

# **GRADE 8 INTEGRATED NOTES**

## **JUNIOUR SECONDARY SCHOOL NOTES**

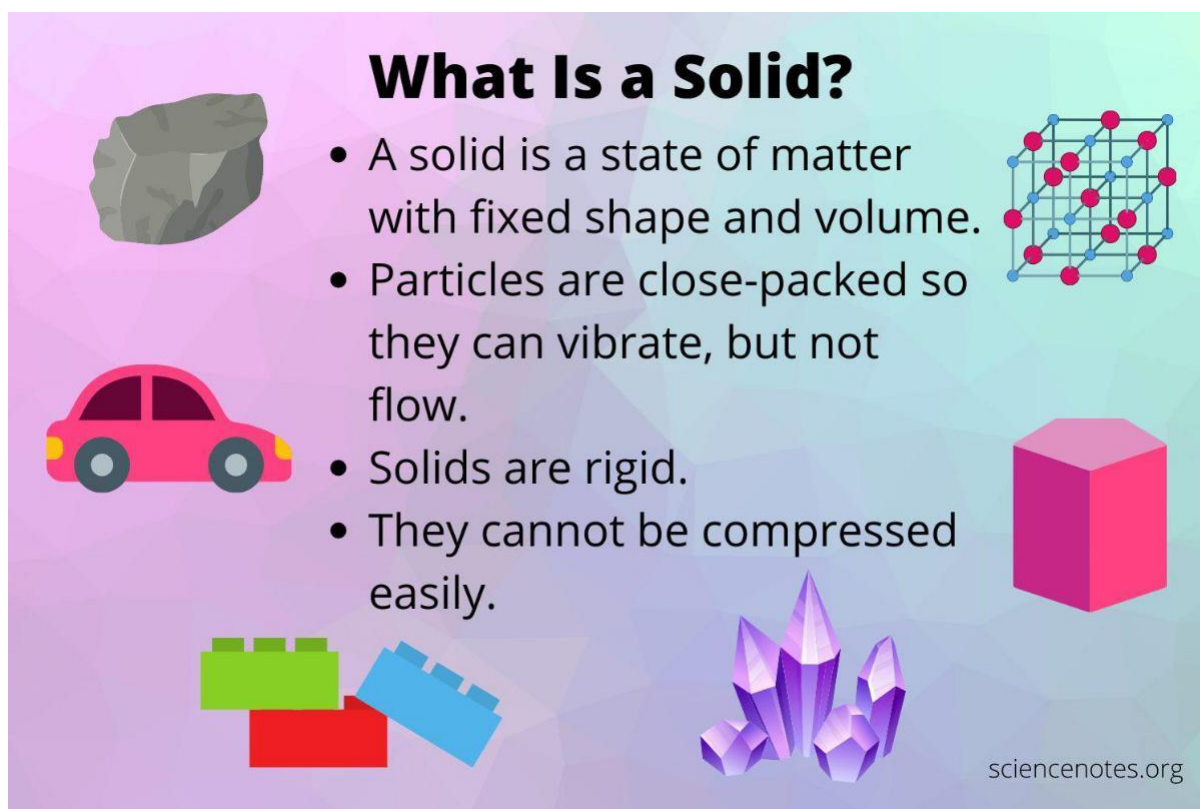
# MIXTURES ELEMENTS AND COMPOUND

## PROPERTIES OF MATTER

*Matter is anything that has weight and occupies space. Everything found around us is matter*

### ♣ Properties of Solids:

- 1) Solid has a fixed shape and a fixed volume.
- 2) Solid cannot be compressed.
- 3) Solids have a high density.
- 4) Force of attraction between the particles in a solid is very strong.
- 5) The space between the particles of solids is negligible.



## What Is a Solid?

- A solid is a state of matter with fixed shape and volume.
- Particles are close-packed so they can vibrate, but not flow.
- Solids are rigid.
- They cannot be compressed easily.

