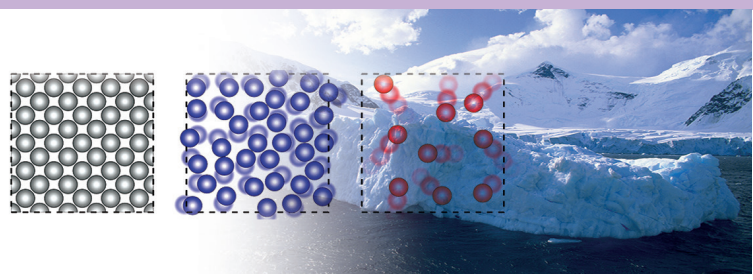
4 Properties of Matter



4.1 Discontinous nature of matter

The environment around us is composed of matter and energy. Recall the facts you learnt in grade 6 about matter and energy. To validate that knowledge further, do Assignment 4.1.

Assignment 4.1

Classify and tabulate following items as matter and energy.

Air, water, ball, light, bulb, sound, table, chair, electricity, heat, magnet

Table 4.1

Matter	Energy
air	light

Of the above, air, water, ball, bulb, table, chair and the magnet require space and have a mass. Such things are known as **matter**. When considering light, sound, heat and electricity, they do not occupy space and have no mass. They are considered **energy**. Components of the environment such as soil, water and rocks and the man made structures and various equipments are examples for matter.

Evidence for the discontinuous nature of matter

An acceptable notion about the nature of matter was first put forward by the Greek philosopher Democritus who lived in the era 460-370 B.C. According to him, matter is made of very small particles. Later, the Greek philosopher Aristotle (384-270 B.C.) stated that matter is not composed of particles. It is said that in Athens of Greece, a public debate was held between the proponents of Aristotle and Democritus. The idea that "matter is particulate in nature" became victorious at that debate and later modern scientists confirmed experimentally the fact that matter is made up of particles. **The status matter exists as a collection of particles with spaces among them is known as discontinuous nature or particulate nature of matter.**

Matter can be classified as **solid**, **liquid** and **gas** according to its physical nature.

Various activities can be done to confirm the discontinuous nature of solid, liquid and gaseous matter.

Discontinuous nature of solid matter

Take a piece of chalk and break it into two pieces. Break one of those pieces again into two pieces. Likewise, break the pieces you get successively till you obtain the smallest possible particle.

When the initial piece was broken into two, you would have got two smaller pieces. When the chalk is broken again and again we get more and more smaller pieces. The smallest piece of chalk that we obtain like this without changing the properties of chalk is called a chalk particle. Accordingly, you would be able to imagine that a piece of chalk is formed by the union of a large number of chalk particles. The piece of chalk which is a collection of small particles has a particulate nature. There are spaces among those particles.

Let us do Activity 4.1 to investigate the discontinuity of solid matter.

Activity 4.1

You will need:- A container of water, a watch glass, blue or red ink, a few crystals of potassium permanganate, a piece of white chalk

Method:-

- Add a small amount of blue/red ink or a potassium permanganate solution to a watch glass. Take a piece of chalk and place one end of it on ink or the solution. Record your observations.

Figure 4.1

When the piece of chalk is placed on the blue/red ink or the potassium permanganate solution in the watch glass, you can see the colour soaking up through the piece of chalk. The ink is able to move up because the piece of chalk is discontinuous. It is because the piece of chalk consists of a large number of very small particles, each with the properties of chalk, and a large number of spaces through which the coloured particles can move. This activity confirms that solid matter is discontinuous.

Have you heard what happens when mercury comes into contact with items made of gold? In such an event, we will be able to observe mercury particles in the item of gold. The reason for this is the movement of mercury particles through the gold particles because gold is discountinuous. Because of this, when gold objects come into contact with mercury they get damaged.

Figure 4.2 ▲ A gold ring that came into contact with mercury

Assignment 4.2

- Plan and implement simple activities to show that solid matter is particulate in nature.

Let us next consider about the discontinuous nature of liquid matter.

Discontinuous nature of liquid matter

Take a small volume of water and divide into two portions. Divide one of them again into two portions. Likewise, divide one half again and again until you get the smallest possible volume.

Even though the small volume of water was divided into two, both volumes contain water. Even at the moment when the volume becomes extremely small after repeated divisions, water is the substance which occupies that volume. In such a way, the smallest volume of water that can be obtained while retaining the properties of water can be called a water particle. Hence, water is formed by the assembling of a large number of water particles with one another.

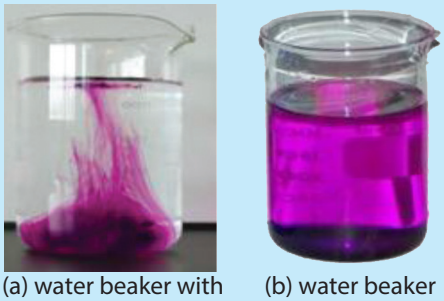
Let us engage ourselves in Activity 4.2 to look into the discontinous nature of liquid matter.

