

(Q3) Define atmosphere. Discuss the origin of North lights.

Atmosphere:

In general atmosphere is blanket of gases that surround the earth and extend to many miles. However, NASA (National Aeronautics and Space Administration) and NOAA (National Oceanic and Atmospheric Administration) define as follows; respectively.

"The atmosphere is a layer of gas and suspended solids extending from the Earth's surface up many thousands of miles, becoming increasingly thinner with distance but always held by the Earth's gravitational pull."

- (Reference: NOAA)

"The atmosphere is a gaseous envelope surrounding and protecting our planet from the intense radiation of the Sun and serves as a key interface between the terrestrial and ocean cycles"

- (Source: NASA)

North Lights:

North lights are also known as Aurora Borealis. It is a natural light display phenomenon in which particles from solar wind electrically charged particles

interact with Earth's magnetic field and upper atmosphere of Earth. It can be seen from late August to mid of the April, in the north pole of the Earth.

Date: _____

Origin of North Lights:

The solar wind that is formed from the dark spot area of the outer surface (i.e. corona) is blown from the sun, having charged particles such as electron and protons, travelled toward earth with a velocity of 400 km/s. It is reached near the earth within two days time. The particles from the solar wind enter in the north and south pole region under the influence of earth magnetic field. Here, electron and protons react with gases in the atmosphere of north and south pole, which gives rise to formation of photon due to electronic interaction of protons and electrons with gases. And, light formation is seen which is known as aurora or north light (Aurora Borealis).

Flare of sun / solar wind



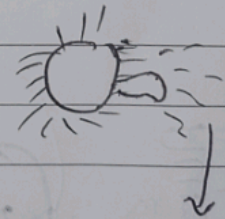
hit air molecules in the north and south atmosphere



