Periodic Table and Intro Chemistry

Use this key to check answers and read the explanations.

1. Which symbol identifies the element oxygen on a periodic table?
   - A. O
   - B. Ox
   - C. Og
   - D. Os

   Correct answer: A. O
   O is oxygen. Og stands for oganesson and Os for osmium, so those two extra letters change the element.

2. On a standard periodic table, what is a vertical column of elements called?
   - A. An isotope
   - B. A period
   - C. A group
   - D. A shell

   Correct answer: C. A group
   Groups run down the table. Periods run horizontally across it.

3. A classroom chart places neon directly above argon. Which element family do both belong to?
   - A. Halogens
   - B. Noble gases
   - C. Alkali metals
   - D. Alkaline earth metals

   Correct answer: B. Noble gases
   Neon and argon are both in Group 18, the noble gases at the right edge of the table.

4. A pinch of salt dissolves completely in a cup of water. How should the clear liquid be classified?
   - A. Pure element
   - B. Heterogeneous mixture
   - C. Pure compound
   - D. Homogeneous mixture

   Correct answer: D. Homogeneous mixture
   The dissolved salt is distributed uniformly through the water. The liquid still contains both substances, which makes it a homogeneous mixture.

5. In one molecule of CO_2, how many oxygen atoms are present?

A. One
B. Two
C. Three
D. Zero

Correct answer: B. Two
The subscript 2 applies to oxygen. Carbon has no subscript here, so the molecule contains one carbon and two oxygens.

6. Two neutral atoms each have 13 protons, but one has an extra neutron. What must both atoms be?

A. Aluminum
B. Silicon
C. Magnesium
D. Phosphorus

Correct answer: A. Aluminum
An atom with 13 protons is aluminum. The added neutron changes the isotope, while the proton count identifies the element.

7. A neutral magnesium atom has 12 electrons. How many remain after it becomes Mg^{2+}?

A. 14
B. 12
C. 13
D. 10

Correct answer: D. 10
A 2+ charge means the atom has lost two electrons. Subtracting two from 12 leaves 10.

8. A diagram shows two hydrogen atoms sharing a pair of electrons. Which bond does the pair represent?

A. Metallic bond
B. Ionic bond
C. Covalent bond
D. Hydrogen bond

Correct answer: C. Covalent bond
The pair is shared by the two bonded atoms, the defining feature of a covalent bond.

9. Boron-10 and boron-11 each have five protons. How many neutrons do they have, in that order?

A. Five and six
B. Five and five
C. Six and five
D. Ten and eleven

Correct answer: A. Five and six
Subtract five protons from each mass number. Boron-10 has five neutrons and boron-11 has six.

10. Aluminum ions have charge 3+ and oxide ions have charge 2−. Which formula balances the charges?

A. AlO_2
B. AlO
C. Al_3O_2
D. Al_2O_3

Correct answer: D. Al_2O_3
Two aluminum ions supply a total charge of +6 and three oxide ions supply −6. Al_2O_3 is the smallest whole-number ratio that balances both.

11. Measured covalent radii are 64 pm for fluorine, 99 pm for chlorine and 114 pm for bromine. Which pattern do they illustrate?

A. All three atoms have the same radius
B. Radius decreases down this group
C. Radius increases down this group
D. Radius is largest for the middle element

Correct answer: C. Radius increases down this group
The three halogens sit in that order from top to bottom. The radii increase as the outer electrons occupy successively larger shells.

12. Which pair has the same number of electrons? The atomic numbers are neon 10, sodium 11 and magnesium 12.

A. Na^+ and neutral Mg
B. Na^+ and Ne
C. Ne and Mg^+
D. Neutral Na and Mg^{2+}

Correct answer: B. Na^+ and Ne
Na^+ has lost one of sodium’s 11 electrons, leaving 10. Neutral neon also has 10 electrons.

13. Which coefficient balances the oxygen atoms in 2 C_4H_{10} + ? O_2 → 8 CO_2 + 10 H_2O?

A. 26
B. 10
C. 16
D. 13

Correct answer: D. 13
The products contain 16 oxygen atoms in carbon dioxide and 10 in water. Each O_2 contains two oxygen atoms, so 26 oxygen atoms require a coefficient of 13.

14. In a fictional sample, 90% of the atoms have a mass of 20.0 u and 10% have a mass of 22.0 u. What is the sample’s mean atomic mass?

A. 20.2 u
B. 20.9 u
C. 21.0 u
D. 21.8 u

Correct answer: A. 20.2 u
Multiply each mass by its fraction of the sample and add the products. The result is 0.90 × 20.0 + 0.10 × 22.0 = 20.2 u.

15. A bromine ion has 35 protons, 46 neutrons and 36 electrons. Which isotope and charge match those counts?

A. Bromine-82 with a negative charge
B. Bromine-81 with a positive charge
C. Bromine-81 with a negative charge
D. Bromine-46 with a positive charge

Correct answer: C. Bromine-81 with a negative charge
Adding 35 protons and 46 neutrons gives mass number 81. The ion has one more electron than proton, giving it a 1− charge.