Humidity And Clouds

Exercise

Q. 1. Match the column and complete the chain:

A	B	C
(A) Cirrus	(i) Vertical extent in the sky	(a) Roaring clouds
(B) Cumulonimbus	(ii) higher altitude	(b) Floating clouds
(C) Nimbostratus	(iii) Medium altitude	(c) continuous rainfall
(D) Alto-cumulus	(iv) Low altitude	(d) snow flake clouds

Answer : (A) Cirrus – (ii) Higher altitude – (d) Snow flake clouds

Explanation- Cirrus is a high-level cloud with an altitude of 7000 to 14000 metres. They are called snow flake clouds because they are composed of ice particles.

(B) Cumulonimbus – (i) Vertical extent in the sky- (a) roaring clouds

Explanation- Cumulonimbus are mountain-like huge vertical clouds which are formed as a result of strong upward water vapour currents in the atmosphere.

They are known as roaring clouds as they are responsible for thunderstorms and lightening.

(C) Nimbostratus – (iv) Low altitude – (c) continuous rain.

Explanation- Nimbostratus clouds are low-level clouds with an altitude of fewer than 2000 metres. They are dark and have dense layers which block the sun and hence cause continuous and persistent rains.

(D) Alto-cumulus – (iii) Medium altitude – (b) floating clouds

Explanation- Alto-cumulus is a mid-level cloud with an altitude of about 2000 to 7000 metres. They contain water droplets and appear puffy. Due to condensation, the clouds become light weight and float in the air. Hence they are called floating clouds.

Q. 2. Choose the correct word from the brackets and complete the sentence:

(Cumulonimbus, Relative humidity, Absolute humidity, Condensation, Vapour-holding capacity)

(a) The _____ of air is dependent on the temperature of the air.
(b) The amount of vapour in 1 cu.m. of air shows the _____ .
(c) As _____ is less in desert areas, the air is dry there.
(d) _____ type of clouds are indicators of the storm.
(e) In a free environment, the _____ of the vapour present in the atmosphere takes place around dust particles.

Answer : (a) Moisture-holding capacity

Explanation: The moisture holding capacity of air is dependent on the temperature of the air. The capacity of the air to hold moisture increases with an increase in the temperature. For example, at 40°C, the moisture holding capacity of the air is 51.12 gm/cu.m.

(b) Absolute humidity

Explanation: Absolute humidity is the amount of water vapour in 1 cu.m of the atmosphere. For instance, near coastal regions, absolute humidity in the air is likely to be higher than near the poles.

(c) Relative humidity

Explanation: Relative humidity is less in desert regions. This is because high temperature reduces the relative humidity of a particular place.

(d) Cumulonimbus

Explanation: Cumulonimbus clouds are indicators of the storm. They are huge and appear dark in colour. They cause rain accompanied by storm and tornadoes.

(e) Condensation

Explanation: In a free environment, the condensation of the vapour present in the atmosphere takes place around dust particles. This is because minute particles of dust, salt, smoke etc. soak water easily.

Q. 3. A. Differentiate between:

Humidity and clouds

Answer :

S.no.	Humidity	Clouds
1.	Humidity refers to "the quantity of water vapour present in the atmosphere."	Clouds refer to a collection of water vapour at a greater height in the sky.
2.	Humidity determines whether the air is dry or damp.	Clouds depend on the process of condensation for their formation.
3.	Humidity can be classified into two types: Absolute Humidity and Relative Humidity.	Clouds are divided into different types: High clouds (ex. Cirrus), Medium clouds (ex. Altocumulus), Low clouds (ex. Strato-cumulus) and Cumulonimbus clouds

Q. 3. B. Differentiate between:

Relative humidity and Absolute humidity

Answer :

S.no.	Relative Humidity	Absolute Humidity
1.	It is expressed as a percentage of the amount of water vapour present in the air to the vapour holding capacity of the atmosphere at the same temperature and same volume.	It is the measure of water vapour in 1 cu.m. of air
2.	It is affected by geographic location and temperature of a particular region.	It is influenced by the land and water distribution on earth as well as seasonal changes.
3.	Relative humidity is expressed in a percentage.	Absolute Humidity is expressed in grams or kilograms per cubic metre.
4.	It is subject to change with a change in the amount of water vapour	It remains relatively constant. It contains an absolute measure of moisture in the atmosphere.

Q. 3. C. Differentiate between:

Cumulus clouds and cumulonimbus clouds

Answer :

S.no.	Cumulus clouds	Cumulonimbus clouds
1.	Cumulus clouds are formed due to the vertical flow of air.	When the vertical flow of the air increases, the cumulus clouds gradually transform into Cumulonimbus clouds.
2.	Cumulus clouds appear huge and are dome-shaped.	Cumulonimbus clouds appear like huge mountains and have an anvil shaped top portion.
3.	These clouds are grey in colour and are responsible for fair and pleasant weather.	These are dark coloured clouds which cause thunder and lightening.
4.	These clouds are also called 'fair weather clouds.	These clouds are also known as 'thunderheads'.

