SNS COLLEGE OF TECHNOLOGY

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Coimbatore – 35

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DEPARTMENT OF AGRICULTURAL ENGINEERING

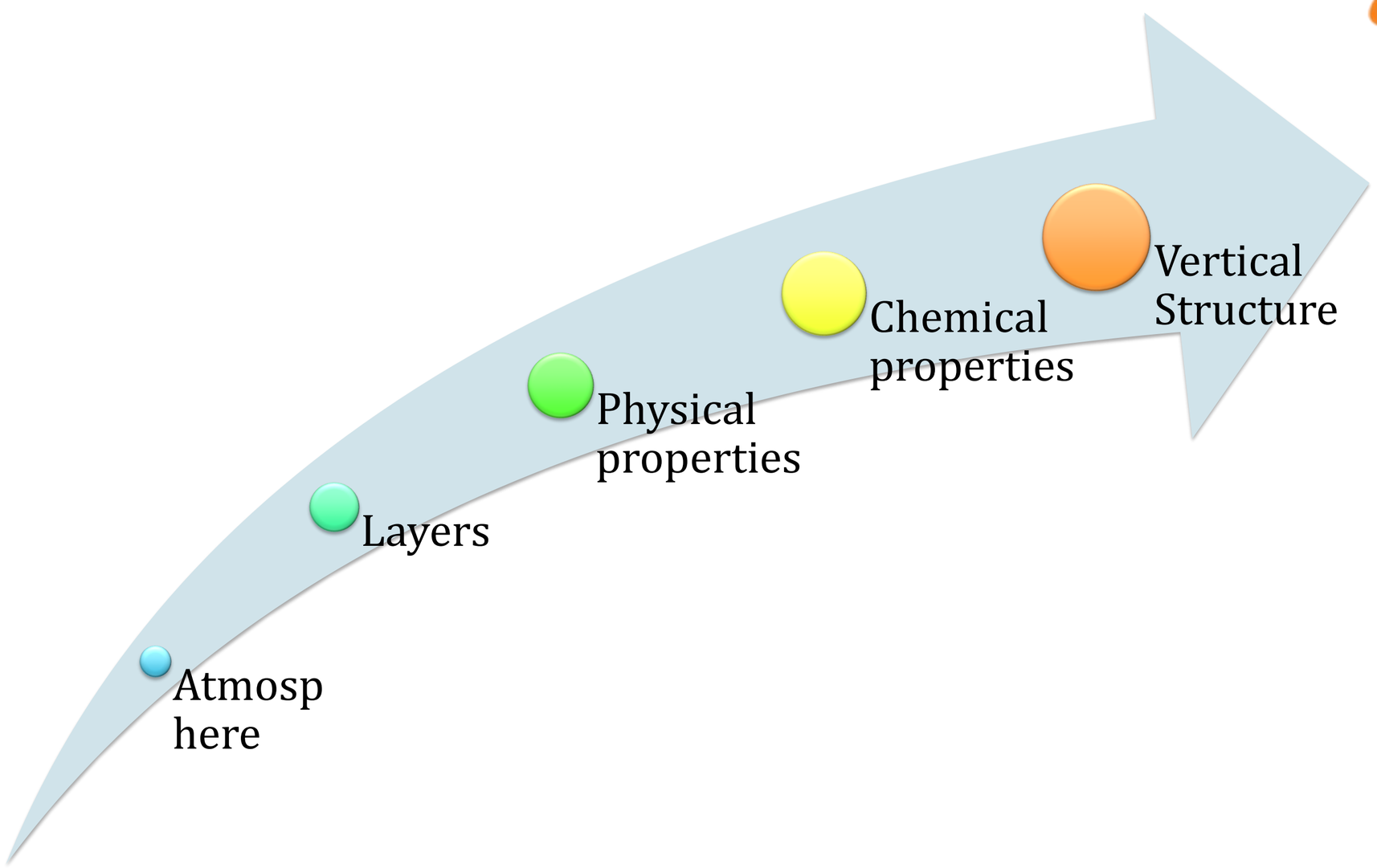
19AGE401 – CLIMATE CHANGE AND ADAPTATION

