

Chemical Symbols for the Elements

Each type of atom (element) has a unique chemical symbol, which has been agreed upon by the International Union of Pure and Appplied Chemistry (IUPAC). The same symbols are used around the world. Some of the symbols are derived from the element's Latin name, as shown in brackets, below.

You are responsible for memorizing the chemical symbols and names (spelled correctly) for the following common elements. Use your Periodic Table to find each chemical symbol. You will be quizzed on the names and symbols in a few days.

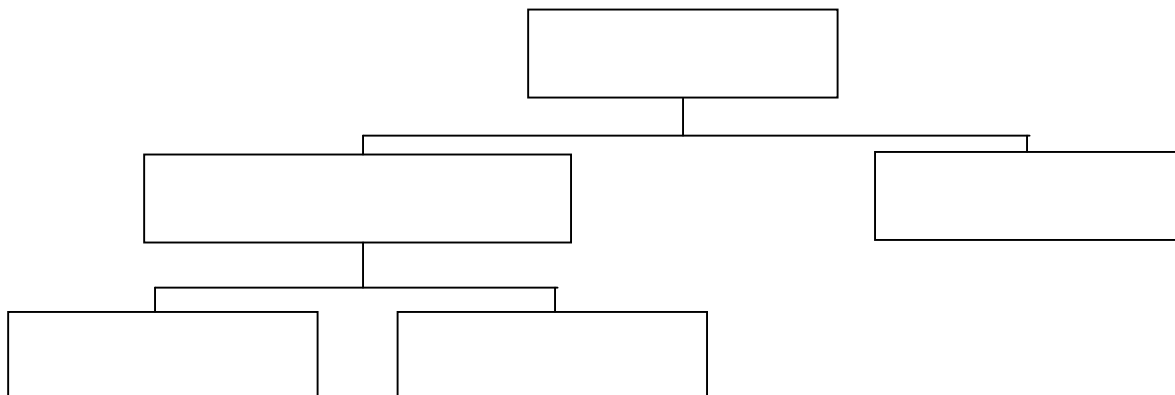
Al	aluminum	H	hydrogen	Zn	zinc
Ar	argon	Ba	barium	H	hydrogen
Ba	barium	Ar	argon	Li	lithium
Be	beryllium	Li	lithium	Cr	chromium
B	boron	P	phosphorus	N	nitrogen
Br	bromine	Be	beryllium	Pt	platinum
Ca	calcium	Pb	lead	Au	gold
C	carbon	Al	aluminum	F	fluorine
Cl	chlorine	Fe	iron	He	helium
Cr	chromium	Mn	manganese	B	boron
Cu	copper (<i>cuprum</i>)	Ca	calcium	Al	aluminum
F	fluorine	Pt	platinum	Mn	manganese
Au	gold (<i>aurum</i>)	S	sulfur	Ar	argon
He	helium	Ag	silver	I	iodine
H	hydrogen	N	nitrogen	Ni	nickel
I	iodine	Br	bromine	Pb	lead
Fe	iron (<i>ferrum</i>)	O	oxygen	Fe	iron
Pb	lead (<i>plumbum</i>)	I	iodine	Ne	neon
Li	lithium	Au	gold	S	sulfur
Mg	magnesium	Cr	chromium	Ag	silver
Mn	manganese	B	boron	O	oxygen
Hg	mercury (<i>hydrargyrum</i>)	Hg	mercury	Br	bromine
Ne	neon	Na	sodium	Ba	barium
Ni	nickel	Sn	tin	C	carbon
N	nitrogen	Ne	neon	Mg	magnesium
O	oxygen	K	potassium	Cu	copper
P	phosphorus	Cl	chlorine	Hg	mercury
Pt	platinum	Ni	nickel	K	potassium
K	potassium (<i>kalium</i>)	F	fluorine	Si	silicon
Si	silicon	Si	silicon	P	phosphorus
Ag	silver (<i>argentum</i>)	Cu	copper	Ca	calcium
Na	sodium (<i>natrium</i>)	Mg	magnesium	Be	beryllium
S	sulfur	Zn	zinc	Sn	tin
Sn	tin (<i>stannum</i>)	C	carbon	Na	sodium
Zn	zinc	He	helium	Cl	chlorine

Classifying Matter

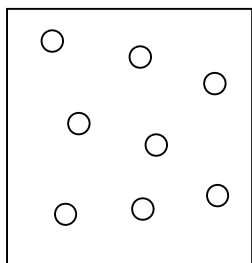
In chemistry, substances can be classified three ways:

- a) by the *type* of particle: as an **atom** or a **molecule**
- b) by the types of atoms in the particle: as an **element** or a **compound**
- c) by the *number* of types of particles: as a **pure substance** or a **mixture**