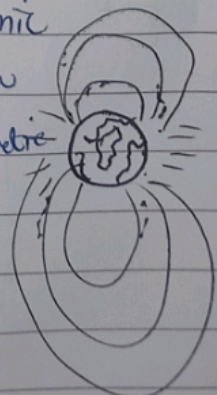
molecules are excited



molecules give off light

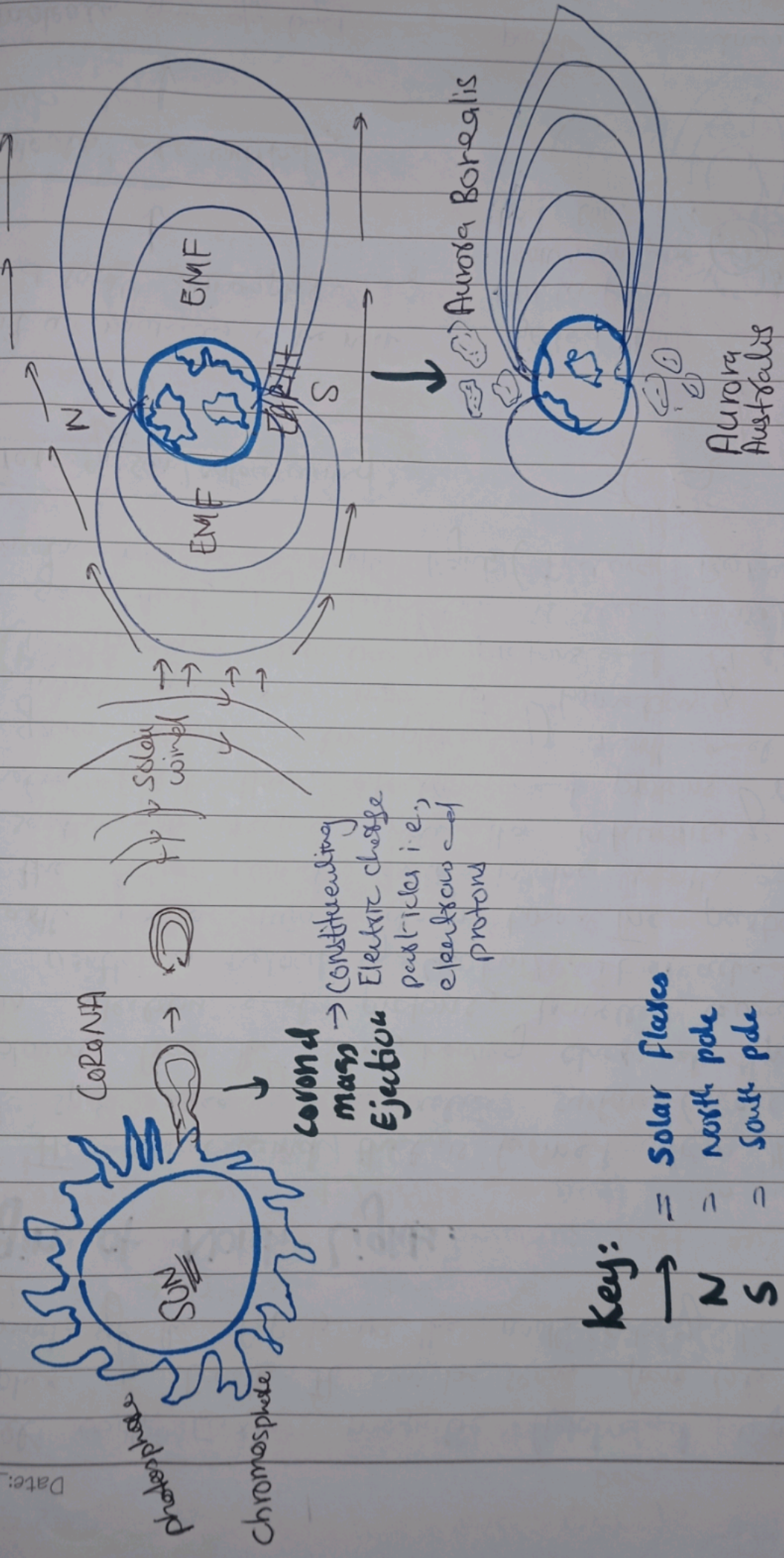


Ejected Atomic Particles follow earth's magnetic field lines



particles cause atmospheric gases to emit light near poles

Origin of North light / Auroras formation



- Key:**
- = Solar Flares
 - N = North pole
 - S = South pole
 - EMF = Earth's Magnetic Field

Date: _____

Q.2) What is the future of air quality index? Discuss PM, VOC, NOx as air pollutants.

Air Quality Index

Air quality index is the parameter to measure that how much is the air is polluted with air pollutants. The higher the AQI value, the greater the level of air pollution and the greater the health concern.

Future of Air Quality Index

The future of air quality index seems to be bleak because according to WHO (World Health Organisation) reports, ~~that~~

There are more than 400 cities which are severely polluted and having worst air quality.

The future of Air Quality Index cannot be promising until grave pragmatic measures are to be taken at individual, domestic, and global level. No promising outcome is observed from ~~past~~ Kyoto protocol and Montreal protocol. ~~The~~ Air quality means the pollutants such as sulphur dioxide, nitrogen oxide, carbon dioxide and volatile organic compounds. These pollutants are increasing day by day by various human activities and massive consumption of plastic or other such machinery which releases VOCs. So that is why the future of Air Quality Index is dismal.

PM, VOC, NO_x as Air Pollutants:

PM, VOC, NO_x stand for Particulate Matter, Volatile Organic Compounds, and Nitrogen Oxides. These all are air pollutants which are emitted from combustion of fossil fuels in vehicles, power plants, wildfires, and industrial processes.