IV – YEAR VII SEMESTER

UNIT 2 – ATMOSPHERE AND ITS COMPONENTS

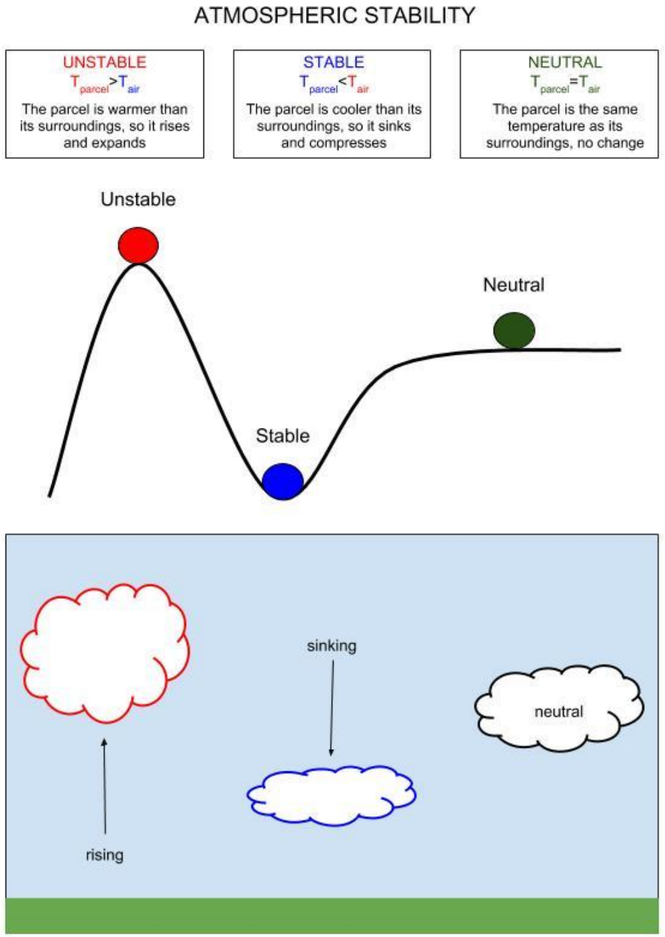
TOPIC 5 – ATMOSPHERIC STABILITY

Last Class Review

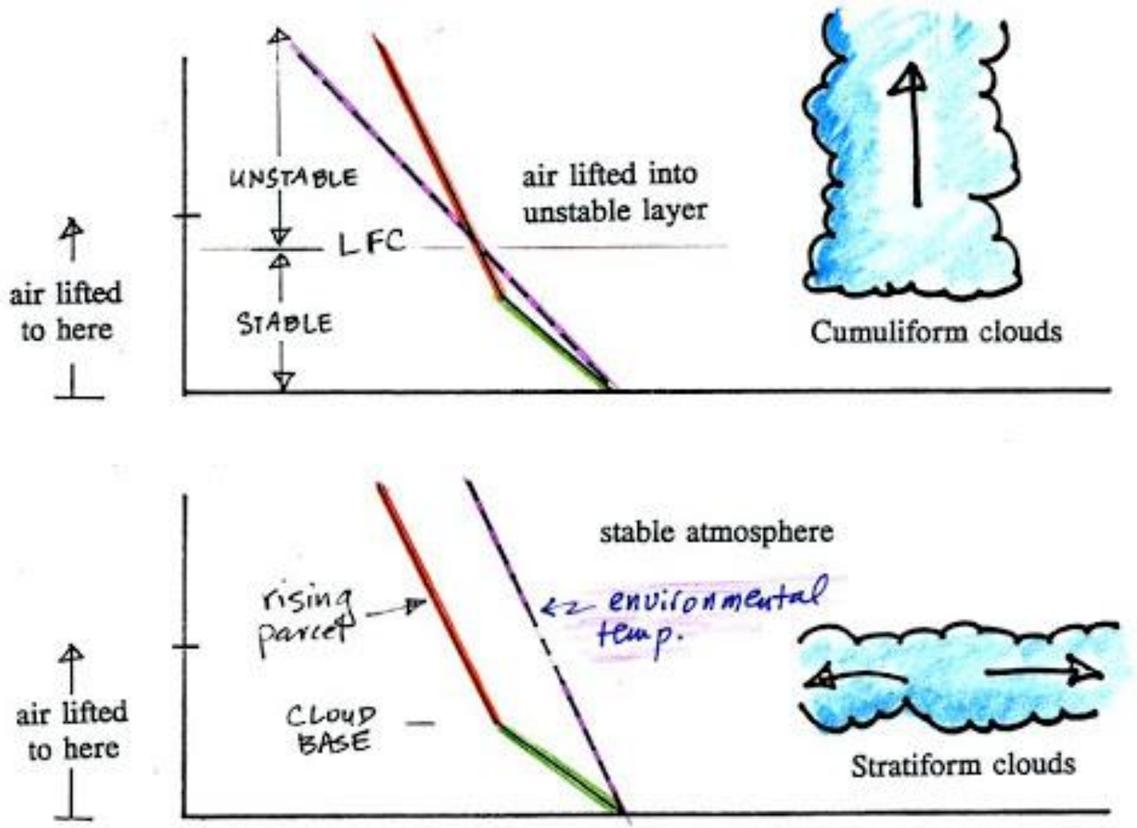


Atmospheric Stability

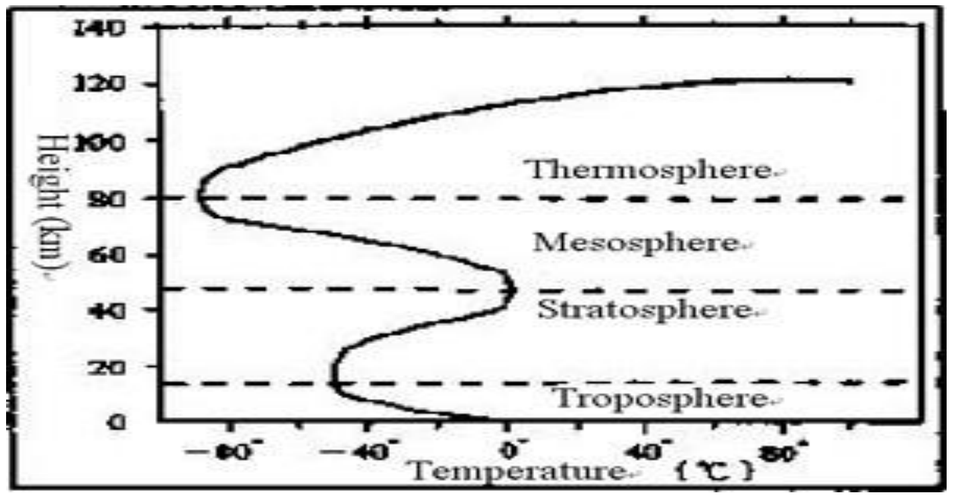
Atmospheric stability determines whether or not air will rise and cause storms, sink and cause clear skies, or essentially do nothing. Stability is dependent upon the Dry and Saturated Adiabatic Lapse Rates and the Environmental Lapse Rate.



Atmospheric Stability



Vertical temperature profile of the atmosphere



- There are several ways of classifying the different layers of the atmosphere.
- The most common classification is based on the ***vertical distribution and variations of temperature in the atmosphere.***
- In this classification, from the lowest layer to the highest layer are respectively the *troposphere, the stratosphere, the mesosphere, and finally the thermosphere.*
- The thickness and the boundary of each layer are not identical throughout the globe but vary in different time and places (Fig. 1)

Vertical temperature profile of the atmosphere

✓The troposphere is about ***12 kilometers thick on average; it is thicker in summer than in winter.***

✓The troposphere over low latitude regions is usually ***thicker than over high latitude regions***.