Activity 4.2

You will need:- A watch glass, a beaker with water, potassium permanganate/ coloured ink

Method:-

- Fill a beaker in half with water and put a crystal of potassium permanganate into it. Record the observations after about five minutes. Then, shake the water in the beaker gently. State the observations.
- Add a drop of coloured ink to a beaker containing water. Record the observations.



(a) water beaker with potassium permanganate (b) water beaker with coloured ink

Figure 4.3 ▲

It can be observed that the colour of the potassium permanganate crystal placed in the beaker of water gradually spreads in water. It happens because the potassium permanganate particles move into spaces among the water particles. When a drop of ink is added to a beaker of water, the water gradually becomes coloured due to the movement of ink particles among water particles. Hence, it is clear that liquid matter also has a particulate nature.

Assignment 4.3

Plan and implement some simple activities to demonstrate that liquid matter is particulate in nature.

Discontinuous nature of gaseous matter

Let us conduct Activity 4.3 to verify that gases are discontinuous.

Activity 4.3

You will need:- Two gas jars, nitrogen dioxide gas, joss stick, a few drops of perfume

Method:-

- Fill a gas jar with brown-coloured nitrogen dioxide gas and close it with another gas jar. Record your observation after two minutes. (Do this as a teacher demonstration.)
- Light a joss stick.
- Place some perfume in a watch glass and leave for some time.
- Record observations.

When a gas jar is filled with brown nitrogen dioxide gas and an inverted gas jar containing air is placed over it, mixing of the two gases can be observed.

The reason for this movement of the nitrogen dioxide particles is the existence of spaces among the air particles.

The scent of the lighted joss stick spreads throughout the classroom. While the smell of perfume diffuses across the classroom, you would be able to see that the perfume had got removed from the watch glasses. We get its smell because its particles have moved through air and entered our nose during the spread of particles.

This leads to the explanation that gaseous matter too is particulate in nature.

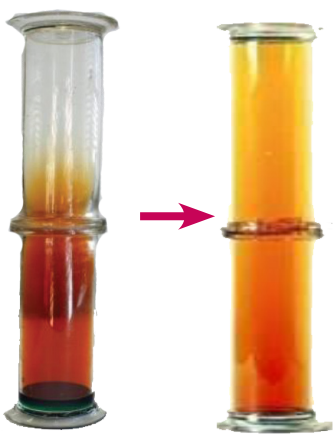


Figure 4.4 ▲ Spread of nitrogen dioxide gas in gas jars

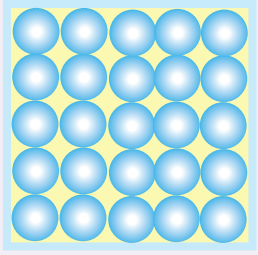
Assignment 4.4

Plan and implement with your teacher simple activities to support the fact that gaseous matter has a particulate nature.

Based on the above, we can conclude that all matter (solid, liquid or gas) is composed of particles and there are spaces among those particles. Thus, we can conclude that matter is discontinous.

4.1.2 Physical properties of matter in relation to its particulate nature

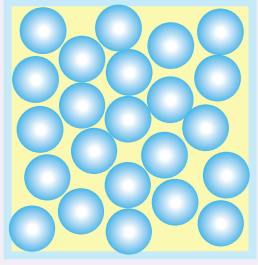
It is the difference in the organisation of particles that leads to the variation of the specific characteristics of the three states in which matter exists. This can be illustrated as follows.



Organisation of particles in a solid

Solid

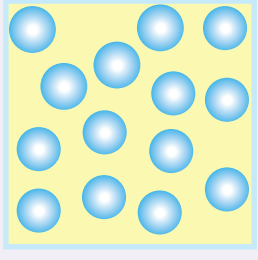
- Particles are orderly arranged.
- Particles are strongly bound to each another.
- Particles do not move relative to one another, but can vibrate in the same positions.
- Space among particles is less.



Organisation of particles in a liquid

Liquid

- Particles are not orderly arranged.
- Though, the particles are close to one another, the binding forces are not as strong as in a solid.
- The particles can move within the liquid.
- Space among particles is less, but higher than that of a solid.



Organisation of particles in a gas

Gas

- Particles are not orderly arranged.
- Binding forces among the particles are very weak.
- Particles move freely and randomly.
- Much space is left among the particles.

The reason for the variety of physical properties of solid, liquid and gaseous matter is the diversity of their paticular arrangement. Let us have a look at Table 4.2 which presents these differences.

