CHAPTER 3 TEST

Atoms: The Building Blocks of Matter

MULTIPLE CHOICE  On the line at the left of each statement, write the letter of the choice that best completes the statement or answers the question.

1.  The behavior of cathode rays in a glass tube containing gas at low pressure led scientists to conclude that the rays were composed of  
   a. energy  
   b. positive particles  
   c. negative particles  
   d. neutral particles

2.  The basic principles of atomic theory that are still recognized today were first conceived by  
   a. Avogadro  
   b. Bohr  
   c. Dalton  
   d. Rutherford

3.  An example of the law of multiple proportions is the existence of  
   a. FeCl₃ and Fe(SO₄)₃  
   b. O₂ and O₃  
   c. CO and CO₂  
   d. FeCl₂ and Fe(NO₃)₂

4.  Atoms of the same element can differ in  
   a. chemical properties  
   b. mass number  
   c. atomic number  
   d. number of protons and electrons

5.  Dalton’s atomic theory helped to explain the law of conservation of mass because it stated that atoms  
   a. could not combine  
   b. were invisible  
   c. all had the same mass  
   d. could not be created or destroyed

6.  Milliken’s experiments determined  
   a. that the electron carried no charge  
   b. that the electron carried the smallest possible positive charge  
   c. the approximate value of the electron’s mass  
   d. that the electron had no mass

7.  In Rutherford’s experiment, a small percentage of the positively charged particles bombarding the metal’s surface  
   a. were slightly deflected as they passed through the metal  
   b. were deflected back toward the source from the metal  
   c. passed straight through the metal  
   d. combined with the metal

8.  Most of the volume of an atom is made up of the  
   a. nucleus  
   b. nuclides  
   c. electron cloud  
   d. protons
CHAPTER 3 TEST continued

FILL IN THE BLANK  Write the correct term (or terms) in the space provided.

9. If a particular compound is composed of elements A and B, the ratio of the mass of B to the mass of A will always be the same. This is a statement of the law of [DEF PEP]

10. The amount of a substance that contains a number of particles equal to the number of atoms in exactly 12 g of carbon-12 is referred to as a(n) [REL ATOMIC MASS]

11. Since any metal cathode used in a cathode-ray tube produced the same charged particles, it was concluded that all atoms contain [ELECTRONS]

12. The smallest particle of an element that retains the chemical properties of that element is a(n) [ATOM]

13. Atoms of the element that have different masses are called [ISOTOPES]

14. The total number of protons and neutrons in the nucleus of an isotope is called its [MASS] number.

15. The short-range attractive forces that hold the nuclear particles together are called [NUCLEAR FORCE]

16. The number of protons in the nucleus of an element is called its [ATOMIC] number.

17. If two or more compounds are composed of elements A and B, the ratio of the masses of B combined with 1 g of A make each compound a ratio of small whole numbers. This is a statement of the law of [MULTI PROP]

18. Dalton’s atomic theory agreed with the modern atomic theory EXCEPT for the statement that all atoms of the same element have the same [MASS]

Complete the following table to compare the types of subatomic particles.

<table>
<thead>
<tr>
<th>Particle</th>
<th>Mass number</th>
<th>Relative charge</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Proton</td>
<td>1</td>
<td>+</td>
<td>NUCLEUS</td>
</tr>
<tr>
<td>20. Neutron</td>
<td>1</td>
<td>-</td>
<td>NUCLEUS</td>
</tr>
<tr>
<td>21. Electron</td>
<td>0</td>
<td></td>
<td>E- CLOUD</td>
</tr>
</tbody>
</table>
CHAPTER 3 TEST continued

SHORT ANSWER  Write the answers to the following questions in the space provided.

22. Give three of the main concepts in Dalton’s atomic theory.

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23. What is molar mass? How is it related to atomic mass?

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24. Explain why the atomic mass of a particular isotope of an element differs from the average atomic mass of that element.

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PROBLEMS  Write the answers to the questions on the line to the left, and show your work in the space provided.

25. The atomic number of nickel-60 is 28. How many neutrons does this isotope have?

26. Carbon-14 has 8 neutrons. What is the atomic number of carbon-14?
An atom of silicon-30 contains 14 protons. How many electrons does it have?

Oxygen has three naturally occurring isotopes in the following proportions: oxygen-16, 99.762% (15.994 91 amu); oxygen-17, 0.038000% (16.999 13 amu); oxygen-18, 0.20000% (17.999 16 amu). What is the average atomic mass of oxygen?

The average atomic mass of chromium is 52.00 amu. What is the mass of 3.00 mol of chromium?

How many moles are in a sample of 63.658 g of carbon? (The molar mass of carbon is 12.01 g/mol.)

The mass of a sample of nickel (average atomic mass 58.69 amu) is 11.74 g. How many atoms does it contain?

The atomic mass of sulfur is 32.06 amu. How many atoms are present in exactly 2 mol sulfur?