

## Elements in Mineral Compounds

	Mineral	Metal	Non-Metal
<b>Metal Oxides</b>	Bauxite	Aluminium	Oxygen
	Haematite	Iron	
<b>Metal Carbonates</b>	Calcite	Calcium	Carbon, Oxygen
	Malachite	Copper	
<b>Metal Sulphides</b>	Galena	Lead	Sulphur
	Iron pyrite	Iron	

### What elements are found in some natural compounds?

- **Natural compounds are made of metals and non-metals.**
- **Metal oxides contain metal and oxygen.**
- **Metal carbonates contain metal, carbon and oxygen.**
- **Metal sulphides contain metal and sulphur.**

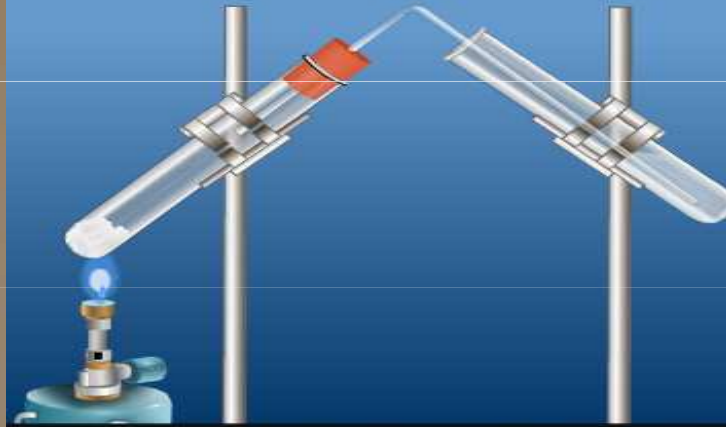
## Effects of Heat on Minerals



### Observation

The glowing splinter goes off.

Cassiterite (tin oxide)



Calcite (calcium carbonate)

When calcite is heated, the limewater turns cloudy.



Iron pyrite (iron sulphide)

### Observation

When iron pyrite is heated, the potassium manganate (VII) turns colourless.

## Observing the Effects of Heat on Minerals

### Conclusion:

<b>Metal Oxides</b>	No effect
<b>Metal Carbonates</b>	Produces metal oxide and carbon dioxide
<b>Metal Sulphides</b>	Produces metal oxide and sulphur dioxide

## Observing the Effects of Heat on Minerals



### Tin oxide:

The glowing splinter goes off.



### Calcium carbonate:

Limewater solution turns cloudy (carbon dioxide is released).



### Iron pyrite:

Potassium manganate (VII) solution changes colour from purple to colourless (sulphur dioxide is released).



**Choose the correct answer.**

**What substances are produced when iron carbonate is heated?**

- A** Iron oxide, carbon
- B** Iron, carbon dioxide
- C** Iron oxide, carbon dioxide
- D** Iron oxide, carbon, oxygen

**Which of the following will release sulphur dioxide when heated?**

- A** Iron oxide
- B** Lead sulphide
- C** Copper carbonate
- D** Magnesium oxide

**Which of the following are the products when the mineral is heated?**

Mineral	Products
<b>A</b> Malachite	Lead oxide and carbon dioxide
<b>B</b> Iron pyrite	Iron and oxygen
<b>C</b> Galena	Lead oxide and sulphur dioxide
<b>D</b> Bauxite	Aluminium oxide and carbon dioxide

## What are the properties of a mineral?

- Most minerals are **hard**.
- Most minerals are **insoluble** in water.
- Some minerals can **breakdown when heated**.
  - When metal carbonates are heated, metal oxides and carbon dioxide are produced.
  - When metal sulphides are heated, metal oxides and sulphur dioxide are produced.
  - Metal oxides are generally more stable and do not breakdown on heating.

## Effects of heat on minerals

Mineral	Chemical Name	Metal formed	Gas released
Malachite	Copper carbonate	Copper oxide	Carbon dioxide

### Word Equation:



carbon dioxide

copper oxide

Copper carbonate



iron oxide

sulphur dioxide

Iron sulphide



carbon dioxide

magnesium oxide

Magnesium carbonate



carbon dioxide

Calcium carbonate

calcium oxide



sulphur dioxide

Iron sulphide

iron oxide

Choose the correct answer.

Which of these minerals is a metal oxide?

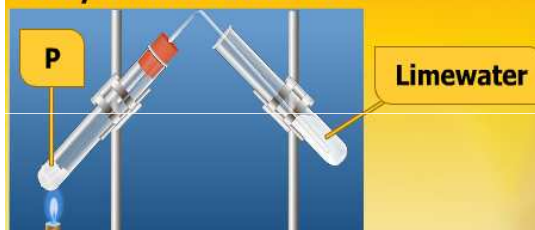
A Pyrite

B Calcite

C Malachite

D Haematite

In the figure given, the limewater turns cloudy. What is substance P?



A Calcite

B Galena

C Cassiterite

D Bauxite

Which mineral compound has the following properties?

- Hard
- Does not dissolve in water
- Does not breakdown on heating

A Lead sulphide

B Aluminium oxide

C Calcium carbonate

D Copper sulphide

Which of the following is the hardest mineral?

A Sapphire

B Diamond

C Quartz

D Ruby

Which of these minerals are found in the form of natural elements:

I. Platinum

II. Gold

III. Calcite

IV. Silver

A I, II and III only

B I, II and IV only

C I, II and only

D III only

Which statement is TRUE?