Table 4.2

Property	Solid	Liquid	Gas
Shape	Has a definite shape	No definite shape. (Takes the shape of the occupied part in the container)	No definite shape. (Takes the shape of the occupied part in the container)
Volume	Has a fixed volume	Has a fixed volume.(Does not spread throughout the entire volume of the container)	No fixed volume. (Spreads throughout the entire volume of the container)
Compressibility	Connot be compressed easily.	Cannot be compressed easily.	Can be compressed easily.
Density	Has a high density	Has a high density	Density is low

A solid has a definite shape because the particles forming it are organised in a regular pattern and are strongly bonded. Liquids and gases lack a definite shape because their particles are not arranged orderly.

Solids and liquids have a definite volume, but gases do not have a definite volume. This is because the gas particles spread freely and occupy the entire volume of the container as the binding forces among gaseous particles are very weak.

Compression means the decrease in volume of matter by increasing pressure. Solid and liquid matter cannot be compressed easily. However, gaseous matter can be compressed easily. In order to compare the compressibility of liquids and gases let us do Activity 4.4.

Activity 4.4

You will need:- Two identical syringes, water, nitrogen dioxide gas

Method:-

- Draw water into one syringe until half of it is filled with water.
- Take an equal volume of nitrogen dioxide gas to the other syringe. (Do this as a teacher demonstration.)
- In both syringes close the open end and push the piston forward.
- In both cases compare the ability to move the piston forward.

You will note that the piston in the syringe with water cannot be pushed forward whereas the piston in the syringe with air can be pushed forward. This shows that it is difficult to compress water but air can be compressed easily. Let us find out the reason for this.

Water is a liquid. As the particles of a liquid are closely packed they cannot be brought closer by applying a force. Therefore, they are relatively difficult to compress. In a gas there are wider spaces among the particles, therefore, by applying a force the particles come closer. That is why the gases can be compressed easily.

When comparing the densities of solids, liquids and gases it is seen that solid and liquid matter have a high density but gases have a low density. Density will be studied further in a future lesson.
Solids, liquids and gases are used for various purposes depending on their properties. Some examples for the instances in which they are used are given below.

- Solids - parts of machinery, parts of vehicles, building materials, weapons
- Liquids - mercury thermometer, hydraulic jack, as a medium of transport
- Gases - inflating tyres, in pressure cookers, in hydrogen balloons, in liquid petroleum gas (LP gas) cylinders

Assignment 4.5

Make models to demonstrate the particulate nature (discontinuity) of the three states of matter.

4.2 Utilizing physical properties of matter

4.2.1 Pure substances and non pure substances

Consider a cylinder containing nitrogen gas and a cylinder containing ordinary air. The cylinder of nitrogen gas contains only nitrogen gas. The cylinder of air contains several gases such as nitrogen, oxygen, argon and carbon dioxide. On the otherhand potable water contains gases and various salts dissolved in it. But, pure water contains only water.

Let us do Assignment 4.6 to explore this further.

Assignment 4.6

- Pay your attention to the substances given in Table 4.3.
- Find out about the components in those substances and complete the table.

Table 4.3

Substance	Components	Contains one component only	Contains more than one component
air	hyrogen, oxygen, argon, carbon dioxide		✓
pure water	water	✓	
drinking water	water, various gases, dissolved in water, salts		
sugar	sugar		
salt solution	salt, water		
a piece of copper	copper		
tea	tea, water, sugar		
aluminium			
iron			
silver			

Of the substances given in the table, if you focus your attention to sugar, silver, pure water, aluminium, iron and copper, it is clear that they are composed of only one component. You may also be able to identify that the salt solution, tea and potable water contain more than one component.

Thus, on the basis of the componets contained, matter can be divided into two main categories as follows.

- Pure substances - Matter that contains only one component.
- Non pure substances - Matter that contains two or more components.

Pure substances

Substances having a constant composition, that is, substances containing only one component with definite properties, are called pure substances.

Hence, sugar, copper, pure water, aluminium, silver and iron given in Table 4.3 are pure substances.

Based on the nature of the pure substances, they can be classified into two groups, **elements** and **compounds**.

Elements

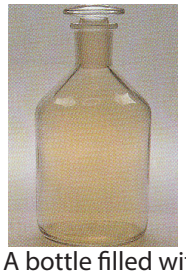
Let us consider copper, aluminium, silver and iron classified under pure substances. These cannot be divided further into simpler substances.

Pure substances with definite properties which cannot be further divided by physical or chemical methods into substances are known as elements.

As at now, scientists have identified nearly 120 elements. Each of these elements has unique properties of its own.

Iron, aluminium, sulphur, carbon, oxygen, nitrogen, mercury, copper, gold, silver, lead, hydrogen and chlorine are a few examples for elements.

