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Rain : Where Does It Come From?

Fig. 1

Ramya and Sowmya were getting ready to go to school. Their mother advised them to keep an umbrella with them. Ramya asked her mother why the umbrella was needed as it was not raining. After looking at the sky, mother told them that it was likley to rain as it was cloudy and windy weather. They started to school wondering about how their mother was able to predict when it could rain.

- Why do we get rains?
- Where do the rains come from?
- How did mother know that it was likely to rain?
- Do all the clouds formed in the sky cause rain?

Rain is a common phenomenon like air and sunlight in our daily life. We generally get more rains in rainy season. Our general observation is that if the sky is cloudy then there is a possibility of rain. But clouds do not lead to rains every time. Some times we witness sudden rains.

- Why do clouds cause rain?
- What is the relation between rains and clouds?
- Why don’t all clouds cause rain?

To understand about clouds and rains we need to first know something about water.

Forms of Water

All of us know that water is available in nature in three forms.

Solid Form

We call soild form of water ice.

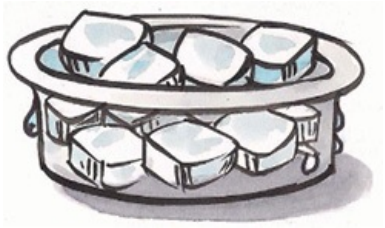


Fig. 2 : Ice

Snow occurs naturally.

Can we convert water into ice?
Explain what we should do?

Liquid Form

What happens if ice is kept in the open air?
If we heat ice, it will change into water.
Water in liquid form is present in oceans, seas, lakes, rivers and even underground.

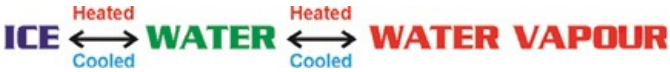
Fig. 3 : Water - Liquid form

Gaseous Form

What happens when water is heated? The gaseous form of water is water vapour which is present in the air around us.

We know that when ice is heated it converts into water and if water is heated it turns into water vapour. Similarly when water vapour is cooled we can get back water. If water is cooled further we will get ice.

Fig. 4



So, we understand that these three forms of water are interchangeable.

Evaporation and formation of clouds

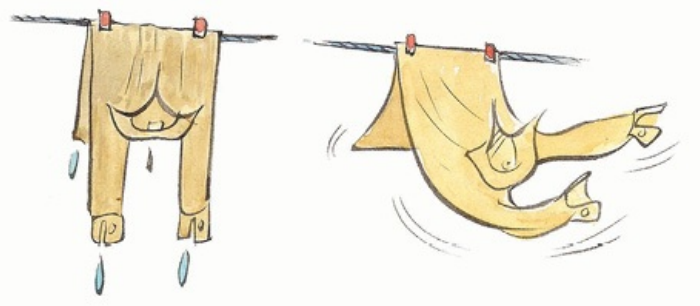


Fig. 5

What happens to the water in wet clothes when they are kept in sunlight? When we want to dry clothes quickly we wave them about or keep them under a fan.

• Does the water in wet cloths dry up only due to sunlight or due to other reasons?

You must have seen that water on wet roads, roof tops and some other places dries up after some time though there is no sunlight.

• Where does this water go after drying up?

If you heat water kept in a bowl by using a stove, you may notice water vapour coming from the bowl. Thus, when water is heated, it gets converted to vapour and mixes with the air. This is what happens to the water in wet clothes also.

The process of water changing into water vapour is called “evaporation”

If water is gently heated it will become warm. Some vapour is produced. If it is heated more, it starts boiling. If we heat it further , it evaporates and converts completely into water vapour.

We know that the amount of heat absorbed by water affects its evaporation. If water is heated more, it will evaporate faster.

• You might have observed evaporation in many situations in day- to-day life. Discuss them with your friends and prepare a list.

Evaporation is a natural process which takes place on the Earth. Water evaporates continuously from the surfaces of water bodies like seas, oceans,

rivers, ponds etc. and changes into water vapour due to the heat supplied by sunlight.

• Where does this water vapour go after evaporation?

The water vapour formed due to evaporation becomes a part of air and cannot usually be seen. The water vapour which enters into air through the process of evaporation forms clouds in the sky.

• What is a cloud?

• How are clouds formed?

Condensation

It is our common experience that on cold winter mornings when we speak, we observe smoke-like vapour coming out of our mouths(Fig 6).

• Why does smoke-like vapour come out of our mouth in winter?

• Do we experience this in summer as well?