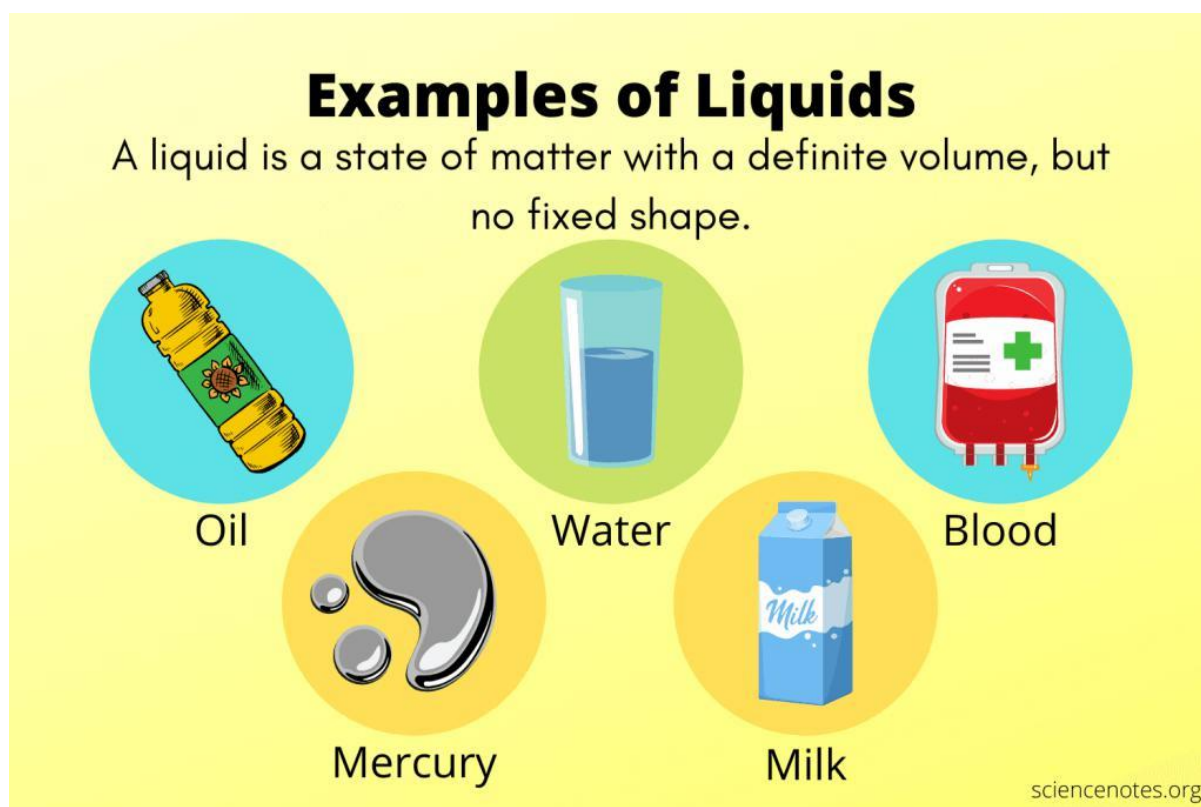
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### Examples of solids

- Sand
- Timber
- Rocks
- Shoe
- Chalk dust
- Tables
- spoon

### ♣ Properties of Liquids:

- 1) Liquid has a fixed volume but no fixed shape.
- 2) Liquids can be slightly compressed. large pressure is required to compress them.
- 3) Liquids have lesser densities than solids.
- 4) Intermolecular forces of attraction is weaker than solids.
- 5) They have considerable space between the particles.



### ♣ Properties of Gases:

- 1) Gases have neither a fixed shape nor a fixed volume.
- 2) Gases can be compressed easily.
- 3) Gases have the least density among the three.
- 4) Intermolecular forces of attraction are weakest.
- 5) The space between the gas particles is large.

## Summary

### SOLID



- Rigid
- Fixed Shape
- Fixed Volume
- Cannot be squashed

### LIQUID



- Not Rigid
- No Fixed Shape
- Fixed Volume
- Cannot be squashed

### GAS



- Not Rigid
- No Fixed Shape
- No Fixed Volume
- Can be squashed

## Diffusion in liquids

*Diffusion is movement of molecules from a region of high concentration to a region of low concentration*

When the crystals of potassium permanganate are kept in water, the purple-coloured crystals of potassium permanganate break further into smaller particles that occupy the space between the molecules of water imparting a purple colour to the water. So this is an example of diffusion

Watch clip on

<https://www.youtube.com/watch?v=BHZZyDMeu1M&t=152>



Potassium permanganate diffusion in water.