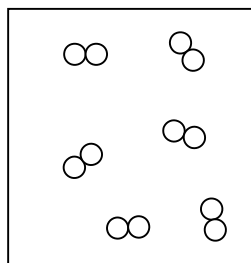
The relationships between the different types of matter can be shown using the following chart:



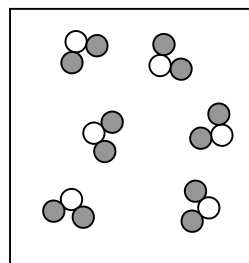
eg. Classify each of the following substances three ways (each different colour circle represents a different type of atom):



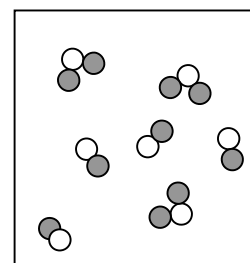
atoms
element
pure substance



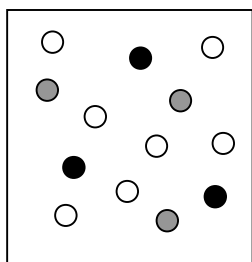
molecules
element
pure substance



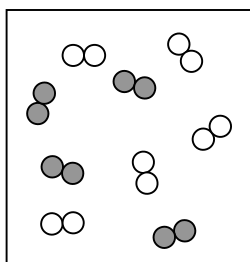
molecules
compound
pure substance



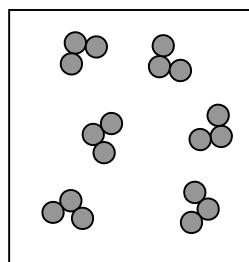
molecules
compounds
mixture



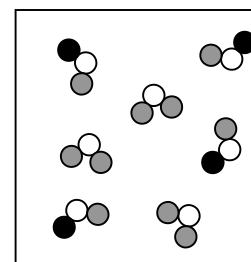
atoms
elements
mixture



molecules
elements
mixture



molecules
element
pure substance



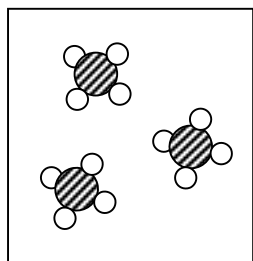
molecules
compounds
mixture

Practice Questions: Classifying Matter

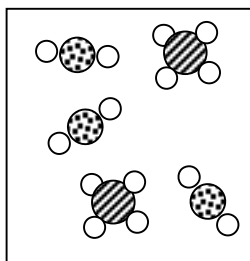
- Write complete definitions for the following terms and include one additional piece of information for each, such as a note of clarification or an example:
matter, pure substance, mixture, atom, element, molecule, and compound.
- Distinguish between:
 - a pure substance and a mixture:** a pure substance contains only one type of particle (either atoms or molecules), while a mixture contains two or more different types of substances
 - an element and a compound:** an element contains only one type of atom, while a compound contains two or more types of atoms chemically bonded together. Elements can be either atoms or molecules, but compounds must be molecules because they must contain more than one atom.
 - an atom and a molecule:** an atom is a single atom which is not bonded to any other atoms, a molecule is the particle that forms when two or more atoms are chemically bonded together.
- After carefully re-reading your notes, answer the following true or false questions:
 - All compounds are molecules. **True**
 - All molecules are compounds. **False**
 - Elements contain only one type of atom. **True**
 - Some elements may also be classified as compounds. **False**
 - Some elements may also be classified as molecules. **True**
 - Compounds can be broken down into simpler substances by chemical reactions. **True**
 - Atoms can be broken down into simpler substances by chemical reactions. **False**
 - H₂O and H₂O₂ are the same compound. **False**
 - The chemical formula of a compound tells us the number and type of each atom in the compound. **True**
 - If the chemical formula of a compound is changed, then the type of compound is also changed. **True**
- Classify the following substances as either elements or compounds. State the number of each type of atom that is present in one particle of each substance:

Al(OH) ₃	compound	1 (Al) + 3 (O) + 3 (H)
I ₂	element	2 (I)
Ca ₃ (PO ₄) ₂	compound	3 (Ca) + 2 (P) + 8 (O)
Mg	element	1 (Mg)
Sn(C ₂ H ₃ O ₂) ₄	compound	1 (Sn) + 8 (C) + 12 (H) + 8 (O)
P ₄	element	4 (P)
C ₄ N ₃ H ₉ O ₂	compound	4 (C) + 3 (N) + 9 (H) + 2 (O)
Ne	element	1 (Ne)

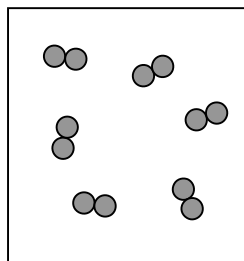
- Each different circle represents a different type of atom. Classify the contents of each box 3 ways:



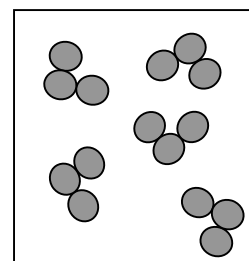
molecules
compound
pure substance



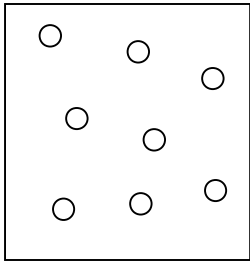
molecules
compounds
mixture



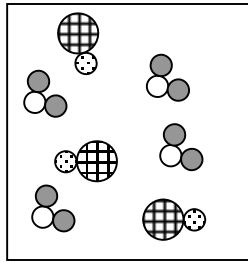
molecules
element
pure substance



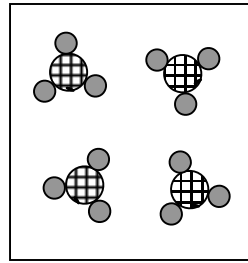
molecules
element
pure substance



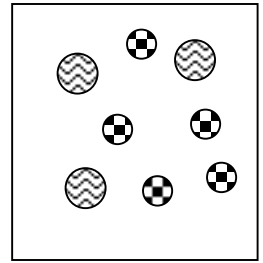
atoms
element
pure substance



molecules
compounds
mixture



molecules
compound
pure substance



atoms
elements
mixture

Chemical vs. Physical Changes

In a chemical change, a chemical reaction occurs and a new substance is formed. The new substance has different properties from the original materials and you will see one or more of the four signs that a chemical change has taken place.

In a physical change, the substance may change its physical form, but the chemical composition and identity of the substance do not change. The following are examples of physical changes:

- changes of state: boiling, melting, freezing, sublimating, evaporating or condensing
- dissolving a substance in water (as long as the substance does not react with the water)
- heating a metal until it gives off light (as long as it looks the same after it cools as it did before)

Classify the following as either physical or chemical changes, and state your reasoning:

- | | |
|---|----------|
| 1. A piece of chalk is ground into powder. | Physical |
| 2. An iron nail rusts. | Chemical |
| 3. The element of an electric stove glows orange. | Physical |
| 4. A silver necklace tarnishes and turns black. | Chemical |
| 5. Wood pulp is bleached white to make paper. | Chemical |
| 6. Paper is shredded. | Physical |
| 7. Alka-seltzer bubbles when it is put in water. | Chemical |
| 8. A pancake is cooked in a frying pan. | Chemical |
| 9. Oil bubbles as it is heated to cook French fries. | Physical |
| 10. A tree grows. | Chemical |
| 11. Glass is heated and blown to make a vase. | Physical |
| 12. Milk is made into cheese. | Chemical |
| 13. Peanuts are ground up to make peanut butter. | Physical |
| 14. Phenolphthalein turns pink when it is added to a base. | Chemical |
| 15. Sugar dissolves in a cup of tea. | Physical |
| 16. When lemon is added to tea, the colour of the tea changes from brown to pale yellow. | Chemical |
| 17. Magnesium bubbles and dissolves in hydrochloric acid. | Chemical |
| 18. A light bulb gives off light. | Physical |
| 19. After being heated in a bunsen burner, a copper wire is coated with a black substance. | Chemical |
| 20. When the contents of a cold pack are mixed, the cold pack becomes icy cold. | Chemical |
| 21. Grapes are crushed to make grape juice. | Physical |
| 22. When yeast is added to sugar water, the mixture becomes frothy and smells of alcohol. | Chemical |
| 23. Bread is toasted. | Chemical |
| 24. Bread dries out when it is left on the counter for a couple of hours. | Physical |
| 25. The copper roof on a building turns green. | Chemical |
| 26. Clouds form in the sky. | Physical |
| 27. Parmesan cheese is grated onto pasta. | Physical |
| 28. When copper metal is added to nitric acid, a strong brown gas is produced. | Chemical |
| 29. Garbage rots and gives off methane gas. | Chemical |
| 30. The wire in a toaster glows red hot when the toaster is plugged in. | Physical |
| 31. Potassium metal catches on fire in water. | Chemical |
| 32. A campfire burns. | Chemical |
| 33. Liquid nitrogen bubbles as it boils. | Physical |
| 34. Food is digested in your stomach and intestines. | Chemical |
| 35. When carbon dioxide is bubbled through lime water, a white solid forms in the lime water. | Chemical |
| 36. Gallium metal melts in your hand. | Physical |
| 37. An egg is cooked. | Chemical |
| 38. A nichrome wire glows white when it is held in a bunsen burner flame. | Physical |
| 39. A firefly glows at night. | Chemical |
| 40. An airbag "explodes" during a collision. | Chemical |