The following tables discusses PM, VOC and NO_x

Pollutants	Description	Health Effects	Environmental Effects
Particulate Matter (PM)	Tiny solid or liquid particles suspended in the air, including dust, soot, and smoke.	Respiratory and cardiovascular issues, aggravates asthma, and lung damage.	Reduces visibility (haze), changing the nutrient balance and affecting the diversity of ecosystems.
Volatile Organic Compounds (VOCs)	Organic chemicals that easily evaporate at room temperature.	Irritation of eyes, nose, and throat; headaches; and long-term exposure may lead to cancer.	Contribute to the formation of ground-level ozone and smog, harming ecosystems.
Nitrogen Oxides (NO _x)	A group of gases composed of nitrogen and oxygen, primarily NO and NO ₂ .	Respiratory problems, aggravates lung diseases like asthma, and reduces lung function.	Leads to the formation of acid rain, ground-level ozone, and contribute to eutrophication in water bodies.

(Q1) What is physical significance of hydrological cycle? Discuss the process briefly.

Physical Significance of Hydrological Cycle:

Followings are the example of physical significance of hydrological cycle.

Balancing of Aquatic System:

Hydrological cycle maintains the balance of the aquatic ecosystem.

Supporting Life:

The water cycle ensures the availability of water among all organisms, including plants, humans, and all many other organisms.

Regulating Climate:

Water cycle regulates weather patterns and temperature.

Facilitating Agriculture:

The hydrological cycle also plays a vital role in agriculture. It

provides the necessary water for crops to grow and helps to distribute nutrients in the soil.

Purifying Water

As water undergoes infiltration, the ground purifies it of pollutants and contaminants.

Cycling of Elements I

Rainfall and surface runoff play important roles in the cycling of various elements, also known as biogeochemical cycle.

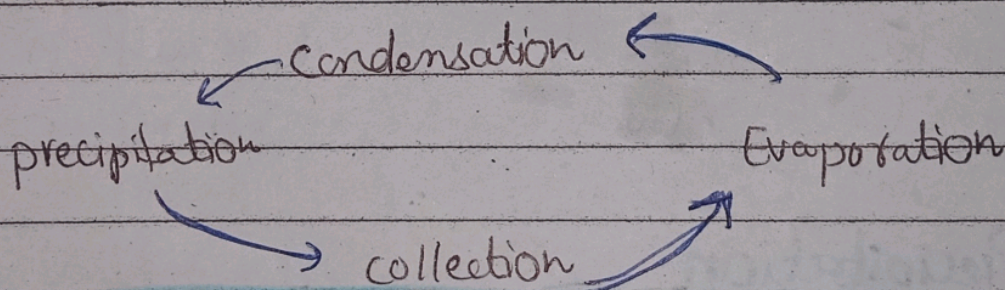
Helping in formation of Soil:

When it rains, it carries weathered rocks, particles and runoff along the soil and water bodies surface, which ultimately results in soil formation.

Hydrological Process:

Water is one of the fundamental natural resources on planet Earth. Around 71% of the earth's surface is covered by water. Hence, water cannot be created or destroyed.

"The hydrological cycle is a bi-geological cycle that included a continuous circulation or flow of water through different phases of the ecosystem"



Flow chart diagram of hydrological process

Phases of Hydrological Cycle:

The hydrological cycle process mainly includes four phases. These are;

- (i) Evaporation
- (ii) condensation
- (iii) precipitation
- (iv) Deposition

(i) Evaporation :

This is the very primary stage of the water cycle. In this process, water from the ocean and plants, in the form of transpiration, changes into gaseous/vapour form due to heating up effect of the sun. In this way water evaporates into the atmosphere.

(ii) Condensation :

As water (in the form of gas) rises higher in the atmosphere, it starts to cool and become a liquid again. This process is called condensation. When a large amount of water vapor condenses, it results in the formation of clouds.