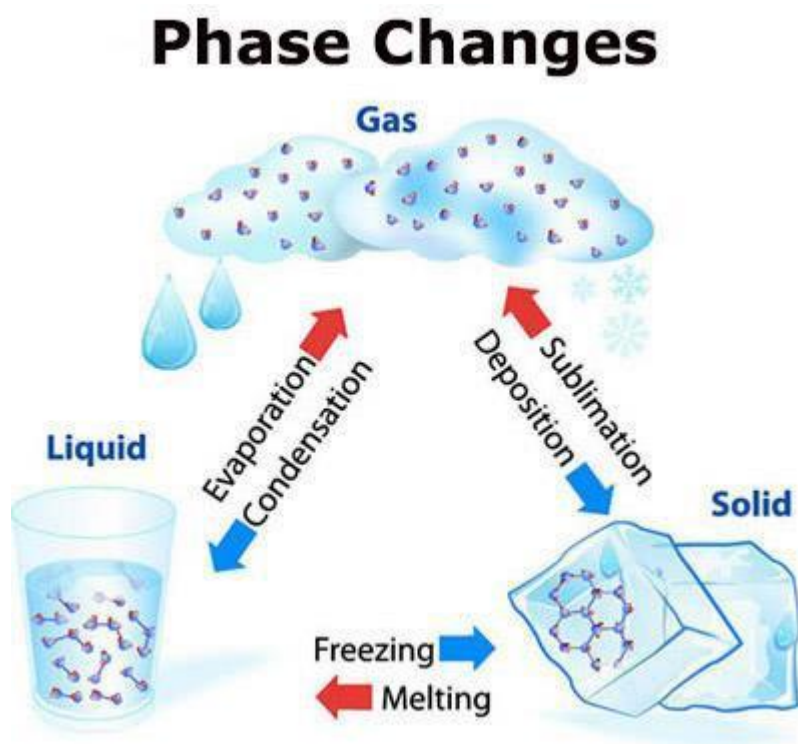
Beaker containing potassium permanganate (purple) and water, and a clock being used to time how long it takes for the purple colour to spread through the water as the potassium permanganate dissolves.

This apparatus is used to demonstrate diffusion in a liquid. Eventually, the random motion of all the potassium permanganate particles results in the purple colour being equally dispersed throughout the water. The process appears slow as the dissolved particles collide with the water molecules and each other, slowing their progress.



## Changes of state of matter

A change of state is a physical change in a matter. They are reversible changes and do not involve any changes in the chemical makeup of the matter. Common changes of the state include melting, freezing, sublimation, deposition, condensation, and vaporization.



## *Why matter states changes*

It is possible that we have seen changes in the state of matter as the ice cubes melt into liquid water, or when the water boils and turns into vapour but have we ever thought about the reason behind this?

The changing states of matter occur as the matter absorbs or loses energy. When an object absorbs energy, molecules and atoms accelerate their movement and this increased energy kinetics can push particles so that they alter their state. The energy that is absorbed is typically thermal or heat energy.

## Changing States of Matter

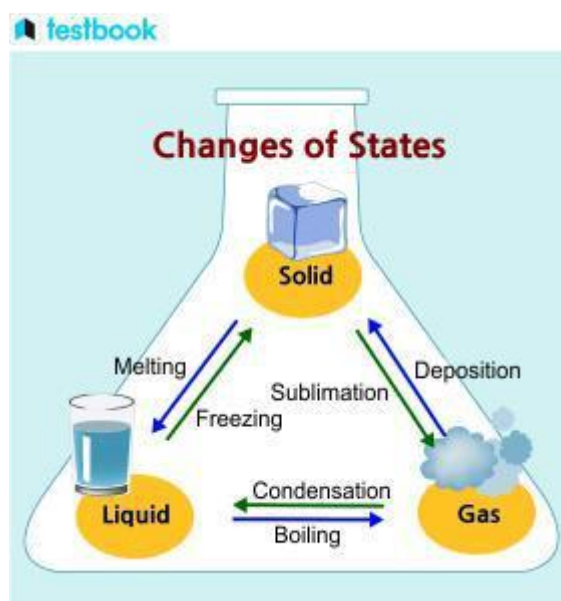
There are generally three types of matter: liquid, solid, and gas. In the solid state, the particles or molecules are tightly together which is why they possess an intense



intermolecular force of attraction. The liquid states of particles, however, are apart from one another and thus have less force to attract them. In the case of gas, the particles are extremely far from one another and exhibit a negligible force of attraction.

If there are changes in the temperature or pressure of a material, the change of states of matter takes place. The state of matter can be changed by changing temperature and pressure. The impact of temperature changes on states of matter shifting will be directly related to changes in the interaction between molecules that make up the substance. If the temperature drops, particles can soften into a robust structure.