✓The troposphere over the equator is ***about 18 kilometers thick,*** while its thickness in the regions nearest the ***two poles is only about eight to nine kilometers.***

✓The temperature in the troposphere usually ***decreases with height at the average lapse rate of 6.5 °C per kilometer.***

✓The air in the troposphere is more ***unstable and with strong convection.***

✓Almost all the ***water vapor*** in the atmosphere exists within this layer; therefore, ***common weather phenomena such as clouds, fog, rain, and snow, occur only in this layer and more often than not in its lower part.***

Vertical temperature profile of the atmosphere

✓The stratosphere extends from ***10 kilometers to 50 - 55*** kilometers above ground.
✓Within the lower part which extends from the top of the troposphere to ***about 30-35 kilometers the temperature is almost constant, or increases slightly with height.***
✓ Above 35 kilometers the ***temperature actually increases with height at the average rate of 5 °C per kilometer***. Since almost no dust or water vapor from the land surface will reach the stratosphere, ***the air flow in this layer is steady.***
✓The bottom part of the stratosphere experiences an increase of temperature due to the fact ***that the sun's ultraviolet radiation is absorbed by the ozone layer.***
✓The region of the mesosphere is **about 50 to 80 kilometers in altitude.**
✓The temperature in this layer usually ***decreases as the height increases*** up to the top of the mesosphere where the temperature can be as low as ***- 95 °C or even lower.***
✓The composition of gases in the atmosphere from the ground to the top of the mesosphere, ***are almost identical except for water vapor and ozone.*** Therefore the region below the mesosphere is also called the ***homosphere.***

Vertical temperature profile of the atmosphere

✓In the thermosphere, over the mesopause, ***temperature rise continually with increasing height due to the direct absorption of high energy solar radiation by atmospheric gases.***

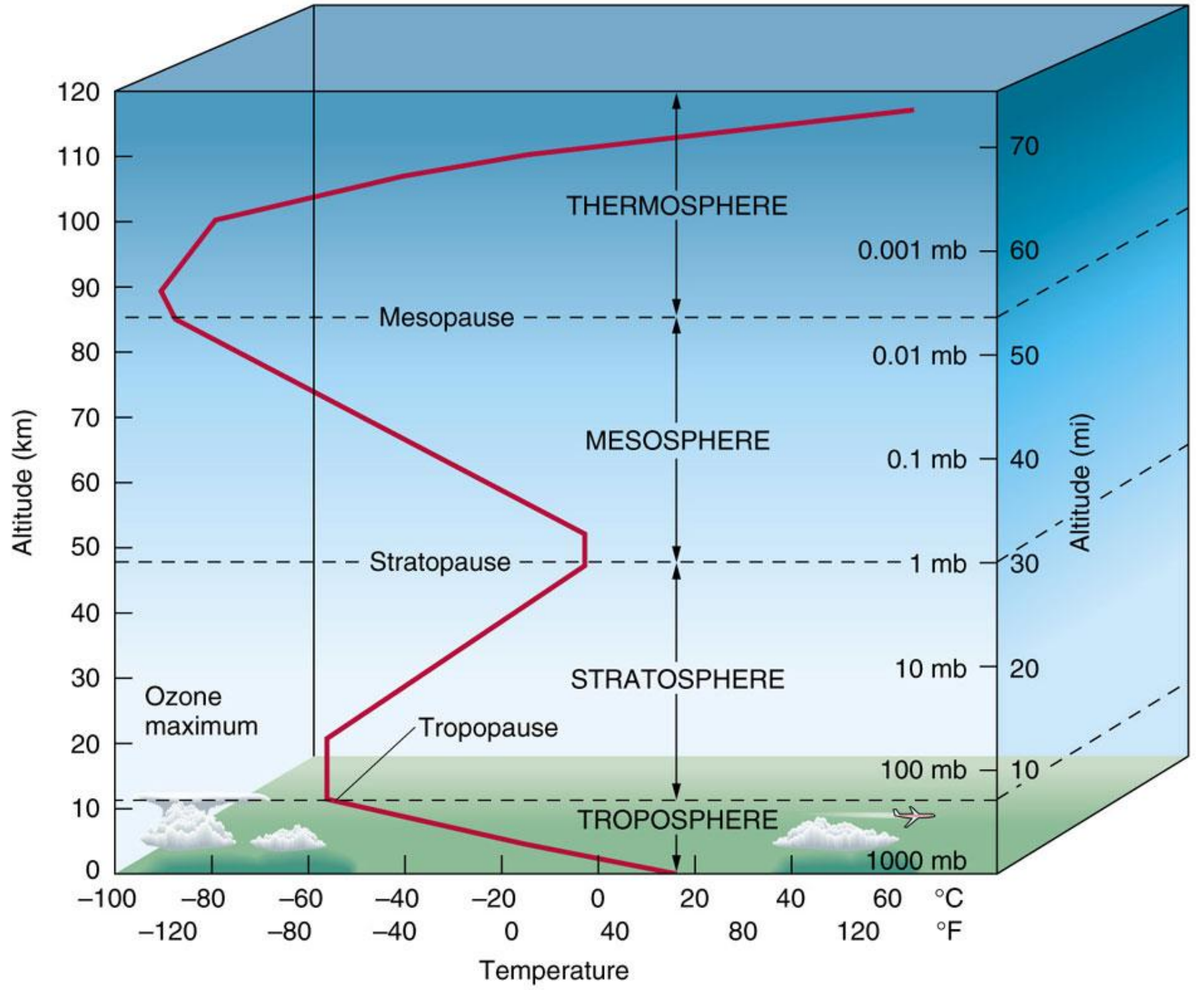
✓The thermosphere is the region above the top of mesosphere ***where the temperature begins to rise again.***