Sulphur



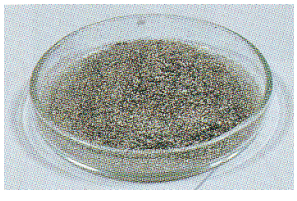
A bottle filled with chlorine gas

Iron

Copper

Carbon

Mercury



Aluminium

Zinc

Figure 4.5 ▲ Some commonly used elements

Compounds

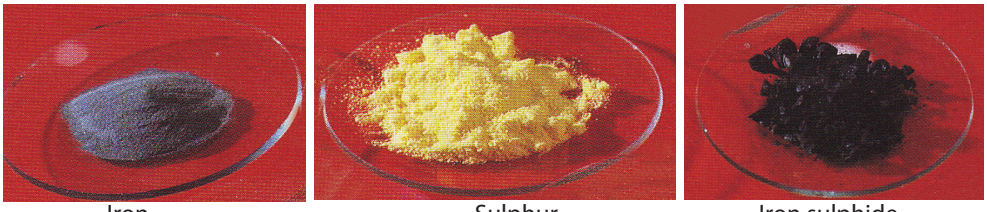
Let us consider about sugar and pure water you classified under the pure substances above. They are formed by the combination of two or more elements.

Compounds are homogeneous, pure substances in which two or more elements are chemically combined in a fixed ratio. The properties of a compound are different from the properties of the elements that contributed to form that compound.

Although, there are only 120 elements, there are millions of compounds in existence. The reason for this the possibility of combining elements in a vast multitude of ways with one another.

Let us inquire into the formation of compounds by the combination of elements chemically through the following example.

- Iron powder is a greyish black solid substance.
- Sulphur powder is a yellow coloured solid.
- When these two are mixed and heated till the solid mass melts, a black solid is formed.



Iron | Sulphur | Iron sulphide

Figure 4.6

It can be observed that the substance formed finally is different in properties from the substances that were used intially.

Now, it may be clear to you that here, the element iron has combined chemically with the element sulphur to form the black coloured compound, iron sulphide.

Given below are some compounds used in everyday life.

A fire extinguisher filled with carbon dioxide | Copper sulphate | Sodium chloride | Calcium carbonate | Sodium hydroxide | Glucose

Figure 4.7

Oxygen, nitrogen and argon present in ordinary air are elements. Nevertheless, carbon dioxide is a compound. The compound carbon dioxide is formed by the combination of the elements carbon and oxygen chemically.

Table 4.4 shows the elements contained in some compounds.

Table 4.4

Compond	Elements present
copper sulphate	copper, sulphur, oxygen
sodium chloride	sodium, chlorine
sodium hydroxide	sodium, hydrogen, oxygen
calcium carbonate	calcium, carbon, oxygen
carbon dioxide	carbon, oxygen
water	hydrogen, oxygen

You will study about non pure substances/ mixtures in a higher grade.

4.2.2 Various physical properties of matter

Different substances have different physical properties. There are a number of physical properties in matter that help to identify and distinguish them. Some of these are presented in Table 4.5

Table 4.5

Physical property	Simple introduction to the physical property
Lustre	Shiny suface due to reflection of light falling on it.
Hardness	Resistance of the material to wear and tear and scratching
Brittleness	Being subject to breaking / crushing into pieces when a force is applied
Thermal conductivity	Ability to conduct heat through the substance
Electrical conductivity	Ability to conduct electricity through the substance
Sonority	Emitting a lasting sound when struck with an object
Colour	The visual quality of the substance
Elasticity	Ability to stretch upon pulling and returning to the initial state when the force is released
Density	Mass of a unit volume
Malleability	Ability to be hammered into sheets without breaking into pieces
Ductility	Ability to be drawn into a wire without breaking
Smell	Sensation caused in the nose due to the volatility of the substance
Expansivity	Increase in volume without an increase in the mass upon increasing temperature
Texture	The rough or smooth nature felt to the touch
Melting point/ temperature	The temperature at which a substance turns from the solid state to the liquid state
Boiling point/ temperature	The temperature at which a substance turns from the liquid state to the gaseous state

Some of the physical properties of a substance can be used to examine its purity.
e.g.:- Density, melting point, boiling point

Density

What can you observe if you put a piece of iron, a cork stopper and a candle to water? The piece of iron sinks while the cork and the candle float. The reason for this is the fact that the density of iron is greater than that of water wheres the density of cork and candle wax is less than that of water. Density is a property unique for a particular substance. **Density is the mass of a unit volume of a given substance.**

Let us do Activity 4.5 to find out whether the density of water has a constant value.

Activity 4.5

You will need:- Density bottle, distilled water, triple beam balance, fresh water, brackish water, hard water

Method:-

- Fill the density bottle (specific gravity bottle) with water, blot it and weigh using the triple beam balance.

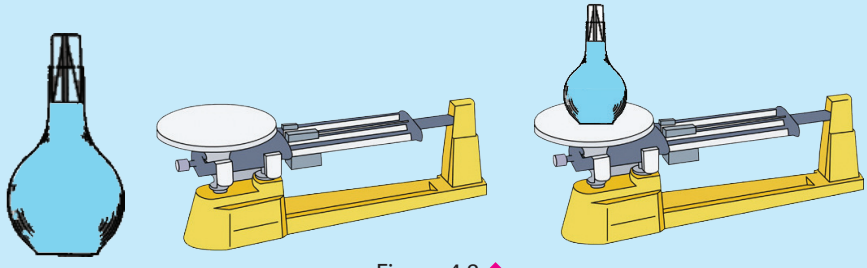


Figure 4.8

- Remove the water, refill the density bottle with distilled water, blot it and weigh.
- Compare the masses obtained.
- Repeat same experiment using the same density bottle but filling it with samples of water obtained from different environments such as fresh water, brackish water, brine and tank water and compare the masses.

