

Chem 10 Chapter 5

Molecules and Compounds

Additional Practice Questions

Worked solutions at the end

Use your course periodic table and a calculator as needed. Show the setup, include units, and round at the end. Question numbers match the numbers in the solutions. Use heading navigation to move between sections.

Additional Practice Questions

Question 1

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

Question 2

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

Question 3

The correct name for FeO is

- A) iron oxide
- B) iron(II) oxide
- C) iron(III) oxide
- D) iron monoxide
- E) iron(I) oxide

Question 4

Which of the following is incorrectly named?

- A) SO_3^{2-} , sulfite ion
- B) $\text{S}_2\text{O}_3^{2-}$, thiosulfate ion
- C) PO_4^{3-} , phosphate ion
- D) ClO_3^- , chlorite ion
- E) CN^- , cyanide ion

Question 5

All of the following are in aqueous solution. Which is incorrectly named?

- A) $\text{HC}_2\text{H}_3\text{O}_2$, acetic acid
- B) HBr , bromic acid
- C) H_2SO_3 , sulfurous acid
- D) HNO_2 , nitrous acid
- E) HClO_3 , chloric acid

Question 6

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

Question 7

Which of these statements is a consequence (follows from) the Law of Definite Proportion?

- A) All samples of chlorine contain chlorine-35 and chlorine-37 in the same (definite) ratio.
- B) The mass of oxygen that is combined with a fixed mass of nitrogen in each of the binary nitrogen oxides can be expressed as a ratio of small whole numbers.
- C) The atomic masses of all of the elements in the periodic table have fixed values.
- D) The % lead by mass in the compound galena is the same for all pure samples obtained from any source.
- E) None of these is correct

Question 8

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

Question 9

Write the names of the following compounds:

- (a) FeSO_4
- (b) $\text{NaC}_2\text{H}_3\text{O}_2$
- (c) KNO_2
- (d) $\text{Ca}(\text{OH})_2$
- (e) NiCO_3

Question 10

Why do we call $\text{Ba}(\text{NO}_3)_2$ barium nitrate, but we call $\text{Fe}(\text{NO}_3)_2$ iron(II) nitrate?

Question 11

The common name for NH_3 is ammonia. What would be the systematic name for NH_3 ? Support your answer.

Question 12

Name each compound. Assume the acids are in aqueous solution.

- (a) $\text{HC}_2\text{H}_3\text{O}_2$
- (b) NH_4NO_2
- (c) Co_2S_3
- (d) ICl
- (e) $\text{Pb}_3(\text{PO}_4)_2$
- (f) KClO_3
- (g) H_2SO_4
- (h) Sr_3N_2
- (i) $\text{Al}_2(\text{SO}_3)_3$
- (j) SnO_2
- (k) Na_2CrO_4
- (l) HClO

Question 13

Write the formula for each compound.

- (a) sulfur difluoride
- (b) sulfur hexafluoride
- (c) sodium dihydrogen phosphate
- (d) lithium nitride
- (e) chromium(III) carbonate
- (f) tin(II) fluoride
- (g) ammonium acetate
- (h) ammonium hydrogen sulfate
- (i) cobalt(III) nitrate
- (j) mercury(I) chloride
- (k) potassium chlorate
- (l) sodium hydride

Solutions

Find the solution with the same question number.

Question 1 Solution

E. Since chloride is Cl^- , MCl_2 implies that the M ion has a 2+ charge. If the ion has 26 electrons, the neutral atom has 28 electrons. Atomic number 28 identifies nickel, Ni.

Question 2 Solution

D. The subscript outside the parentheses multiplies every atom inside. There are $2 \times 4 = 8$ oxygen atoms in one formula unit.

Question 3 Solution

B. Oxygen is present as O^{2-} , so iron must have charge 2+. The name is iron(II) oxide.

Question 4 Solution

D. ClO_3^- is chlorate; chlorite is ClO_2^- .

Question 5 Solution

B. HBr(aq) is hydrobromic acid. Bromic acid is $\text{HBrO}_3\text{(aq)}$.

Question 6 Solution

A. Many transition metals form cations with more than one positive charge. The Roman numeral in a compound name specifies the charge.

Question 7 Solution

D. The law of definite proportions states that a pure compound has a fixed composition by mass. Thus the percentage of lead is the same in every pure sample of galena.

Question 8 Solution

A. The correct name is magnesium hydroxide. Ionic compound names do not use molecular prefixes such as di- to state the number of hydroxide ions.

Question 9 Solution

- (a) Iron(II) sulfate.
- (b) Sodium acetate.
- (c) Potassium nitrite.
- (d) Calcium hydroxide.
- (e) Nickel(II) carbonate.

Question 10 Solution

Barium can only form Ba^{2+} in these compounds, so we do not need to clarify it by putting (II) in the name. Iron can form Fe^{2+} or Fe^{3+} , so we need to make clear which ion is in the compound by putting the charge as a Roman numeral.

Question 11 Solution

Nitrogen trihydride. We do use the tri- prefix because it is a covalent compound: nonmetal–nonmetal.

Question 12 Solution

- (a) Acetic acid.
- (b) Ammonium nitrite.
- (c) Cobalt(III) sulfide.
- (d) Iodine monochloride.
- (e) Lead(II) phosphate.
- (f) Potassium chlorate.
- (g) Sulfuric acid.
- (h) Strontium nitride.
- (i) Aluminum sulfite.
- (j) Tin(IV) oxide.
- (k) Sodium chromate.
- (l) Hypochlorous acid.

Question 13 Solution

- (a) SF_2 .
- (b) SF_6 .
- (c) NaH_2PO_4 . Even though this is an ionic compound, there is a di- prefix in its name. How come? “Dihydrogen phosphate” is the anion’s name, and the two hydrogens are covalently bonded to the phosphate part. The anion is H_2PO_4^- , not PO_4^{3-} .
- (d) Li_3N . Li is a Group 1A metal and forms Li^+ ; N is a Group 5A nonmetal that forms N^{3-} when ionized.
- (e) $\text{Cr}_2(\text{CO}_3)_3$. Two Cr^{3+} cations neutralize three CO_3^{2-} anions.
- (f) SnF_2 . F is a halogen, and as such it forms an anion with -1 charge. Two are needed to neutralize Sn^{2+} .
- (g) $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$.
- (h) NH_4HSO_4 . Hydrogen sulfate, HSO_4^- , is the anion part.
- (i) $\text{Co}(\text{NO}_3)_3$.
- (j) Hg_2Cl_2 .

(k) KClO_3 .

(l) NaH .