

Practice – How Atoms Differ

For each statement below, write true or false.

1. False The number of neutrons in an atom is referred to as its atomic number.
2. True The periodic table is arranged by increasing atomic number.
3. True Atomic number is equal to the number of electrons in a neutral atom.
4. True The number of protons in an atom identifies it as an atom of a particular element.
5. False The number of neutrons in an atom is always equal to that atom's atomic number.

Answer the following questions about atoms.

6. Lead has an atomic number of 82. How many protons and electrons does lead have? 82 p⁺, 82 e⁻
7. Oxygen has 8 electrons. How many protons does oxygen have? 8 p⁺
8. Zinc has 30 protons. What is its atomic number? 30
9. Astatine has 85 protons. What is its atomic number? 85
10. Rutherfordium has an atomic number of 104. How many protons & electrons does it have? 104 p⁺, 104 e⁻
11. Polonium has an atomic number of 84. How many protons & electrons does it have? 84 p⁺, 84 e⁻
12. Nobelium has an atomic number of 102. How many protons & electrons does it have? 102 p⁺, 102 e⁻

Determine the number of protons, electrons, and neutrons for each isotope described below.

13. An isotope with atomic number 19 and mass number 39. * 19 p⁺, 19 e⁻, 20 n⁰
14. An isotope with 14 electrons and a mass number of 28. 14 p⁺, 14 e⁻, 14 n⁰
15. An isotope with 21 neutrons and a mass number of 40. * 19 p⁺, 19 e⁻, 21 n⁰
16. An isotope with an atomic number of 51 and a mass number of 123. 51 p⁺, 51 e⁻, 72 n⁰
17. Which of the isotopes in problems 13-16 are isotopes of the same element? Identify the element. * 19K

Write each isotope below in symbolic notation.

18. neon-22 $^{22}_{10}\text{Ne}$

19. helium ^4_2He

20. cesium-133 $^{133}_{55}\text{Cs}$

21. uranium-234 $^{234}_{92}\text{U}$

Label the mass number and the atomic number on the following isotope notation.

22. mass # 
23. atomic # 

Circle the letter of the choice that best completes the statement.

24. The mass of an electron is
 a. smaller than the mass of a proton
 b. smaller than the mass of a neutron
 c. a tiny fraction of the mass of an atom
 d. all of the above
25. One atomic mass unit is
 a. 1/12 the mass of a carbon-12 atom.
 b. 1/16 the mass of an oxygen-16 atom.
 c. exactly the mass of one proton.
 d. approximately the mass of 1 proton plus 1 neutron.
26. The atomic mass of an atom is usually not a whole number because it accounts for
 a. Only the relative abundance of the atom's isotopes.
 b. Only the mass of each of the atom's isotopes.
 c. The mass of the atoms electrons.
 d. Both the relative abundance and the mass of each of the atom's isotopes.

Use the figures to answer the following questions.

Osmium
76
Os
190.2

Niobium
41
Nb
92.906

27. What is the atomic number of osmium? 76
28. What is the chemical symbol for niobium? Nb
29. What is the atomic mass of osmium? 190.2
30. What units is the atomic mass reported in? atomic mass units (u)
31. How many protons and electrons does an osmium atom have? A niobium atoms? Os - 76p⁺ + e⁻, Nb - 41p⁺ + 41e⁻

Calculate the atomic mass of each element described below. Then use the periodic table to identify each element.

32.

Isotope	Mass (amu)	Percent Abundance
⁶³ X	62.930	69.17
⁶⁵ X	64.928	30.83

$$(62.930 \times 0.6917) + (64.928 \times 0.3083) = \boxed{63.55 \text{ u}}$$

This is → Cu

33.

Isotope	Mass (amu)	Percent Abundance
³⁵ X	34.969	75.77
³⁷ X	36.966	24.23

$$(34.969 \times 0.7577) + (36.966 \times 0.2423) = \boxed{35.45 \text{ u}}$$

This is → Cl

Answer the following.

34. A carbon atom has a mass number of 12 and an atomic number of 6. How many neutrons does it have?

6 n°

35. An isotope of mercury has 80 protons and 120 neutrons. What is the mass number of this isotope?

200

36. An isotope of xenon has an atomic number of 54 and contains 77 neutrons. What is the xenon isotope's mass number?

131

Fill in the following tables, listing how many protons, neutrons, and electrons are contained in each of the following atoms

Atom	Number of Protons	Number of Neutrons	Number of Electrons
$^{132}_{55}\text{Cs}$	55	77	55
$^{59}_{27}\text{Co}$	27	32	27
$^{163}_{69}\text{Tm}$	69	94	69
$^{70}_{30}\text{Zn}$	30	40	30

Atom	Number of Protons	Number of Neutrons	Number of Electrons
Gallium-64	31	33	31
Fluorine-23	9	14	9
Titanium-48	22	26	22
Helium-8	2	6	2