Even if the masses are taken by repeating weighing several times, you will be able to see that the mass of an equal volume of distilled water takes a constant value. But the masses of equal volumes of fresh water, brine and brackish water will not be equal.

Distilled water is the water free from dissolved solids. Since, the density of pure water always takes the same value, pure water can be identified by measuring the density.

Similarly, for other pure substances, the density is a fixed value. Therefore, the purity of solids, liquids and gases can be determined by finding their densities.

Table 4.6 gives densities of some pure substances.

Table 4.6

Substance	Density/kg m^{-3}
Gold	19300
Mercury	13600
Lead	11300
Copper	8900
Iron	7700
Aluminium	2700
Water	1000

Melting point

There is a fixed temperature at which a solid turns into a liquid. This temperature is known as its melting point. Pure substances have a fixed melting point.

Let us conduct the following experiment to find out whether the melting point of pure substances has a constant value.

Activity 4.6

You will need:- A boiling tube, a beaker, some ice chips, water, a thermometer, a burner, a stand, a stirer

Method:-

- Fill about one fourth of a boiling tube with ice chips.
- Arrange the apperapus as in Figure 4.9.
- Heat till the ice melts.
- Stir the water well, using a stirer.
- Tabulate temperature against time.

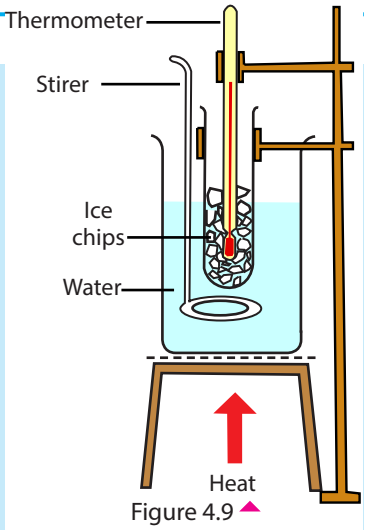


Figure 4.9

Table 4.7

Time	Temperature

You would have observed that the temperature remains constant until all the ice melts.

When heat is supplied, matter turns from the solid state to liquid state without changing its temperature. The specific temperature at which this change in state occurs is called the melting point.

In the above experiment the temperature remained at 0 °C until all the ice turned into liquid water. So, the melting point of pure water at normal atmospheric pressure is 0 °C.

Table 4.8 indicates melting points (at standard atmospheric pressure) of some pure substances.

Table 4.8

Substance	Melting point/ (°C)
Ice	0
Sulphur	132
Lead	317
Aluminium	660
Copper	1083
Iron	1539

The melting point of pure substances is a constant. Therefore, the purity of a substance can be determined by measuring its melting point.

Boiling point

There is a definite temperature at which a liquid turns into a gaseous state. That temperature is known as its boiling point. Pure substances have a constant boiling point.

In order to find out whether there is a constant value for the boiling point of pure substances let us conduct Activity 4.7.

Activity 4.7

You will need:- A boiling tube, water, a thermometer, a stand, a burner

Method:-

- Add water to a boiling tube and fix a thermometer as shown in Figure 4.9.
- Heat the water with the burner.
- Tabulate the change in temperature with time.

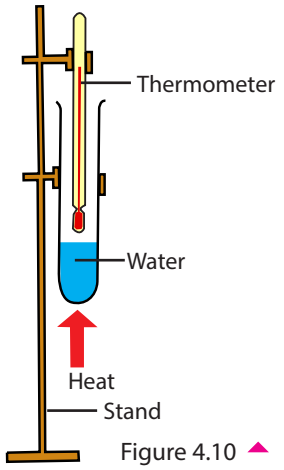


Figure 4.10

Table 4.7

Time	Temperature

When water is heated temperaure rises gradually. At a certain moment, the rise in temperature stops and water turns into the vapour state from the liquid state. That temperature remains unchanged till all the water is vapourised. That temperature is called the **boiling point** of water. The boiling point of pure water at standard atmospheric pressure is 100 °C. (The boiling point a liquid depends on the surrouding pressure. If the surrounding pressure falls, the boiling point falls. The boiling point of water on a high mountain is lower than 100 °C.)

If water is not pure due to the dissolving of foreign substances the boiling point (100 °C) may be elevated or lowered. From this it is clear that the boiling point is also a physical characteristic that can be used to probe the purity of a compound.

Table 4.10 shows boiling points of some substances under normal atmospheric pressure.