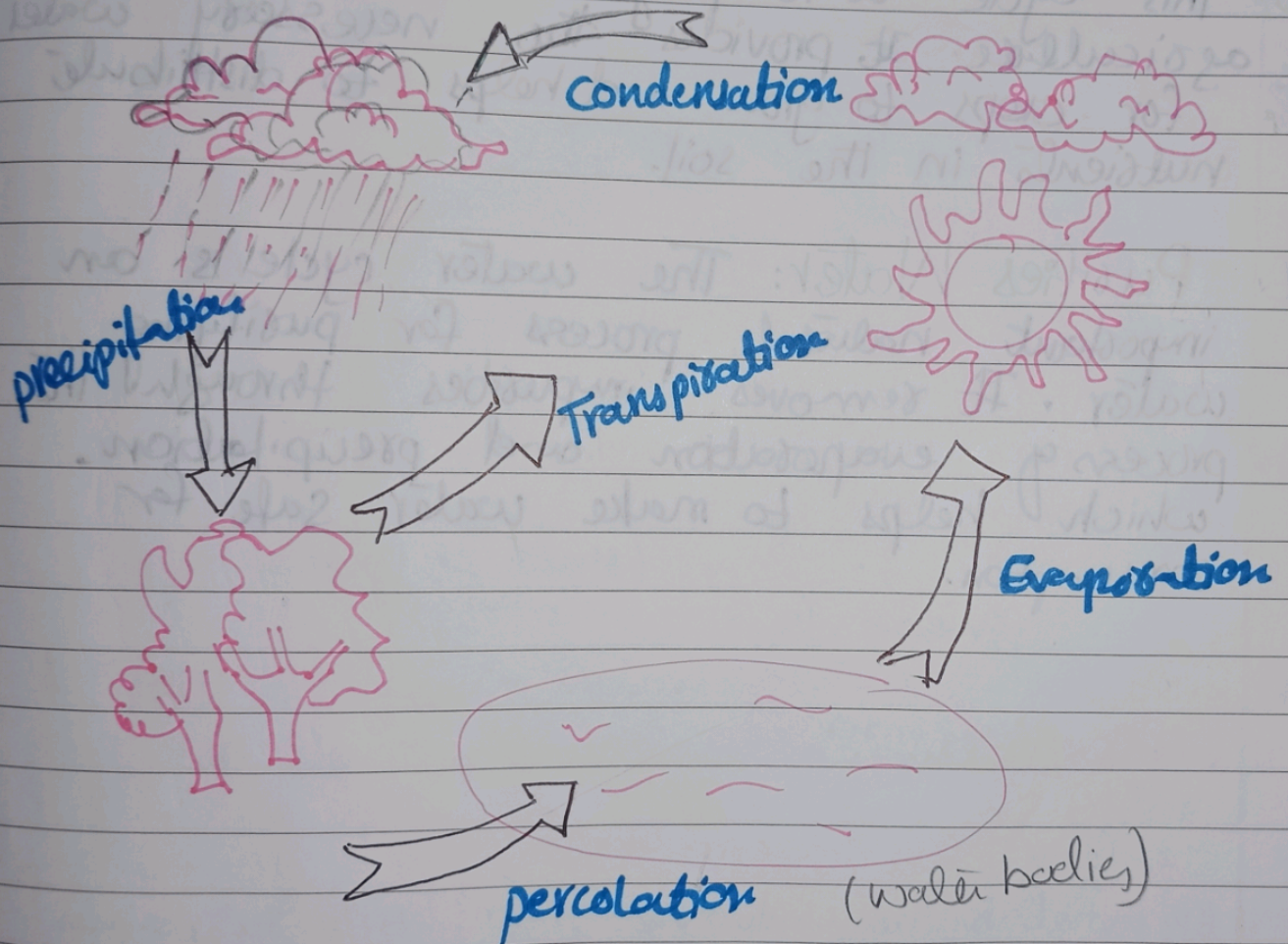
(iii) Precipitation :

When the water in the clouds gets too heavy, the water falls back to the earth. This is called precipitation. Some examples of precipitation are rain, snow, hail, and sleet.

(iv) Deposition :

The deposition is the last stage of the water cycle in which water is deposited in various water bodies, including lakes, rivers, oceans, ponds or in lands which turn into groundwater.

Thus, water cycle repeats itself again and again.



The Water Cycle