

Elements, Compounds and Mixtures

Simulation: edtechsims.com/elements-compounds-mixtures

Name: _____ Class: _____ Date: _____



Scan to open

Part A: Key Ideas

On the sim: Open How to Identify Elements, Compounds and Mixtures on the home page and read all six cards.

A1 Complete the definitions.

[6]

An element is a substance made up of only _____. It cannot be broken down into simpler substances by chemical means.

A compound is a substance made up of two or more different elements _____ in a _____ ratio.

A mixture contains two or more substances that are _____. Its particles are _____.

Air is a mixture made up mainly of _____ and _____.

A2 Write the three questions you should ask, in order, when classifying a particle diagram.

[3]

1.

2.

3.

Part B: Classifying Particle Diagrams

On the sim: Play the game at Level 1 and Level 2 in Practice mode. Then classify each diagram below.

B1 Fig. 1 shows eight particle diagrams. Each circle is an atom; atoms that touch are joined.

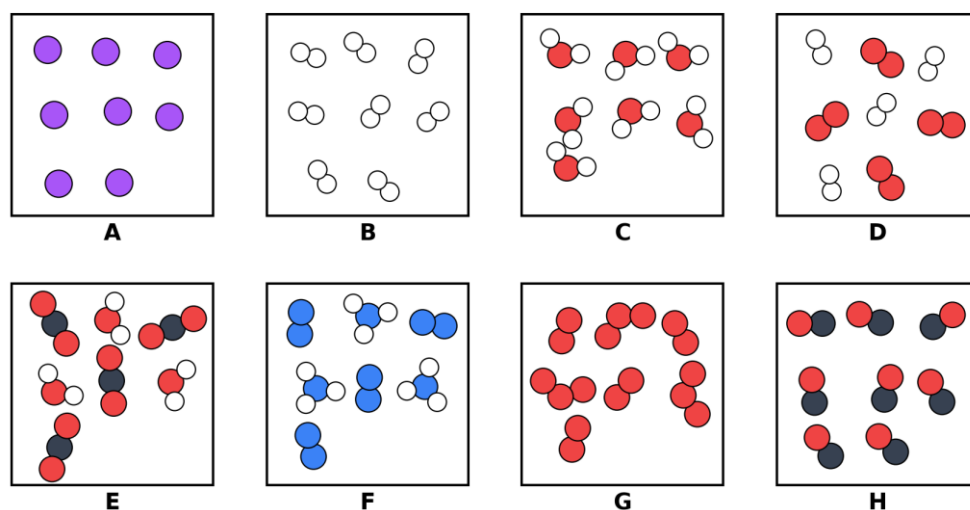


Fig. 1

○ hydrogen ● carbon ● nitrogen ● oxygen ● neon

Complete Table 1. In the last column, write the formula of each substance (Level 3). Use "+" for a mixture.

Box	Level 1: Element, compound or mixture?	Level 2: Type	Level 3: Formula
A			
B			
C			
D			
E			
F			
G			
H			

Table 1

Part C: Common Traps

C1 Circle True or False. If a statement is false, explain why.

[10]

1. O_2 is a compound because it contains two atoms joined together.

True / False Reason:

2. A sample containing O_2 and O_3 molecules is an element because it has only one type of atom.

True / False Reason:

3. CO and CO_2 contain the same elements, so a sample of CO and CO_2 is a pure compound.

True / False Reason:

4. In a compound, every particle in the diagram must be identical.

True / False Reason:

5. A mixture of H_2 and O_2 can be written as H_2O .

True / False Reason:

C2 Why is $H_2 + O_2$ not the same as H_2O ?

[2]

.....
.....

Part D: Game Record

On the sim: Play the game in Timed mode (90 s) with all three levels selected. Record your best attempts.

Attempt	Levels selected	Mode	Score
1			
2			
3			

Part E: Practice Questions

E1 Classify each substance as an element, a compound or a mixture.

[4]

Substance	Classification	Substance	Classification
Air		Sodium chloride	
Sea water		Copper	
Distilled water		Brass	
Nitrogen		Carbon dioxide	

E2 A student mixes iron filings with sulfur powder. She then heats the mixture strongly to form iron(II) sulfide.

(a) Describe how the iron could be separated from the mixture before heating.

[1]

.....

(b) Explain why the iron cannot be separated from iron(II) sulfide in the same way.

[2]

.....

.....

(c) State two differences between the properties of a mixture and a compound.

[2]

.....

.....

.....

E3 Sea water boils over a range of temperatures, but pure water boils at 100 °C. Explain this difference.

[2]

.....

.....

Answer Key: Elements, Compounds and Mixtures

Part A: Key Ideas

On the sim: Open How to Identify Elements, Compounds and Mixtures on the home page and read all six cards.

A1 Complete the definitions. [6]

An element is a substance made up of only **one type of atom**. It cannot be broken down into simpler substances by chemical means.

A compound is a substance made up of two or more different elements **chemically combined** in a **fixed** ratio.

A mixture contains two or more substances that are **not chemically combined**. Its particles are **not all identical**.

Air is a mixture made up mainly of **N₂** and **O₂**.

A2 Write the three questions you should ask, in order, when classifying a particle diagram. [3]

1. How many types of atom are there?
2. Are different types of atom chemically joined?
3. Are all the particles identical?