Q. 4. A. Answer the following questions:

Why is the air in a region dry?

Answer : The air in a region is dry primarily due to low moisture content. Moreover, distance from the sea, the high speed of the wind and increased rate of evaporation contribute to a decrease in the moisture holding capacity of the atmosphere.

For example, in Rajasthan, the air is dry and hot leading to the low moisture content in the air.

Q. 4. B. Answer the following questions:

How is humidity measured?

Answer : Humidity is measured in grams per cubic metres. The air is considered to be dry when the humidity in the air is 0 gm/cu.m. Whereas the air is saturated when the humidity at 30°C temperature is 37gms/cu.m.

Q. 4. C. Answer the following questions:

What are the prerequisites for condensation?

Answer : Condensation is a process by which water vapour is converted into water. The following are the prerequisites for condensation to take place:

1. Firstly, the presence of water vapour in the atmosphere is required for condensation to occur.

2. Secondly, low temperature is important as it decreases the moisture holding capacity of the air which leads to condensation.

3. Finally, fine particles such as dust, salt etc. need to be present around which condensation happens.

Q. 4. D. Answer the following questions:

What is a cloud? Write its types.

Answer : A cloud is a collection of water vapour and fine particles at a greater height in the sky formed due to the process of condensation.

According to international classification, clouds are divided into three main types based on their altitudes above sea level:

1. High clouds: The clouds which are at the height of 7000 to 14000m and contain ice particles are known as high clouds. They include Cirrus, Cirrocumulus and Cirrostratus clouds.

2. Medium clouds: These clouds have a general altitude of 2000 to 7000 metres. They comprise alto-stratus and alto-cumulus clouds.

3. Low clouds: These are at an altitude of fewer than 2000 metres. They are divided into five types.

a) Strato-cumulus

b) Stratus Clouds

c) Nimbostratus clouds

d) Cumulus clouds

e) Cumulonimbus clouds.

Q. 4. E. Answer the following questions:

Which type of clouds gives rain?

Answer : A cloud is a collection of water vapour, and fine particles at a greater height in the sky formed due to the process of condensation.

Nimbostratus clouds lead to uninterrupted precipitation and even snowfall. These low-level clouds have thick layers and are grey in colour which blocks out the sun.

Q. 4. F. Answer the following questions:

On what does the percentage of relative humidity depend?

Answer : Relative humidity is determined by the amount of water vapour in the atmosphere (called absolute humidity) in proportion to the vapour holding capacity at the same temperature and same volume.

$$\text{Relative humidity (\%)} = \frac{\text{Absolute} - \text{humidity (\%)}}{\text{Vapour holding capacity}} \times 100$$

Relative humidity is inversely proportional to the temperature. When the temperature decreases, Relative humidity increases. It is low when the temperature is high.

Therefore, Relative humidity is usually higher in mornings and nights but lower in afternoons due to the increase in temperature.

Q. 5. A. Give geographical reasons:

Clouds float in the sky.

Answer : Due to the process of condensation, fine water and ice particles float in the air at higher elevation as they are light in weight. These particles gather around to form clouds. Clouds float in the sky due to the vertical flow of the air.

Q. 5. B. Give geographical reasons:

The proportion of relative humidity changes according to altitude.

Answer : Elative humidity changes with a change in the temperature and altitude of a particular region. As the altitude of a place increases, the air gets thin and the moisture holding capacity of the air decreases (low atmospheric pressure) which results in reduced humidity.

Q. 5. C. Give geographical reasons:

Air becomes saturated.

Answer : When the water evaporates from the earth, it is released into the air. The air has a maximum ability to hold moisture in a certain quantity and at a particular temperature only. When this ability is reached, and relative humidity reaches 100%, the air is considered to have reached its saturation point.

In other words, when the proportion of water vapour and the vapour holding capacity is equal, the air is said to be saturated.

Q. 5. D. Give geographical reasons:

Cumulus clouds change into cumulonimbus clouds.

Answer : Cumulus and cumulonimbus clouds are low clouds. These are at an altitude of fewer than 2000 metres. Cumulus clouds are responsible for pleasant weather. Due to an increase in the vertical flow of air, cumulus clouds get turned into cumulonimbus clouds which leads to rain.

Q. 6. A. Solve the following:

When the temperature of the air is 30° C, its vapour-holding capacity is 30.37 gms/ cu. m. If absolute humidity is 18 gms / cu. m. then what would be the relative humidity?

Answer : Given:

Temperature- 30°C

Vapour holding capacity- 30.37 gms/cu.m.

Absolute Humidity- 18 gms/cu.m.

$$\text{Relative humidity} = \frac{\text{Absolute} - \text{humidity}\,(\%)}{\text{Vapour holding capacity}} \times 100$$

$$= \frac{18 \times 100}{30.37} = 59.27\%$$

Q. 6. B. Solve the following:

What would be the absolute humidity of air if 1 cu. m. air contains 4.08 gms of vapour at 0°C temperature?