In winter, the air in our atmosphere is very cool as compared to the air coming out from our mouth. Water vapour present in the air coming out from our mouth gets cooled suddenly to form very tiny droplets. These tiny droplets concentrated in a limited area, appear like smoke or a small cloud near our mouth.

Fig. 6

You might have observed that during mornings in winter, some fog is formed and small dew drops appear on grass, leaves of plants etc.

• From where do these water drops come on the leaves and grass?

Fig. 7 : Dew on grass

Activity-1: Condensation

Take some water in a glass. Add some pieces of ice to it. Observe for few minutes.

Fig. 8

• What changes do you observe on the outer surface of the glass?

You would observe formation of small drops of water on the outer surface of the glass.

• Why are these drops formed?

• Do they get formed if there is no ice in the glass?

Ice-cold water in the glass cools its surface. Air around the glass contains water vapour which is warmer than the surface of the glass. Due to the cold glass, air close to its surface will also become cooler. This changes the water vapour in the air around the surface of the glass into water and forms small drops on the outer surface of glass.

Have you ever observed in your daily life where water vapour changes into water? List them out.

The process of conversion of water vapour into water is called "condensation".

Clouds and rain

On a warm day, the sun heats up the ground as well as the water in seas, oceans, rivers, ponds etc. This water converts into water vapour by the process of evaporation.

Fig. 9

This water vapour rises up into the atmosphere. As we move away from the surface of the earth, the air becomes cooler. Hence, when water vapour reaches higher levels it condenses due to contact with cool air and forms small drops or water droplets. These tiny droplets remain floating in air at higher levels of the

atmosphere and appear as clouds.

Activity-2: Clouds in kitchen

Take a vessel filled with water. Keep it on a stove and heat it slowly. Observe for some time. Now cover the vessel with a plate. Remove the plate after a couple of minutes (Fig 10). Do you see any changes on the inner surface of the plate?

Pour some cool water on the plate and observe what happens?

What similarities do you find between evaporation of water from surface of water bodies and evaporation of water from a bowl heated in the kitchen?

From both cases discussed above, we know that water vapour helps to form clouds.

The clouds formed on the surface of the different water bodies do not stay there. They start to move from one place to another in the direction of winds.

As more clouds come together they become laden with water vapour. Winds bring the clouds from the sea to the land. The colder air in the upper layers of the atmosphere cools the clouds.

• Have you observed the colour of a cloud before rain?

• How are clouds converted into rain?

We all know that without clouds, it will not be possible to get rains and that all clouds do not cause rains. Some changes take place in the clouds before they cause rain.

• What changes do you notice in the sky and in the atmosphere before it rains?

• What changes take place in clouds before raining?

Fig. 11

The clouds moving in air are generally at higher levels. Sometimes the cool breeze coming along with air makes the clouds cooler. This leads to water droplets present in the clouds to condense and form large water drops.

Further cooling of clouds increases the size of their water drops and clouds become heavy and descend towards the earth. The colour of such clouds changes from white to gray giving us the feeling of dark clouds gathering. When the size of the water drops increases further it becomes difficult for the cloud to hold them and water drops begin to fall. This is called **"rain"**.(Fig 11)

In our daily life, we observe that before raining, clouds descend towards the earth's surface and we experience a cool breeze before rainfall.

In very cold conditions, the drops of water turn into crystals of ice and fall as snow. Sometimes big drops of water solidify into ice and fall as pieces of ice known as **hailstones.**

Do you know:

Generally, we get rains in some particular months during the year. In our state, rains occur normally from June to September . During that season you might have observed in the sky that clouds are moving along with the winds blowing from western direction (South West side). These winds are called "South West monsoon". Similarly, we observe in the months of November and December rains occur due to movements of clouds in the direction of winds blowing from Eastern side (North East side). These winds are called **"North East Monsoon".** Now a days we are not getting timely rains and seasons are also changing slightly. Think, why is it happening so?

Water cycle

When it rains ponds, lakes etc are filled with water. Water from rainfall runs down as small streams. These small streams join together and make bigger streams. These bigger streams join the rivers. The rivers flow down to seas and oceans. Some of this rain water seeps into the ground and becomes ground water.

As it is very hot during summer, large quantity of water evaporates from seas, lakes, rivers etc. and converts into water vapour. This goes up into the air to form clouds. These clouds again cool and produce rain.