The diagram below depicts the change of states of matter through different types of processes taking place in those states:



Here to understand this phenomenon we can take an example of the conversion of ice into water. In this conversion, the ice which is a solid form of water gets changed into water which is the liquid form itself. This change in the state occurs due to a process known as melting, and in this process, when kept at a higher temperature the solid ice gets converted into liquid water. In melting, mainly the liquefaction of ice takes place.

From this example, we can understand that the change of states of matter can only occur through a certain process that takes place due to a rise or fall in its temperature or due to an increase or decrease in its pressure. Without these things, nothing can change the state of a matter. There are many processes similar to melting which are responsible for changing the state of a particular matter.

## Changes Between Liquids and Solids

We have seen that changes of state take place and the compound changes from one physical form to another. One such change is between liquids and solids. To

understand this we can take an example of rock which gets converted into lava when exposed to extreme heat and pressure but when it cools down the lava again converts back into a rock.

### ***Freezing***

Freezing is the process in which the liquid converts into solid. To understand this we can take an example liquids getting converted into crystals. There are many liquids which do convert into solid but they do not take the exact solid form rather they convert themselves into tiny crystals.

### ***Melting***

Melting is a process in which the solid converts into liquid by getting exposed to heat and pressure. We can understand this from the example of metal converting into molten liquids by artisans to give them different kinds of shapes.

## **Changes Between Liquids & Gases**

Another change that takes place between different types of states is that between liquids and gases. In this change the liquids get converted into gases or the gases into liquids and this mainly occurs by two processes. An example to understand this is liquid water getting converted into water vapours which is the gaseous form of water and then the water vapour getting converted back into liquid water.

### ***Vaporization***

Vaporization is the process in which the liquid gets converted into its gaseous form. For example, if we take some water in a saucepan and heat it up then after some time the water will start to decrease in quantity. This thing happens with water as it gets converted into steam by the presence of heat and pressure on it.

### ***Condensation***

The conversion of gases into liquids takes place by the process of condensation. In this the water vapour which is present in the atmosphere into droplets of dew on grass and trees when temperature is low and pressure is also low.

## **Changes between Solids & Gases**

One more change that takes place is the solid state of matter changing into gaseous phase and then the gaseous state into the solid state. It can be understood by the



example of freeze drying of water in which it gets converted from solid to gaseous in normal temperature and pressure and when the temperature and pressure is lowered it goes back to its solid form.

### ***Sublimation***

Sublimation is a process in which the solid state of matter converts directly into the gaseous state and the gaseous back into solid state without going through the liquid phase change. This process can be understood by taking the example of dry ice. Dry ice converts from solid to gas in normal temperature and pressure but when the temperature is lowered and the pressure is decreased it converts back to its solid form.

### ***Deposition***

Deposition is a phase change where gas becomes a solid without going through the liquid phase.

The forces of attraction between the solids are completely eliminated when they have absorbed enough energy. A deposition is the inverse of Sublimation and vice versa.

The most typical example of deposition is frost, which is the deposition of water vapour from humid air which converts into a solid ice.

## **Examples of Change of State of Matter in Everyday Life**

There are several examples of changes of state of matter that occur in everyday life. Here are a few common examples:

- **Ice melting:** When ice at 0°C is heated, it changes from solid state to liquid state and starts melting.
- **Frost formation:** When the temperature drops below 0°C, water vapour in the air condenses directly into solid ice crystals.
- **Water boiling:** When water is heated, it changes from liquid state to gas state (steam).
- **Condensation of water vapour:** When water vapour in the air cools below 100°C, it changes from gas state to liquid state and condenses to form liquid water droplets.
- **Sublimation:** An example of sublimation is when solid dry ice (frozen carbon dioxide) changes into carbon dioxide gas without melting.

## **Causes and Effects of Changing States of Matter**

The main cause of change in states of matter is due to the addition or loss of energy in the state of a substance that is altered physically.

This phenomenon is connected with the movement of molecules. Solids possess very little kinetic energy, meaning that they only vibrate and keep the bonds of chemical strength. If the energy source is placed in (e.g. heat energy, which can later be converted into kinetic energy) then the molecules begin spinning and vibrating faster, which causes the strength of the bonds to diminish.

If a certain amount of heating is applied (this is different for each substance, for example, the melting point of the water is 0°C while the boiling point is 100°C) those molecules will be moving towards the point of not remaining in their original form. When energy levels are reduced and reversed, the process begins again.

