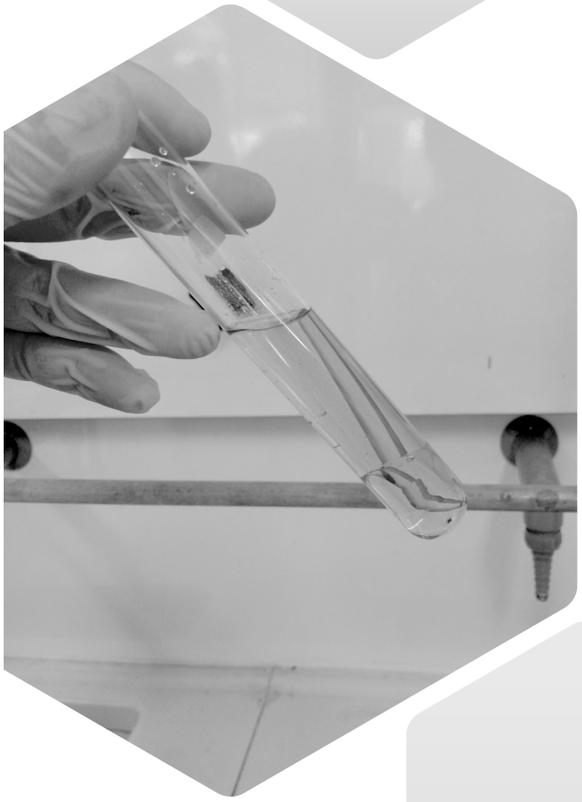
1 Properties and states of matter



Themes
States of matter, properties of matter, physical and chemical properties, surface tension, energy types

Reading skills
Skimming and scanning
Identifying main points

Vocabulary
Collocations
Adjective suffixes

Writing skills
Paragraph structure;
Identifying topic sentences

Note-taking skills
Taking linear notes from a lecture on "States of matter"

Introducing formality and academic register
Introducing formality by comparing and contrasting two webinars on "States of matter"

Discussion

1 All matter exists in at least three states: solid, liquid and gas. In pairs, decide whether the following examples of matter are solid, liquid or gas: cast iron [**S**], potassium [**S (20°C)**], nitrogen [**G**], steel [**S**], chlorine [**G**], mercury [**L**], carbon [**S**], carbon dioxide [**G**], chalk [**S**], sand [**S**], salt and purple cabbage extract [**L**].

2 What is needed for states of matter to change phase?
[**Supply of energy is required.**]

Reading

University students are often asked to read a lot of resources before they decide what is relevant to their needs at the time. To save time, they often use two speed reading techniques such as skimming and scanning.

Skimming involves locating the main points or prevalent themes without reading every word in the text. You can do so by identifying the purpose of the article and reading the topic sentences or the subheading if there are any. You can also look for any illustrations or signposting language like "Unlike the properties of solids,…". If you are familiar with the subject discussed you might as well skip it altogether.

Task 1 Skim the text and answer the following questions:

- What is the purpose of the text?
  [**To discuss properties of different types of matter**]
- What are the main points raised in it?
  [**Classification is based on ordered arrangement, shape, volume, compressibility and mobility**]
- How is the article organised?
  [**Seven section with a subheading each**]

Scanning involves locating more detailed information such as numbers, symbols and long words. It becomes easier if it follows skimming. As such, university students tend to read the introduction and the conclusion so as to check if they are relevant and useful for them.

Task 2 Find words in the text that describe the word "arrangement".

SCANNING	
[**ordered** **random** **internal**]	arrangement
[**regular** **disordered** **symmetrical**]	arrangement

Intensive and Active reading involves reading every single word in the text highlighting and underlying key points and details. Students are often encouraged to use a dictionary.

Task 3 What example illustrates crystalline [**diamonds/salts**] and amorphous [**glass**] solids?

Reading

Definition of matter

Matter is anything that **occupies** space and has **mass**. All matter exists in at least three states: solid, liquid and gas depending on **temperature** and **pressure**. All three states of matter consist of **particles**, whose behaviour determines the state and the energy required for bond making and bond breaking. In fact, the differences in **spacing** and **speed** are some of the main reasons for the different **properties** of the three states of matter.

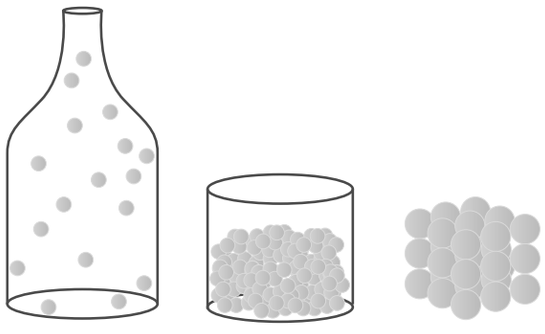


Figure 1 Visual representation of gaseous, liquid and solid particles in a container.

Classification of Solids and properties

Solids can be either **crystalline** or **amorphous**. The particles composing a crystalline solid, such as diamonds or salt, have an **ordered internal arrangement**. Solids that do not have a fixed, symmetrical internal structure are called amorphous. A species comprising an amorphous solid is a permanently super-cooled liquid, such as glass. Due to their fixed shape or **volume**, solids cannot be **compressed** or **expanded**. Although solids feature a high degree of order, their particles tend to vibrate about fixed positions and their vibrations increase with increasing energy supply. When sufficient energy is supplied, solid particles overcome the attractive (cohesive) forces that keep them together and they separate.

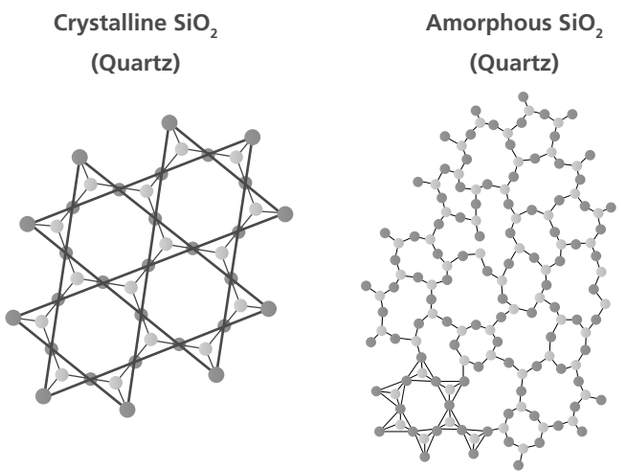


Figure 2 Visual representation of Crystalline SiO_2 and amorphous Sio_2

Properties of liquids

As in solids, liquid particles are very close together, but there is no regular or ordered arrangement. They exhibit considerable **mobility**, which increases as the temperature rises. In liquids there is a **short-range** order and a long-range disorder; hence, we often claim that they are in between the ordered solid state and the random gaseous state. Their molecules are in constant motion and they take the shape of the container they are in*. Being amorphous, liquids bear another common property; fluidity. As it measures the degree the easy flow of a liquid is allowed, fluidity is the reciprocal of viscosity.