

Chapter 2: Atoms, Molecules, and Ions

- Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?
 - NH_4 and NH_4Cl
 - ZnO_2 and ZnCl_2
 - H_2O and HCl
 - NO and NO_2
 - CH_4 and CO_2
- A sample of chemical X is found to contain 5.0 grams of oxygen, 10.0 grams of carbon, and 20.0 grams of nitrogen. The law of definite proportion would predict that a 70 gram sample of chemical X should contain how many grams of carbon?
 - 5.0 grams
 - 7.0 grams
 10. grams
 - 15 grams
 - 20 grams
- How many of the following postulates of Dalton's atomic theory are still scientifically accepted?
 - All atoms of the same element are identical.
 - Compounds are combinations of different atoms.
 - A chemical reaction changes the way atoms are grouped together.
 - Atoms are indestructible.
 - 0
 - 1
 - 2
 - 3
 - 4
- The first scientist to show that atoms emit any negative particles was
 - J. J. Thomson
 - Lord Kelvin
 - Ernest Rutherford
 - William Thomson
 - John Dalton
- The scientist whose alpha-particle scattering experiment led him to conclude that the nucleus of an atom contains a dense center of positive charge is
 - J. J. Thomson
 - Lord Kelvin
 - Ernest Rutherford
 - William Thomson
 - John Dalton

6. Which one of the following statements about atomic structure is false?
- A) An atom is mostly empty space.
 - B) Almost all of the mass of the atom is concentrated in the nucleus.
 - C) The protons and neutrons in the nucleus are very tightly packed.
 - D) The number of protons and neutrons is always the same in the neutral atom.
 - E) All of the above statements (A-D) are true.
7. Rutherford's experiment was important because it showed that:
- A) Radioactive elements give off alpha particles.
 - B) Gold foil can be made to be only a few atoms thick.
 - C) A zinc sulfide screen scintillates when struck by a charged particle.
 - D) The mass of the atom is uniformly distributed throughout the atom.
 - E) An atom is mostly empty space.
8. Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains
- A) 35 protons, 44 neutrons, 35 electrons
 - B) 34 protons and 35 electrons, only
 - C) 44 protons, 44 electrons, and 35 neutrons
 - D) 35 protons, 79 neutrons, and 35 electrons
 - E) 79 protons, 79 electrons, and 35 neutrons
9. Which of the following atomic symbols is incorrect?
- A) ${}^14_6\text{C}$
 - B) ${}^{37}_{17}\text{Cl}$
 - C) ${}^{32}_{15}\text{P}$
 - D) ${}^{39}_{19}\text{K}$
 - E) ${}^{14}_8\text{N}$
10. Which among the following represent a set of isotopes? Atomic nuclei containing:
- I. 20 protons and 20 neutrons
 - II. 21 protons and 19 neutrons
 - III. 22 neutrons and 18 protons
 - IV. 20 protons and 22 neutrons
 - V. 21 protons and 20 neutrons
- A) I, II, III
 - B) III, IV
 - C) I, V
 - D) I, IV and II, V
 - E) No isotopes are indicated.

11. Which of the following statements are *true* of uranium-238?
- Its chemical properties will be exactly like those of uranium-235.
 - Its mass will be slightly different from that of an atom of uranium-235.
 - It will contain a different number of protons than an atom of uranium-235.
 - It is more plentiful in nature than uranium-235.
- III, IV
 - I, II, III
 - I, II, IV
 - II, III, IV
 - all of these
12. An isotope, X, of a particular element has an atomic number of 15 and a mass number of 31. Therefore:
- X is an isotope of phosphorus.
 - X has 16 neutrons per atom.
 - X has an atomic mass of 30.973.
 - A and B.
 - A, B, and C.
13. ${}_{20}^{40}\text{Ca}^{2+}$ has
- 20 protons, 20 neutrons, and 18 electrons
 - 22 protons, 20 neutrons, and 20 electrons
 - 20 protons, 22 neutrons, and 18 electrons
 - 22 protons, 18 neutrons, and 18 electrons
 - 20 protons, 20 neutrons, and 22 electrons
14. Which of the following statements is (are) true?
- ${}_{8}^{18}\text{O}$ and ${}_{9}^{19}\text{F}$ have the same number of neutrons.
 - ${}_{6}^{14}\text{C}$ and ${}_{7}^{14}\text{N}$ are isotopes of each other because their mass numbers are the same.
 - ${}_{8}^{18}\text{O}^{2-}$ has the same number of electrons as ${}_{10}^{20}\text{Ne}$.
 - A and B
 - A and C
15. A species with 12 protons and 10 electrons is
- Ne^{2+}
 - Ti^{2+}
 - Mg^{2+}
 - Mg
 - Ne^{2-}