Whereas, the effects of change in the state of matter are only two which are mentioned as well as explained below:

- o **Change in Temperature:** The temperature change occurs in states of a matter when it undergoes heat transfer to its surroundings. When a substance is placed in surroundings of a different temperature, heat is exchanged between the substance and the surroundings, causing both to achieve an equilibrium temperature. So when an ice cube is exposed to heat, its water molecules absorb heat energy from the surrounding atmosphere and begin to move more energetically, causing the water ice to melt into liquid water.
- o **Change in Pressure:** The change in pressure occurs in states of a matter only when it undergoes liquefaction. We can understand this effect from the examples of smoke rising all over the stage at performances or parties. Dry ice is the only thing that exists (solid carbon dioxide). The solid carbon dioxide is kept at high pressure and instantly melts when pressure is reduced down to 1 bar. The space between particles of the material is what determines its physical state. In the end, when pressure is applied to the gas, it is compressed into a liquid. Then, the pressure applied to liquids becomes solid. Pressure does not affect solids. If pressure is applied to the material and the chemical state of the substance shifts from liquid to gas and after that, liquid changes to solid.

## Experiments of Changing States of Matter

Below are mentioned three experiments that depict all the five processes that take place during the change of state of matter:

- o If we take an ice cube and put it in a bowl then after some time it will melt into water. This depicts the conversion of a solid into liquid due to the process of melting which took place due to an increase in the temperature of the substance. Now if we put that bowl that has water in a freezer, then the water will again solidify into ice and again change its state. This phenomenon occurs due to the conversion of liquid into solid by the process of freezing. Freezing can only take place when the temperature of a substance is decreased.
- o Now if you put a bowl filled with water outside your home in the sun then after some days there will be no water. Due to an increase in the temperature, the liquid water changes its form into gaseous water vapour which depicts the process of evaporation taking place. Now to depict condensation we can take a bottle and fill it with some chilled water and as time goes by we can see small droplets of water outside of the

bottle which occurred due to the process of condensation taking place. Condensation occurs when the gaseous water vapours come in contact with the cold water having a decreased temperature; they start to solidify and get converted into liquid water again.

- If we take some dry ice and put it in a bowl then after some time we can see that the dry ice will disappear. This occurs due to the process of sublimation taking place in it. Sublimation converts the solid into a gaseous form and it occurs only when the temperature is increased. To reverse this process we can decrease the temperature as well as pressure and the atmospheric dry ice will again solidify.

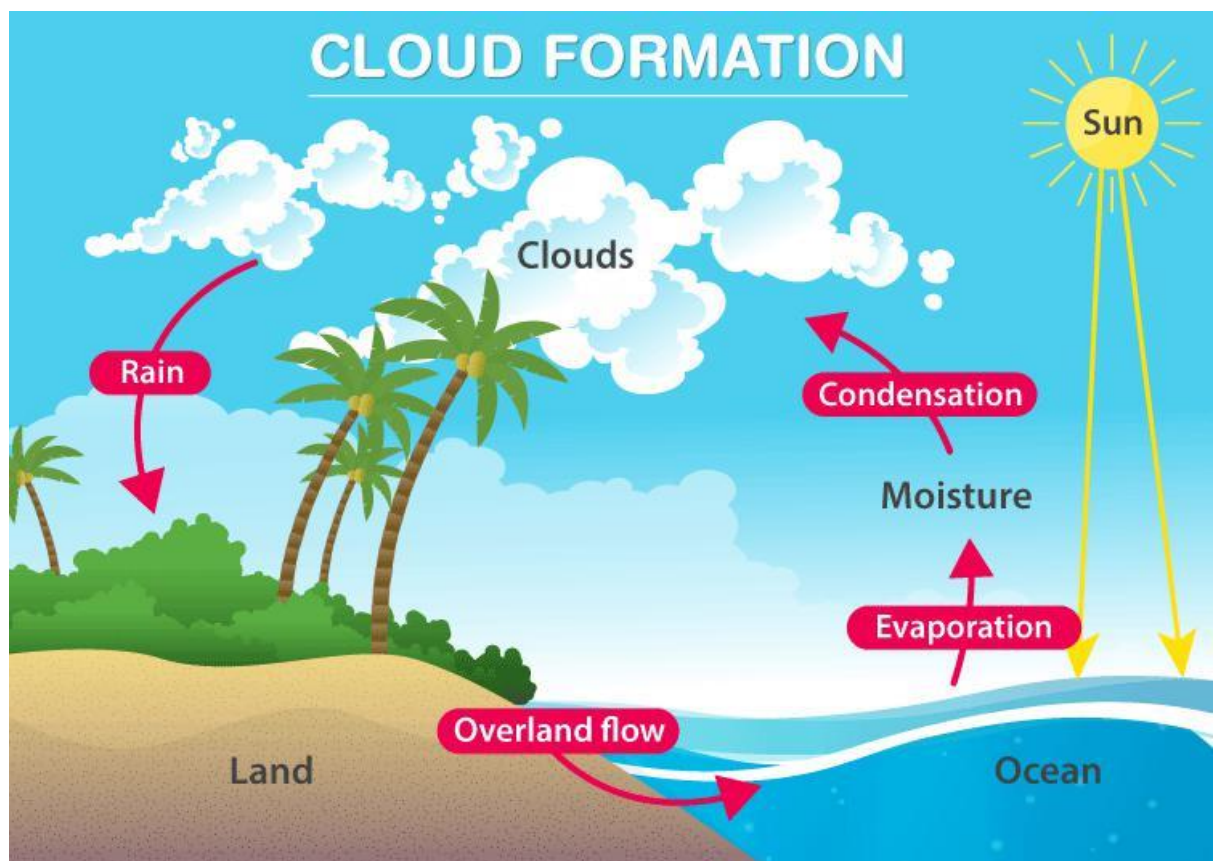
### Applications of Changing States of Matter