Table 4.10

Substance	Boiling point (°C)
Ethyl alcohol	77
Water	100
Sulphur	444
Lead	1744
Iron	2900

Now let us see whether we can classify the elements we identified as pure substances based on their physical properties.

Activity 4.8

You will need:- Iron, copper, sulphur, carbon (graphite), magnesium, aluminium, lead, zinc

Method:-

- Identify observations or simple activites appropriate to examine the properties such as metallic lustre, sonority, thermal conductivity, electrical conductivity, malleability and brittleness. You can have an understanding about this by reading the paragraph coming after this activity.
- Do the relevant activities and record the obervations using a table such as Table 4.11. Place a tick (√) when the element has the relevant property and a corss (×) if it does not.

Table 4.11

Substance	Lustre	Sonority	Thermal conductivity	Electrical conductivity	Malleability	Brittleness
Iron	√	√	√	√	√	×
Copper						
Sulphur						
Graphite						
Magnesium						
Aluminium						
Lead						
Zinc						

Some methods which you can adopt to examine each physical property are described below. To investigate the physical properties you can use either those methods or other methods after discussing with your teacher.

To examine the **lustre**, you can scratch the surface of the substance with a knife or clean it with a sand paper.

The material used to examine **sonority** should be at least one millimetre thick. It can be done by striking with a metal rod or dropping on the cement floor from a suitable height.

To inquire into the **thermal conductivity** a change that can be observed during the transmission of heat has to be used. For example, drops of candle wax can be placed on rods made of different materials and melting of the wax during conduction of heat can be done.

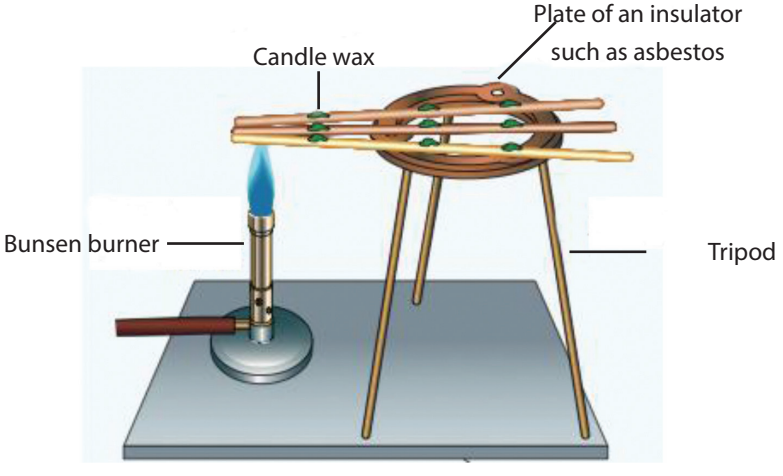


Figure 4.11 ▲ Examine thermal conductivity

In order to examine **electrical conductivity** a simple circuit should be constructed. It could be constructed on a circuit board or made by connecting the pieces of equipment using crocodile clips.

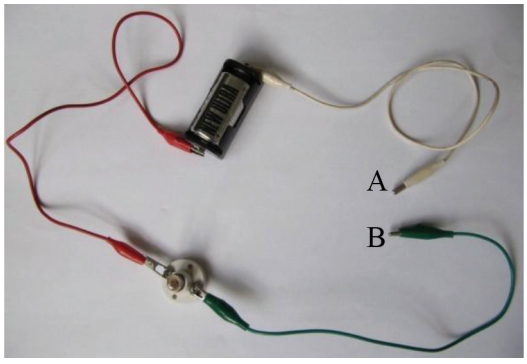


Figure 4.12

If the substance to be tested placed between A and B, conduct electricity, the bulb will light. If the substance does not conduct electricity the bulb will not light.

To observe malleability and brittleness a piece of the relevant substance can be struck lightly with a hammer after placing it on a fairly thick surface. If it turns into a sheet on hammering, it shows malleablilty. If it crumbles, it is a brittle substance.

Based on the results of the above experiment and other characteristics, elements can be divided into two classes, metals and non metals. The diversity of the physical properties of metals and non metals can be illustrated as follows.