Answer : Absolute humidity is defined as “the amount of water vapour in 1 cu. m. of air.”

Given, water vapour= 4.08 gms

Volume of air= 1 cu. m.

Q. 7. Collect the weather-related information from newspapers for the month of July. Relate the difference in the maximum and minimum temperatures with humidity.

Answer : For the month of July 2018 in Mumbai, high temperatures were usually around 31°C, hardly falling below 27°C or exceeding 33°C.

While low temperatures for the month were around 27°C, hardly falling below 23°C or rising above 27°C.

Table 1.1 shows the high and low temperatures with their respective average temperatures and humidity percentage levels for the month of July.

July	High Temperatures	Average High Temperatures	Low Temperatures	Average Low Temperatures	Average Humidity levels (in %)
1	33°C	30°C	24°C	25°C	70.49%
8	27°C	30°C	23°C	25°C	94.07%
15	29°C	29°C	26°C	25°C	91.15%
22	30°C	29°C	26°C	24°C	75.49%
29	31°C	29°C	27°C	24°C	81.87%

According to the weather reports of Mumbai, July 2018 was the most humid month of the year.

Activity

Q. 1. Make a table showing the types of clouds. Use various photographs.

Answer :

No.	Types of Clouds	Altitude (in metres)	Classification	Pictures
1.	Cirrus	7000 to 14000	High	
2.	cirrostratus			
3.	cirrocumulus			
4.	Alto-Stratus	2000 to 7000	Middle	
5.	Alto-cumulus			

6.	Strato-cumulus	Less than 2000	Low	
7.	Stratus			
8.	Nimbostratus			
9.	Cumulus	The extent could be variable	Vertical development	
10.	Cumulonimbus			

Intext Questions

Q. 1. Look at the pictures shown in figure 3.1. Discuss the weather conditions shown in these pictures in the class and write the descriptions in the boxes below

Answer : In the first picture, the day is hot, and the people are predicting that a sandstorm is on the rise.

In the second picture, the day is very hot, it must be a summer noon and the people are indeed feeling very hot. Also, the weather conditions are very humid, the humidity is high in the air and hence it is very sweaty.

In the third picture, the day is very cold, mostly the winter season in on the go over there. To prevent the children from catching cold, the mother advices them to wear the sweater and play.

In the above discussion, the words hot, moist, cool etc. show the condition of the air. They relate to the content of the moisture in the air.

Q. 2. During winters, when you exhale on the glass of your mirror, what happens. If you try to do this in summer why doesn't this happen?

Answer : For precipitation to occur, the conditions should be humid and the moisture content in the air must be high.

In winters, the air that we exhale, is hotter than the air that is present surrounding the window glass. Hence, when the hot air from our mouth touches the cool surface of the window glass, it precipitates to form water droplets.

In summers, the air that we exhale, is cooler than the air that is present surrounding the window glass. Hence, when the cool air from the mouth touched the hot surface of the window, no precipitation occurs and no water droplets are formed.

Precipitation usually occurs only when hot air touches cooler surfaces.

Q. 3. The vapour holding capacity of 1 cu. m. of air in various temperatures is given here. Calculate the difference in the capacities by observing the table.

Temperature of the air(0 C)	Vapour holding capacity (gm/ cu.m.	Difference in the capacities (gm/ cu.m)
-5	3.26	---
0	4.85	1.59
5	6.80	
10	9.40	
15	12.83	
20	17.30	
30	30.37	
40	51.12	

Answer :

Temperature of the air(0 C)	Vapour holding capacity (gm/ cu.m.	Difference in the capacities (gm/ cu.m)
-5	3.26	---
0	4.85	1.59
5	6.80	1.95
10	9.40	2.6
15	12.83	3.43
20	17.30	4.47
30	30.37	13.07
40	51.12	20.75

Q. 4. What will happen if the temperature of saturated air at 20° C drops down to 10° C abruptly?

Answer : With the decrease in temperature from 20 degree C to 10 degree C there will be a relative fall in humidity. With the change in temperature the humidity content of the air changes.

The cold air is capable of holding less water content than that of warmer air even when fully saturated. The temperature fall will make the air lose its moisture content and reduce the humidity index.

Saturation level is that point where no further addition can be made to the present state.

Q. 5. Look at figure 3.8 first. Now go out of the classroom in the ground. Observe the clouds in the sky. Discuss the following points in the class and write answers in your notebook.

• What was the colour and size of the clouds?

• What type of clouds did you observe? (Take help from fig 3.8)

• Can these clouds bring rain? Give reasons.

Answer : • The colour of the clouds is white and they are not huge in size.

• The altitude is less, so I think they might be cumulonimbus clouds or cumulus clouds

• Yes, these clouds can bring continuous rainfall. The low altitude clouds consist of five types of clouds. They are also called as Strato-cumulus clouds. They have layers. Their colour is white to earthy. Round clusters of clouds can be here. Stratus clouds also have layers. They are ash coloured and their base is uniform. Nimbo-stratus has thick layers. They are grey-ash in colour and cause continuous rainfall and even snowfall.