Naming Ionic Compounds Chemistry Questions with Solutions

Q-1: What do you mean by the nomenclature of ionic compounds?
Answer: Nomenclature of ionic compounds is the process of giving different names to chemical compounds so that they can be distinguished as distinct chemicals. For example, KOH is potassium hydroxide and NaCl is sodium chloride.

Q-2: Which of the following is the correct name for $Fe(HCO_3)_2$?
a) Ferric bicarbonate
b) Iron(II) hydrogen carbonate
c) Iron hydrogen carbonate
d) Iron bicarbonate

Answer: b) Iron(II) hydrogen carbonate
Explanation: Iron can exist in more than one oxidation state, so its oxidation state must be specified in parentheses. Iron(II) hydrogen carbonate is the proper name for it because of this.

Q-3: How can you name ionic compounds with polyatomic cations?

Answer: Two naming conventions exist for polyvalent cations. -

The first method - An ion's positive charge is denoted by a Roman numeral placed in parentheses after the name of the element and the word ion.

The second method uses two (-ic and -ous) suffixes that are attached to the element name's stem. The lower of the two cation charges is indicated by the -ous suffix, while the higher is indicated by the -ic suffix.

Q-4: How are binary ionic compounds named when a metal forms multiple cations?

Answer: If an ionic compound's formula specifies that its metal cation may have more than one possible charge, one must first ascertain the cation's charge before determining the compound's correct name.

Take $FeCl_2$ and $FeCl_3$ as examples. Due to the presence of two Cl^- ions in the formula (one charge on each chloride ion), the iron ion in the first compound has a +2 charge. The three Cl^- ions in the second compound's formula signify the iron ion's +3 charge. These two compounds are distinct from one another and require distinct names. These charges are written as Roman numerals in parentheses after the metal ion name. Thus, the names are iron(II) chloride and iron(III) chloride, respectively.

Q-5: What is the significance of naming ionic compounds?

Answer: Ionic compounds are named so that they can be easily distinguished as separate chemicals.

Q-6: How are ionic compounds formed?

Answer: Ionic compounds are defined as those held together by ionic bonds. In order to reach their closest configuration as a noble gas, elements can either gain or lose electrons. For the completion of octets, ions are formed (either by gaining or losing electrons), which aids in their stabilisation.

Metals typically lose electrons to complete their octet in a reaction with nonmetals, whereas nonmetals typically gain electrons to complete their octet. Ionic compounds are typically formed during reactions between metals and nonmetals.

Q-7: What does a Roman numeral in parentheses indicate when naming ionic compounds?

a) Number of metal ions
b) Number of nonmetal ions
c) Oxidation state of a metal
c) Oxidation state of a nonmetal

Answer: c) Oxidation state of a metal
Explanation: If a metal can produce ions with various oxidation states, its name is followed by a Roman numeral in parentheses to indicate the oxidation state of the metal.

Q-8: What does the prefix in the name of an ionic compound signify?

a) Number of atoms for each element
b) Number of ions
c) Number of negative charges
d) Number of positive charges

Answer: a) Number of atoms for each element
Explanation: Prefixes are used to specify the number of atoms of each element in a compound's molecule because molecular compounds can form compounds with different ratios of their constituent elements. Examples include N_2O_4, dinitrogen tetroxide. Here, 'di' signifies two nitrogen atoms, and 'tetra' represents four oxygen atoms.

Q-9: Fill in the name and empirical formula for each ionic compound.

Cation	Anion	Empirical Formula	Name of the Compound
a) Fe^{3+}	S^{2-}		
b) Pb^{2+}	IO_3^-		

c) Na^+	HPO_4^-		

Answer:

Cation	Anion	Empirical Formula	Name of the Compound
a) Fe^{3+}	S^{2-}	Fe_2S_3	Iron(III) Sulphide
b) Pb^{2+}	IO_3^-	$Pb(IO_3)_2$	Lead(II) Iodate
c) Na^+	HPO_4^-	Na_2HPO_4	Sodium Hydrogen Phosphate

Q-10: Write the formulas for the following chemical compounds.
a) Manganese(II) phosphate
b) Ammonium oxide
c) Tetrasulphur dinitride
d) Yttrium chlorate
e) Lithium sulphite

Answer:
a) $Mn_3(PO_4)_2$
b) $(NH_4)_2O$
c) S_4N_2
d) $YClO_3$
e) Li_2SO_3

Q-11: Give the name of the following ionic compounds.
a) $LiC_2H_3O_2$
b) Pb_3N_2
c) $CoCO_3$
d) $Ti(SO_4)_2$
e) Ga_2O_3

Answers:
a) Lithium acetate
b) Lead(II) nitride
c) Cobalt(II) carbonate
d) Titanium(IV) sulphate
e) Gallium oxide

Q-12: Complete the following table:

Compound	Name of the Metal Cation	Name of the Nonmetal Anion	Name of the Compound
A) V_2O_5			
B) $HgCl_2$			
C) $Sr_3(PO_4)_2$			
C) Ag_2S			
D) Mg_3P_2			

Answer:

Compound	Name of the Metal Cation	Name of the Nonmetal Anion	Name of the Compound
A) V_2O_5	V^{5+}	O^{2-}	Vanadium(V) oxide
B) $HgCl_2$	Hg^{2+}	Cl^-	Mercuric chloride
C) $Sr_3(PO_4)_2$	Sr^{2+}	PO_4^{3-}	Strontium phosphate
C) Ag_2S	Ag^+	S^{2-}	Silver sulphide
D) Mg_3P_2	Mg^{2+}	P^{3-}	Magnesium phosphide

Q-13: Which one of the following anions does not have the suffix "ide"?
a) S^{2-}
b) P^{3-}
c) $C_2O_4^{2-}$
d) N^{3-}

Answer: c) $C_2O_4^{2-}$
Explanation: Except $C_2O_4^{2-}$, all have “ide” as a suffix at their end. $C_2O_4^{2-}$ is an oxalate ion.

Q-14: Write the formula for the fluoride, sulphide and iodide for the following metal and metal ions.
a) Aluminium
b) Lead(IV)

c) Potassium

Answer:

Metal/Metal Ion	Fluoride	Sulphide	Iodide
a) Aluminium	AlF_3	Al_2S_3	AlI
b) Lead(IV)	PbF_4	PbS_2	PbI_4
c) Potassium	KF	K_2S	KI

Q-15: Match the following:

Name of the Ionic Compound	Use
A) Sodium Hypochlorite	i) Antacid
B) Potassium Phosphate	ii) Added to purified water
C) Magnesium Sulphate	iii) Preservative
D) Magnesium Hydroxide	iv) Food additive
E) Sodium Sulphite	v) Active ingredient in household bleach

Answer: A)-v), B)-iv), C)-ii), D)-i), E)-iii)

Practice Questions on Naming Ionic Compounds

Q-1: Write the name for the following ionic compounds.
a) $Al_2(CO_3)_3$
b) $Mg_3(PO_4)_2$
c) $CaCO_3$

Answer:
a) Aluminium carbonate
b) Magnesium Phosphate
c) Calcium Carbonate

Explanation:

a) The aluminium ion has +3 charge and carbonate ion has -2 charge. Two aluminium ions need to balance the charge on the three carbonate ions. The compound's name is aluminium carbonate.
b) The magnesium ion has +2 charge and the phosphate ion has -3 charge. In order to balance charges, 3 magnesium and two phosphate ions will be required. The compound's name is magnesium phosphate.
c) The ions have the same magnitude of charge, that is, 2, one of each (ion) is needed to balance the charges.The name of the compound is calcium carbonate.

Q-2: Write the name for each of the following ions.
a) Stannous ion
b) Chromic ion
c) Aurous ion
d) Phosphide ion
e) Iodide ion

Answer:
a) Sn^{2+}
b) Cr^{3+}
c) Au^{+}
d) P^{3-}
e) I^{-}

Q-3: What does the suffix "ous" represent?
a) Lower of the two cation charges
b) Higher of the two cation charges
c) Higher or lower depending on the ion
d) None of the above

Answer: a) Lower of the two cation charges
Explanation: The common system employs two suffixes (-ic and -ous) that are appended to the element name's stem. The -ic suffix denotes the higher of the two cation charges, while the -ous suffix denotes the lower. Cu, for example, has +1 and +2 oxidation states. Cu's +1 oxidation state will be referred to as cuprous ion (Cu+), while the other will be referred to as cupric ion (Cu2+).

Q-4: Write the rules for writing the ionic compounds formula.
Answer: The rules that you have to follow while writing a chemical formula are as follows:

- The valencies or charges on the ion must balance.
- When a compound contains a metal and a nonmetal, the metal's name or symbol comes first. Calcium oxide (CaO), Magnesium chloride ($MgCl_2$), iron sulphide (FeS), magnesium oxide

(MgO), and so on, where oxygen, chlorine, and sulphur are nonmetals and are written on the right, whereas calcium, magnesium, and iron are metals and are written on the left.

- The number of ions present in a compound created using polyatomic ions is expressed by enclosing the formula of an ion in a bracket and writing the number of ions outside the bracket. $Zn(OH)_2$ is an example. The bracket is not required if the number of polyatomic ions is one. .For instance, LiOH.

Q-5: Write the formulas for the ionic compounds listed below.

a) Chromium(III) Chloride
b) Copper(II) Selenide
c) Titanium(III) Sulphate

Answer:

a) $CrCl_3$

b) CuSe

c) $Ti_2(SO_4)_3$

Explanation:

a) In chromium(III) chloride, Cr is in +3 oxidation state. Chloride is in -1 oxidation state. Thus, 3 chloride ions will be required to balance the charge on chromium ions. Hence the formula is $CrCl_3$.

b) In copper selenide, copper is in +2 oxidation state and selenide in -2 oxidation state. Thus, one of each ion is needed to balance the charges. Hence the formula is CuSe.

c) Titanium(III) Sulphate contains titanium in +3 and sulphate in -2 oxidation state. To balance the charges, 2 titanium ions and 3 sulphate ions are required. Hence the formula is $Ti_2(SO_4)_3$.