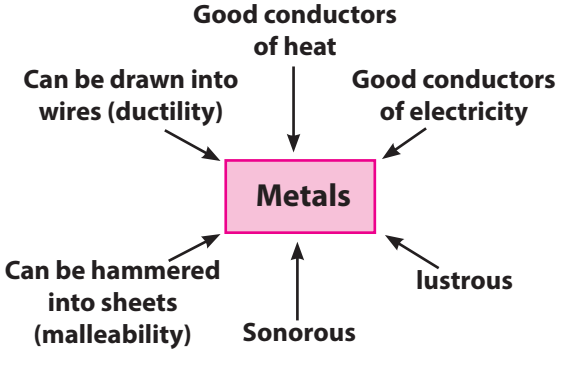


Figure 4.13

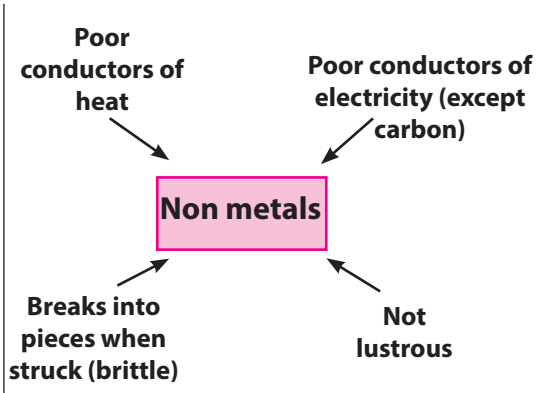


Figure 4.14

Assignment 4.7

Classify the substances given in Table 4.11 in Activity 4.8 as metals and non metals.

Based on their physical properties, elements can be classified as metals and non metals. Moreover, based on the physical state of matter they can be classified as solid, liquid and gas. Study Table 4.12 well and get to know the diversity of elements.

Table 4.12

Element	Metallic/Non metallic nature	Physical state (solid, liquid, gas)
Sodium	Metal	Solid
Aluminium	Metal	Solid
Calcium	Metal	Solid
Iron	Metal	Solid
Copper	Metal	Solid
Magnesium	Metal	Solid
Zinc	Metal	Solid
Lead	Metal	Solid
Mercury	Metal	Liquid
Carbon	Non metal	Solid
Silicon	Non metal	Solid
Phosphorus	Non metal	Solid
Sulphur	Non metal	Solid
Iodine	Non metal	Solid
Hydrogen	Non metal	Gas
Nitrogen	Non metal	Gas
Oxygen	Non metal	Gas
Chlorine	Non metal	Gas
Argon	Non metal	Gas
Bromine	Non metal	Liquid

Day-to-day applications of various physical properties of matter

The physical properties of matter can be usefully applied in various ways in our everyday life. Table 4.13 presents a few such instances.

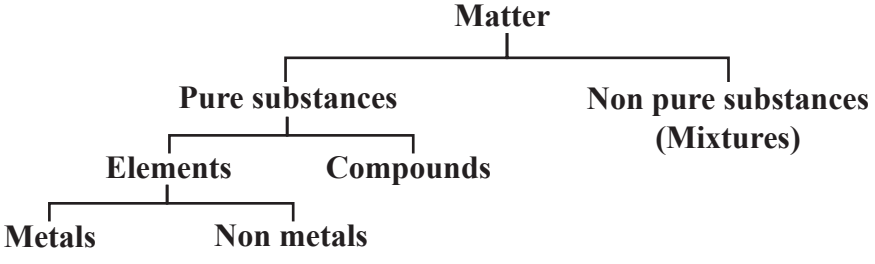
Table 4.13

Physical property of matter	Instances of application	Substance
Metallic lustre	making jewellery	gold, silver
Hardness	withstanding weight	steel rails
	cutting glass	diamonds stylets
Compressibility	storing gases in cylinders	oxygen, LP gas
Odour	detecting gas leakages	LP gas
	spreading the scent	perfumes, sweet smelling smoke
Thermal conductivity	cooking pans	aluminium
	soldering	lead
Electrical conductivity	conducting electricity	copper, aluminium cables
Elasticity	decoration	rubber balloons
Expansivity	measuring temperature	mercury/ alchol theremometers
	automatic electrostats	electrical appliances with a bimetallic strip
Brittleness	breaking larger pieces into smaller pieces	chemical compounds, cereals, granite, egg shells
Texture (smooth)	applying talcum powder	talc (a mineral)
Texture (rough)	smoothening the surface of wood, walls etc	sand paper

Assignment 4.8

Explore information relating to the instances where the properties of matter are exploited in real life and present the information in a creative manner.

At the end of the chapter, a schematic diagram such as one given below can be constructed.



Summary

- The things that have a mass and that occupy space are known as matter.
- The making of matter from particles and the existence of spaces among them is referred to as the discontinous nature of matter.
- All three states, solid, liquid, and gas are discontinuous.
- The reason for the specific features of matter in solid, liquid and gaseous state is the diversity of the arrangement of particles in them.
- The different properties of solids, liquids and gases make them applicable for different purposes.
- Based on composition, matter can be classified as pure substances and non pure substances.
- Pure substances can further be classified into two catergories; elements and compounds.
- Pure substances with definite properties and indivisible by physical or chemical methods into substances with different properties are called elements.
- The pure substances formed by the chemical combination of two or more elements in a constant ratio are known as compounds.
- Sonority, thermal conductivity, electrical conductivity, malleability, ductility, density, melting point, boiling point, hardness, elasticity, expansivity, lustre, etc are physical properties of matter.
- In pure substances the physical properties such as density, boiling point and melting point have a constant value.
- Based on the physical properties, elements can be classified as metals and non metals.
- Various physical properties of substances are used for daily activities in life.

