

Polyatomic Ions Worksheet

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Part 1: Building a Foundation

Which of the following is a polyatomic ion?

Hint: Think about the definition of polyatomic ions.

- A) Na^+
- B) Cl^-
- C) NH_4^+
- D) Mg^{2+}

Which of the following are examples of polyatomic ions? (Select all that apply)

Hint: Look for ions that consist of multiple atoms.

- A) SO_4^{2-}
- B) H_2O
- C) CO_3^{2-}
- D) NO_3^-

Explain what distinguishes a polyatomic ion from a monatomic ion.

Hint: Consider the number of atoms in each type of ion.

List the chemical formulas for the following polyatomic ions:

Hint: Refer to your notes or a periodic table.

1. A) Sulfate

2. B) Nitrate

3. C) Phosphate

Part 2: Comprehension and Application

What is the charge on the phosphate ion (PO₄)?

Hint: Consider the common charges of phosphate.

- A) -1
 B) -2
 C) -3
 D) 0

Which of the following statements about polyatomic ions is true? (Select all that apply)

Hint: Think about the properties of polyatomic ions.

- A) They are always negatively charged.
 B) They consist of two or more atoms.
 C) They can form salts with cations.
 D) They are only found in organic compounds.

Describe how the naming of polyatomic ions typically reflects their composition or the central atom present.

Hint: Consider the naming conventions used in chemistry.

Which compound is formed when ammonium ions (NH_4^+) combine with sulfate ions (SO_4^{2-})?

Hint: Consider the charges of the ions when combining them.

- A) $(\text{NH}_4)_2\text{SO}_4$
 B) NH_4SO_4
 C) $\text{NH}_4(\text{SO}_4)_2$
 D) $(\text{NH}_4)_3\text{SO}_4$

When combining carbonate ions (CO_3^{2-}) with calcium ions (Ca^{2+}), which of the following statements are true? (Select all that apply)

Hint: Think about the properties of the resulting compound.

- A) The resulting compound is CaCO_3 .
 B) The compound formed is soluble in water.
 C) The charges of the ions balance each other.
 D) The resulting compound is a type of salt.

Write the balanced chemical equation for the reaction between sodium ions (Na^+) and phosphate ions (PO_4^{3-}).

Hint: Consider the charges of the ions when writing the equation.

Part 3: Analysis, Evaluation, and Creation

Which of the following best describes the relationship between hydroxide ions (OH^-) and water (H_2O)?

Hint: Think about the formation of hydroxide ions.

- A) Hydroxide ions are a form of water.
- B) Hydroxide ions are formed by the dissociation of water.
- C) Hydroxide ions have no relation to water.
- D) Hydroxide ions are the same as water.

Analyze the following statements and identify which are correct regarding the formation of polyatomic ions. (Select all that apply)

Hint: Consider the types of bonds involved in polyatomic ions.

- A) Polyatomic ions are formed by ionic bonds.
- B) Polyatomic ions are formed by covalent bonds.
- C) Polyatomic ions can participate in redox reactions.
- D) Polyatomic ions are always stable in solution.

Compare and contrast the structural differences between nitrate (NO_3^-) and nitrite (NO_2^-).

Hint: Consider the number of oxygen atoms in each ion.

Which of the following scenarios would result in the formation of a precipitate?

Hint: Think about the solubility rules for ionic compounds.

- A) Mixing sodium nitrate (NaNO_3) with potassium chloride (KCl).
- B) Mixing calcium chloride (CaCl_2) with sodium carbonate (Na_2CO_3).
- C) Mixing ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$) with sodium hydroxide (NaOH).
- D) Mixing magnesium sulfate (MgSO_4) with barium nitrate ($\text{Ba}(\text{NO}_3)_2$).

Propose which of the following polyatomic ions could be used to create a buffer solution. (Select all that apply)

Hint: Consider the properties of buffer solutions.

- A) Acetate ($\text{C}_2\text{H}_3\text{O}_2^-$)
- B) Phosphate (PO_4^{3-})
- C) Sulfate (SO_4^{2-})
- D) Bicarbonate (HCO_3^-)

Design a simple experiment to demonstrate the formation of a polyatomic ion precipitate. Describe the materials, procedure, and expected results.

Hint: Think about common reactions that produce precipitates.