Part B: Classifying Particle Diagrams

On the sim: Play the game at Level 1 and Level 2 in Practice mode. Then classify each diagram below.

B1 Fig. 1 shows eight particle diagrams. Each circle is an atom; atoms that touch are joined.

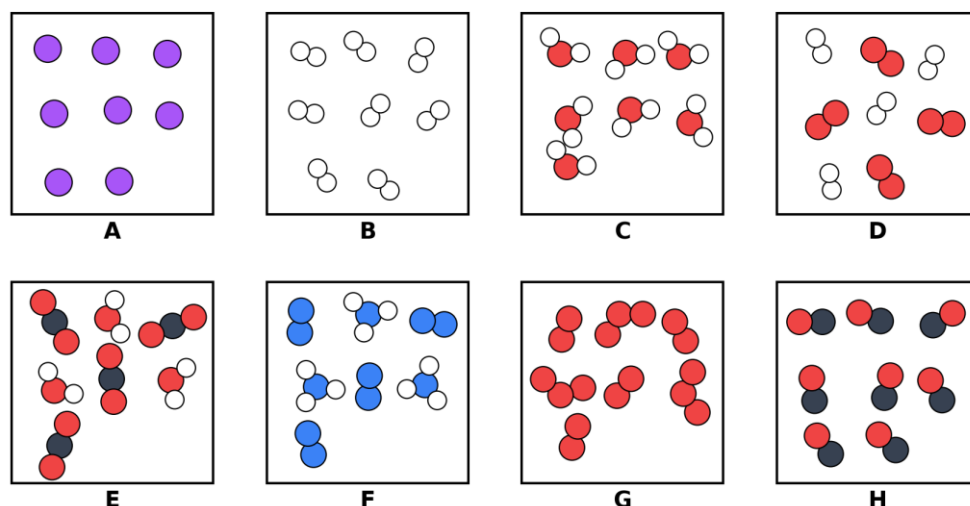


Fig. 1

○ hydrogen ● carbon ● nitrogen ● oxygen ● neon

Complete Table 1. In the last column, write the formula of each substance (Level 3). Use "+" for a mixture.

Box	Level 1: Element, compound or mixture?	Level 2: Type	Level 3: Formula
A	Element	Element (atoms)	Ne
B	Element	Element (molecules)	H ₂
C	Compound	Compound	H ₂ O
D	Mixture	Mixture of elements	H ₂ + O ₂
E	Mixture	Mixture of compounds	CO ₂ + H ₂ O
F	Mixture	Mixture of an element and a compound	N ₂ + NH ₃
G	Mixture	Mixture of elements	O ₂ + O ₃
H	Compound	Compound	CO

Table 1

Part C: Common Traps

C1 Circle True or False. If a statement is false, explain why. [10]

- O₂ is a compound because it contains two atoms joined together.
False. Both atoms are oxygen, so O₂ is an element.
- A sample containing O₂ and O₃ molecules is an element because it has only one type of atom.
False. The particles are not all identical, so it is a mixture (of two elements).
- CO and CO₂ contain the same elements, so a sample of CO and CO₂ is a pure compound.
False. The atoms are joined in different ratios, so they are different compounds; the sample is a mixture of compounds.
- In a compound, every particle in the diagram must be identical.
True. A compound has a fixed composition, so all its particles are the same.
- A mixture of H₂ and O₂ can be written as H₂O.
False. The atoms are not chemically joined; the mixture is written H₂ + O₂.

C2 Why is H₂ + O₂ not the same as H₂O? [2]

In H₂ + O₂ the hydrogen and oxygen atoms are in separate molecules and not chemically joined. In H₂O each molecule contains hydrogen and oxygen atoms chemically combined.

Part D: Game Record

On the sim: Play the game in Timed mode (90 s) with all three levels selected. Record your best attempts.

Attempt	Levels selected	Mode	Score
1			
2			
3			

Scores from the sim.

Part E: Practice Questions

E1 Classify each substance as an element, a compound or a mixture. [4]

Substance	Classification	Substance	Classification
Air	Mixture	Sodium chloride	Compound
Sea water	Mixture	Copper	Element
Distilled water	Compound	Brass	Mixture
Nitrogen	Element	Carbon dioxide	Compound

E2 A student mixes iron filings with sulfur powder. She then heats the mixture strongly to form iron(II) sulfide.

(a) Describe how the iron could be separated from the mixture before heating. [1]

Use a magnet; the iron filings are attracted to it and the sulfur is not.

(b) Explain why the iron cannot be separated from iron(II) sulfide in the same way. [2]

In iron(II) sulfide the iron and sulfur are chemically combined, so the iron is no longer free and the compound is not attracted to a magnet. It can only be separated by a chemical reaction.

(c) State two differences between the properties of a mixture and a compound. [2]

Any two: a mixture has a variable composition, a compound has a fixed composition; a mixture keeps the properties of its components, a compound has different properties from its elements; a mixture can be separated by physical methods, a compound only by chemical methods; no energy change on forming a mixture, but energy is usually given out or taken in when a compound forms.

E3 Sea water boils over a range of temperatures, but pure water boils at 100 °C. Explain this difference. [2]

Pure water is a single substance with a fixed boiling point. Sea water is a mixture with a variable composition, so it does not have a fixed boiling point (it boils above 100 °C over a range).