made of different metals, then all atoms must contain electrons.

- a. True
- b. False

ANSWER: True

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.4 - Early Atomic Experiments and Models

35. J. J. Thomson postulated that atoms consist of a diffuse cloud of negative charge.

- a. True
- b. False

ANSWER: False

POINTS: 1

QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.4 - Early Atomic Experiments and Models

36. Ernest Rutherford proposed the "plum pudding" model of the atom.

- a. True
- b. False

ANSWER: False

POINTS: 1

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QUESTION TYPE: True / False

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.4 - Early Atomic Experiments and Models

37. The process at the center of scientific inquiry is called the _____.

ANSWER: scientific method

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

38. A _____ is a possible explanation for an observation.

ANSWER: hypothesis

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

39. A natural _____ summarizes what happens in a series of experiments, and a _____ is an attempt to explain why it happens.

ANSWER: law; theory

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.1 - Scientific Method

40. The law of _____ states that mass is neither created nor destroyed in a chemical reaction.

ANSWER: conservation of mass

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

41. The law of _____ states that a given compound always contains exactly the same proportion of elements by mass.

ANSWER: definite proportions

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

42. _____ states that at the same temperature and pressure, equal volumes of different gases contain the same number of particles.

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ANSWER: Avogadro's hypothesis

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws

43. The _____ in a chemical formula represent the number of atoms in a particular molecule or formula unit.

ANSWER: subscripts

POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

LEARNING OBJECTIVES: AF.ZUMD.21.01.2 - Fundamental Laws