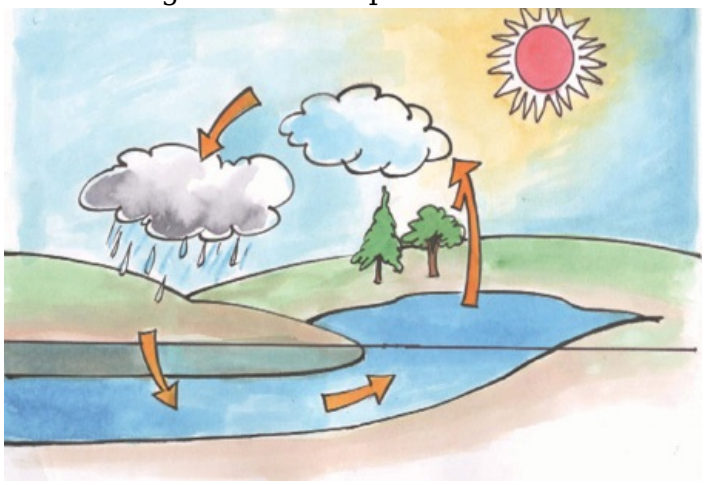


Fig. 12 : Water cycle

The circulation of water into water vapour by evaporation, water vapour to clouds and clouds to rain by condensation is known as **"water cycle"**

This cycle of evaporation and condensation takes place continuously in nature**.** (Fig 12)

Deforestation and pollution from factories are now causing global warming. So, the atmospheric conditions are not favourable for clouds to get cooled. Consequently, there is a decrease in rainfall. This disturbs the water cycle and causes either floods or droughts.

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Keywords

Evaporation, condensation, water cycle, cloud, water vapour, atmosphere, stream, droplets, dew, rain, hails, breeze, wind

What we have learnt?

- Water on the Earth can exist in three forms: ice (solid form), water (liquid form) and water vapour (gaseous form).
- The process of changing of water into water vapour is called evaporation.
- If water receives more heat, it evaporates faster.
- Clouds are formed from tiny droplets of water vapour.
- Evaporation of water from the surface of seas, lakes, ponds etc. is part of cloud formation.
- All clouds do not always cause rain.
- As we move up from the surface of the Earth, air becomes cooler.
- The process of conversion of water vapour into water is called condensation.
- The cycle of evaporation and condensation of water, present on the Earth's surface, causes rain.
- The conversion of water into water vapour, water vapour to clouds and clouds to rain is known as water cycle.

Improve your learning

1. How are clouds formed? Explain?
2. How does the rain water reach from clouds to rivers or oceans?
3. When do clouds become cool?
4. Explain the relationship between the heat of sun and evaporation.
5. Why do we experience cloud like smoke near our mouth while we speak during the winter season?
6. Correct the given sentence if necessary.

"If the size of water drops decreases in the clouds, they can no longer hold the water drops."

7. Which of the following days is more suitable for drying of washed clothes? Explain why.

(a)Windy day (b)Cloudy day

8. Which of the following statements are right or wrong ?

(a) evaporation takes place quickly when more heat is supplied.

(b) for condensation of water, it should be cooled.

(c) water vapour is obtained from water by evaporation.

9. Visit your school library or internet, collect information about (Kashmir) Dal Lake regarding in which season water in the lake becomes ice and snow fall is very high and why the place attracts more tourists?
10. Draw a diagram to explain the water cycle.
11. How do you feel when you see the beauty of Rainbow in the sky? Express your feelings in the form of a song or a poem.
12. Why do clouds, once seen at a particular point, may not be there after some time?
13. How do you appreciate the contribution of water cycle in making water available for various needs of plants and animals?
14. Revanth blew air from his mouth onto the mirror while he was getting ready to go to school. He observed that the image in the mirror was not clear. Do you have any doubts to raise in this situation? Prepare questions on your doubts.
15. Why does the driver of a vehicle wipe the glass inside, even if the wiper is working on the outer surface of the glass when he drives in rain?

* * * *

Rain drops are not shaped like this, they are shaped like this as they fall.
Raindrops vary in size from 0.02 inch to about 0.031 inch diameter.

The umbrella was originally intended for shade from the hot Egyptian sun.

Acid rain is the combination of sulphur dioxide and nitrogen dioxide from polluting clouds from nuclear reactor and other fossil fuels.
If the rain drops are very small, they are collectively termed drizzle.
Raindrops fall between 7 and 18 miles per hour (3 and 8 metres per second).
A monsoon is a seasonal wind, found especially in Asia that reverses direction between summer and winter and often brings heavy rains.