The phenomenon of change of states of matter can be found in the following examples:

#### 1. Preventing ice-cream from melting by using the dry ice.



#### 2. Formation of the clouds.



Clouds form when the invisible water vapour in the air condenses into visible water droplets or ice crystals. For this to happen, the parcel of air must be saturated, i.e. unable to hold all the water it contains in vapour form, so it starts to condense into a liquid or solid form.

### 3. Formation of the fog and dew.

Fog is an atmospheric condition characterised by the cloud appearing close to or at the earth's surface. Dew is the condensation that occurs due to temperature drops to the dew point. Calm winds lead to the formation of dew. When the air above the ground cools under light wind speeds, fog also forms

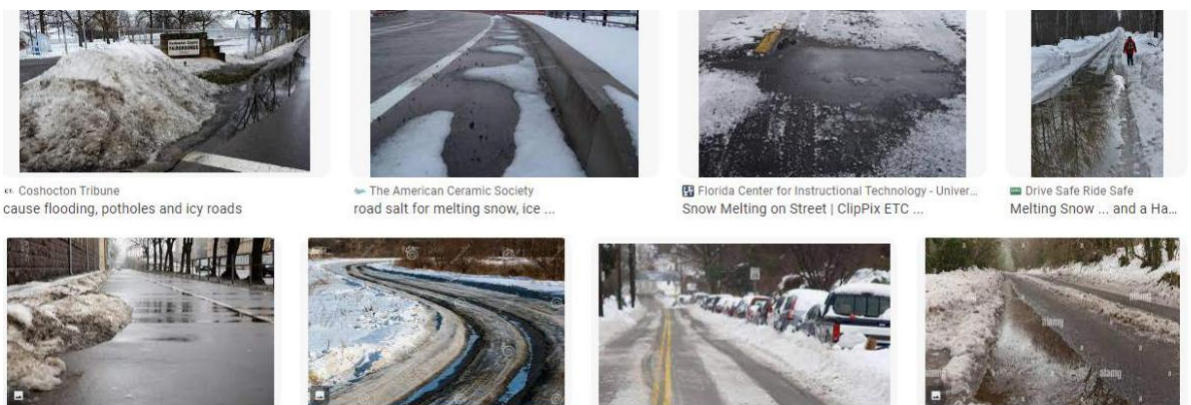
### 4. Formation of water droplets outside of the glass.



5.

### 6. Melting of the snow on the road.

Salt melts ice and snow by lowering its freezing point. Salt is best put on the roads before they freeze or before snow arrives. Then, as snow falls, the salt mixes with it, lowering its freezing point. The result is a brine solution, preventing subsequent ice forming.



### 7. Refrigeration

Refrigeration, or cooling process, is the removal of unwanted heat from a selected object, substance, or space and its transfer to another object,



substance, or space. Removal of heat lowers the temperature and may be accomplished by use of ice, snow, chilled water or mechanical refrigeration



## Temporary and permanent changes