16. The numbers of protons, neutrons, and electrons in ${}_{19}^{39}\text{K}^+$ 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
17. 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.
18. Which of the following are incorrectly paired?
- A) K, alkali metal
 - B) Ba, alkaline earth metal
 - C) O, halogen
 - D) Ne, noble gas
 - E) Ni, transition metal
19. All of the following are characteristics of metals *except*:
- A) good conductors of heat
 - B) malleable
 - C) ductile
 - D) often lustrous
 - E) tend to gain electrons in chemical reactions
20. All of the following are characteristics of nonmetals *except*:
- A) poor conductors of electricity
 - B) often bond to each other by forming covalent bonds
 - C) tend to form negative ions in chemical reactions with metals
 - D) appear in the upper left-hand corner of the periodic table
 - E) do not have a shiny (lustrous) appearance
21. How many protons and electrons does the most stable ion for oxygen have?
- | | # protons | # electrons |
|----|-----------|-------------|
| A) | 10 p | 8 e |
| B) | 8 p | 6 e |
| C) | 6 p | 8 e |
| D) | 8 p | 8 e |
| E) | 8 p | 10 e |

22. You are given a compound with the formula MCl_2 , in which M is a metal. You are told that the metal ion has 26 electrons. What is the identity of the metal?
- A) Fe
 - B) Al
 - C) Zn
 - D) Co
 - E) Ni
23. Which of the following names is incorrect?
- A) cobalt(II) chloride
 - B) magnesium oxide
 - C) aluminum(III) oxide
 - D) diphosphorus pentoxide
 - E) All of the above names are correct.
24. Which of the following pairs is incorrect?
- A) iodine trichloride, ICl_3
 - B) phosphorus pentoxide, P_2O_5
 - C) ammonia, NH_3
 - D) sulfur hexafluoride, SF_6
 - E) All of the above pairs are correct.
25. The correct name for $LiCl$ is
- A) lithium monochloride
 - B) lithium(I) chloride
 - C) monolithium chloride
 - D) lithium chloride
 - E) monolithium monochloride
26. How many oxygen atoms are there in one formula unit of $Ca_3(PO_4)_2$?
- A) 2
 - B) 4
 - C) 6
 - D) 8
 - E) none of these
27. The correct name for FeO is
- A) iron oxide
 - B) iron(II) oxide
 - C) iron(III) oxide
 - D) iron monoxide
 - E) iron(I) oxide
28. The correct name for P^{3-} is
- A) phosphide ion
 - B) phosphorus ion
 - C) phosphorus(III) ion
 - D) phospho(III) ion
 - E) phosphite

29. What is the subscript of barium in the formula of barium sulfate?
A) 1
B) 2
C) 3
D) 4
E) 0
30. Which of the following pairs is *incorrect*?
A) NH_4Br , ammonium bromide
B) K_2CO_3 , potassium carbonate
C) BaPO_4 , barium phosphate
D) CuCl , copper(I) chloride
E) MnO_2 , manganese(IV) oxide
31. Which metals form cations with varying positive charges?
A) transition metals
B) Group 1 metals
C) Group 2 metals
D) Group 3 metals
E) metalloids
32. Which of the following elements does NOT have a symbol taken from a LATIN name for the element or one of its compounds?
A) iron
B) copper
C) sodium
D) potassium
E) titanium
33. How many protons, neutrons and electrons, in that order are present in the anion formed by one atom of ^{125}I ?
A) 53, 74, 54
B) 52, 72, 53
C) 54, 72, 53
D) 53, 72, 54
E) 54, 74, 54
34. Which statement is INCORRECT?
A) An atom of ^{60}Zn has an equal number of protons and neutrons
B) An atom of ^{50}Mn has an equal number of electrons and neutrons
C) An atom of ^{18}O has an equal number of protons and neutrons
D) An atom of ^{41}K has an equal number of protons and electrons
E) An atom of ^{238}U contains 146 neutrons.
35. Which of the following compounds is incorrectly named?
A) $\text{Mg}(\text{OH})_2$ is magnesium dihydroxide
B) CaO is calcium oxide
C) NH_4NO_3 is ammonium nitrate
D) K_3PO_4 is potassium phosphate
E) MgSO_3 is magnesium sulfite

Go Vikings!!