A Iron oxide can dissolve in water

B When copper carbonate is heated, it releases sulphur dioxide

C Aluminium oxide does not breakdown on heating

D Lead sulphide breaksdown to lead oxide and carbon dioxide on heating

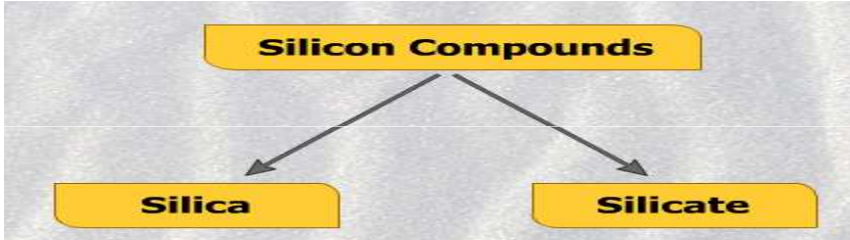
Which word equation is CORRECT?

A Lead sulphide  $\xrightarrow{\text{heat}}$  lead oxide + sulphur dioxide

B Copper carbonate  $\xrightarrow{\text{heat}}$  copper + carbon dioxide

C Iron carbonate  $\xrightarrow{\text{heat}}$  iron oxide + sulphur dioxide

D Copper carbonate  $\xrightarrow{\text{heat}}$  copper oxide + oxygen



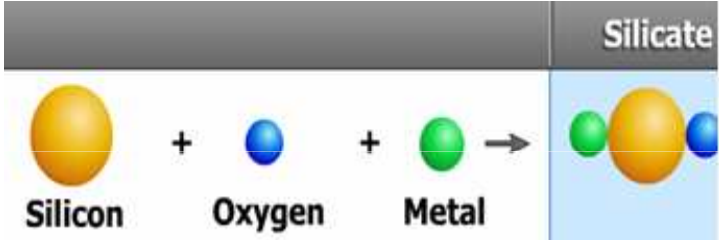
Silica is a silicon compound consisting of silicon and oxygen.

Silica is also known as silicon dioxide.

Examples of silica are sand, quartz, flint and jasper.

Silicate is a silicon compound consisting of silicon, metal and oxygen.

Examples of silicate are asbestos, clay, mica, topaz, jade and ruby.





**Silica is a silicon compound consisting of silicon and oxygen.**

**Silica is also known as silicon dioxide.**

**Examples of silica are sand, quartz, flint and jasper.**



Jasper



Flint



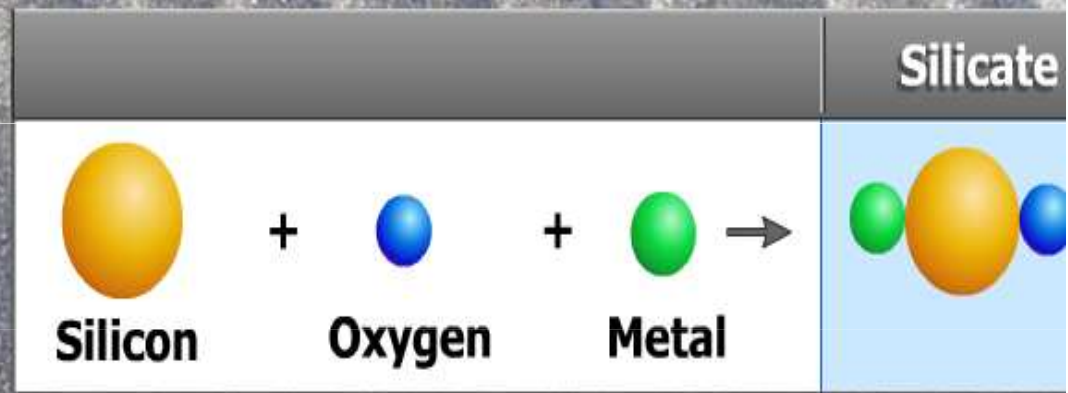
Quartz



Sand

**Silicate is a silicon compound consisting of silicon, metal and oxygen.**

**Examples of silicate are asbestos, clay, mica, topaz, jade and ruby.**



### Fill in the blanks

Drag and drop the words into the correct boxes.

#### Silicon Compounds

1. The two types of silicon compounds are:  and
2.  +  →
3.  +  +  →

Oxygen

Silicon

Metal

Silicate

Silica

### Group the silicon compounds

Based on the picture clues below, key-in the name of the mineral into the correct group. Press "Check" to see the answer.

Silica	Silicate

Ruby



Check

Clay

Quartz



Sand



Flint



Asbestos



## What are the different forms of silicon compounds?

- Silicon compounds exist as silica and silicate.
- Silica contains silicon and oxygen.
- Silicate contains silicon, oxygen and metal.

## What are examples of silica?

- Examples of silica are sand, quartz, flint and jasper.

## What are examples of silicate?

- Examples of silicate are asbestos, mica, clay, jade, topaz and ruby.

## Properties of Silica and Silicates

Silica and silicates are stable because both compounds:

- do not dissolve in water
- do not react with acid
- do not break down on heating

## Daily Uses of Silicon Compounds

		
Glassware	Ceramic	Gemstones
		
Concrete	Insulators	Microchips
		
Optic Fibres	Talcum powder	Fire extinguisher