Exercise

01) For the following questions, select the correct answer or the most suitable answer from the responses given

01. Which of the following response contains only matter?
    1. Air, water and light
    2. Water, heat and a brick
    3. Electricity, a brick and ink
    4. A brick, ink and air

02. A property only common to solids and liquids is
    1. having a definite shape
    2. having a definite volume
    3. the ability to compress
    4. the free movement of particles

03. When a drop of ink is added to a vessel of water, the colour of ink spreads throughout water. Which of the following response explains this observation best

1. Water is discontinuous
2. Ink is discontinuous
3. Water and ink are discontinuous
4. Ink is discontinous and water is continous

04. Which of the following is a pure substance?

1. Bottled water
2. Fizzy drinks
3. Colourless toothpaste
4. Crystals of sodium hydroxide

05. The property of crumbling upon the application of a small force is called

1. Hardness
2. Brittleness
3. Elasticity
4. Ductility

06. Given below are three ideas expressed by three students about the masses of equal volumes of water and kerosene

A) Their masses are equal

B) Mass of kerosene is less

C) Mass of water is greater

The correct response of these is /are

1.only A 2. only B 3. only C 4. only B and C

07. Which of the following substance is an electrical conductor?

1. Iron 2. Wood 3. Sand 4. Wax

08. What is the boiling point of pure water at standard atmospheric pressure?.

1. 0 ^{0}C 2. 30 ^{0}C 3. 100 ^{0}C 4. Between 30 ^{0}C - 100 ^{0}C

09. What is the liquid metal that conducts electricity?

1. Water 2. Mercury 3. Alcohol 4. Wine spirit

10. Some ideas expressed by students about the boiling point of a liquid are as follows

A) It is the temperature at which a change in state occurs

B) It is the temperature at which a solid turns into a liquid without changing temperature upon heating

C) It is the temperature at which a liquid turns into a gas without changing temperature on heating.

The correct statements of the above are;

1. only A 2. only B 3. only C 4. only A and C

11. Which of the following is correct about the density of a metal?

1. It always takes a high value
2. Mostly it takes a low value
3. It takes a definite value
3. Densities of all the metals are equal

02) Place the mark √ if each of the following statements is correct and mark × if it is wrong.

01. Air does not belong to the category of matter. ( )
02. All matter has a particulate arrangement. ( )
03. Gas particles move freely. ( )
04. Sun contains only energy. ( )
05. Solids, liquids and gases can be compressed easily. ( )
06. A liquid has a fixed shape as well as a fixed volume. ( )
07. Copper is a brittle metal. ( )
08. Sulphur is an electric conductor and a non metal. ( )
09. Sonority is a property seen in most of the metals. ( )
10. All metals have malleable and ductile properties. ( )

Technical Terms

Energy	-	ශක්තිය	-	சக்தி
Matter	-	පදාර්ථය	-	சடம்
Discontinous nature	-	අසන්තත ස්වභාවය	-	தொடர்ச்சியற்ற தன்மை
Shape	-	හැඩය	-	வடிவம்
Volume	-	පරිමාව	-	கனவளவு
Compressibility	-	සම්පීඩනය	-	நெருக்கற்றகவு
Density	-	ඝනත්වය	-	அடர்த்தி
Pure substances	-	සංශුද්ධ ද්‍රව්‍ය	-	தூய பதார்த்தம்
Elements	-	මූලද්‍රව්‍ය	-	மூலகம்
Compounds	-	සංයෝග	-	சேர்வைகள்
Metals	-	ලෝහ	-	உலோகங்கள்
Non metals	-	අලෝහ	-	அல்லுலோகங்கள்
Mixtures	-	මිශ්‍රණ	-	கலவைகள்
Lustre	-	දිස්නය	-	பளபளப்பு
Hardness	-	දෘඪතාව	-	வன்மை
Brittleness	-	භංගුර බව	-	நொருங்குமியல்பு
Thermal conductivity	-	තාප සන්නායකතාව	-	வெப்பக்கடத்துத் திறன்

Electrical conductivity	-	විද්‍යුත් සන්නායකතාව	-	மின்கடத்து திறன்
Sonority	-	රැව් දෙන හඬ	-	கணிர்ஒலி
Colour	-	වර්ණය	-	நிறம்
Elasticity	-	ප්‍රත්‍යස්ථතාව	-	மீள்தன்மை
Malleability	-	ආහන්‍යතාව	-	வாட்டத்தகுமியல்பு
Ductility	-	තන්‍යතාව	-	நீட்டற்றகுமியல்பு
Smell	-	ගන්ධය	-	மணம்
Expansivity	-	ප්‍රසාරණතාව	-	விரிவு
Texture	-	වයනය	-	இழையமைப்பு
Melting point	-	ද්‍රවාංකය	-	உருகுநிலை
Boiling point	-	තාපාංකය	-	கொதிநிலை