✓When sun activity is low, this layer can extend to ***400 kilometers in altitude.***

✓During high sun activity periods ***the layer can reach around 500 kilometers in altitude.***

✓The air in the lower region of the thermosphere is **extremely thin**; therefore the particles in the air can easily be ionized, resulting in profuse ***free electrons in the air.***

Vertical temperature profile of the atmosphere



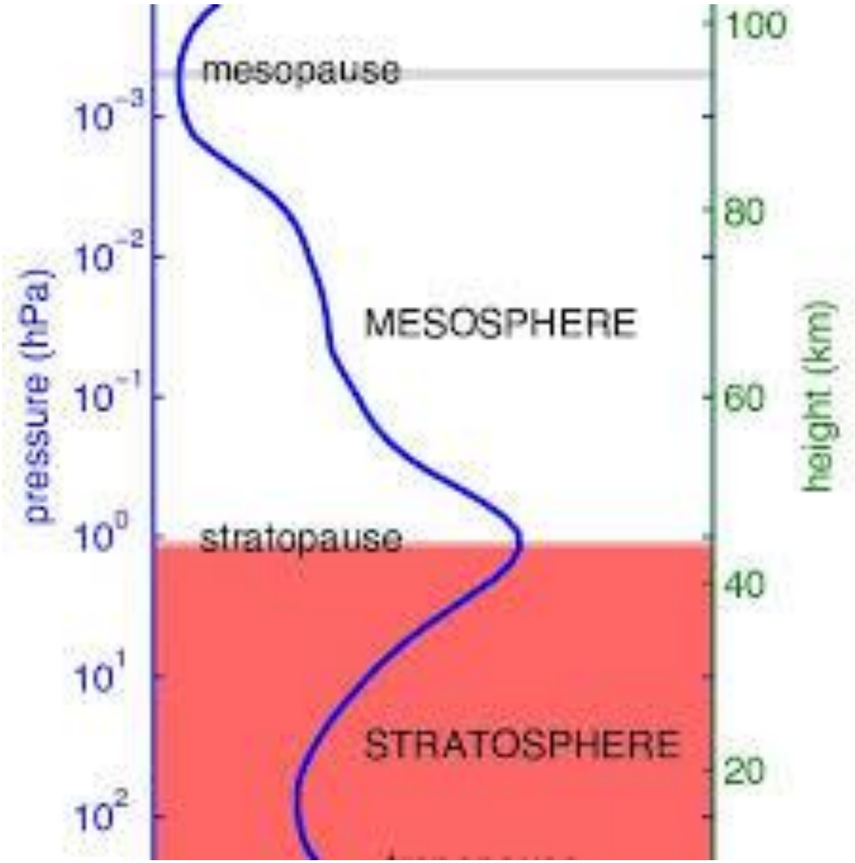
Vertical temperature profile of the atmosphere

✓Considering the composition, this layer is a part of the heterosphere, where the atmospheric compounds stratified by their molecular mass.

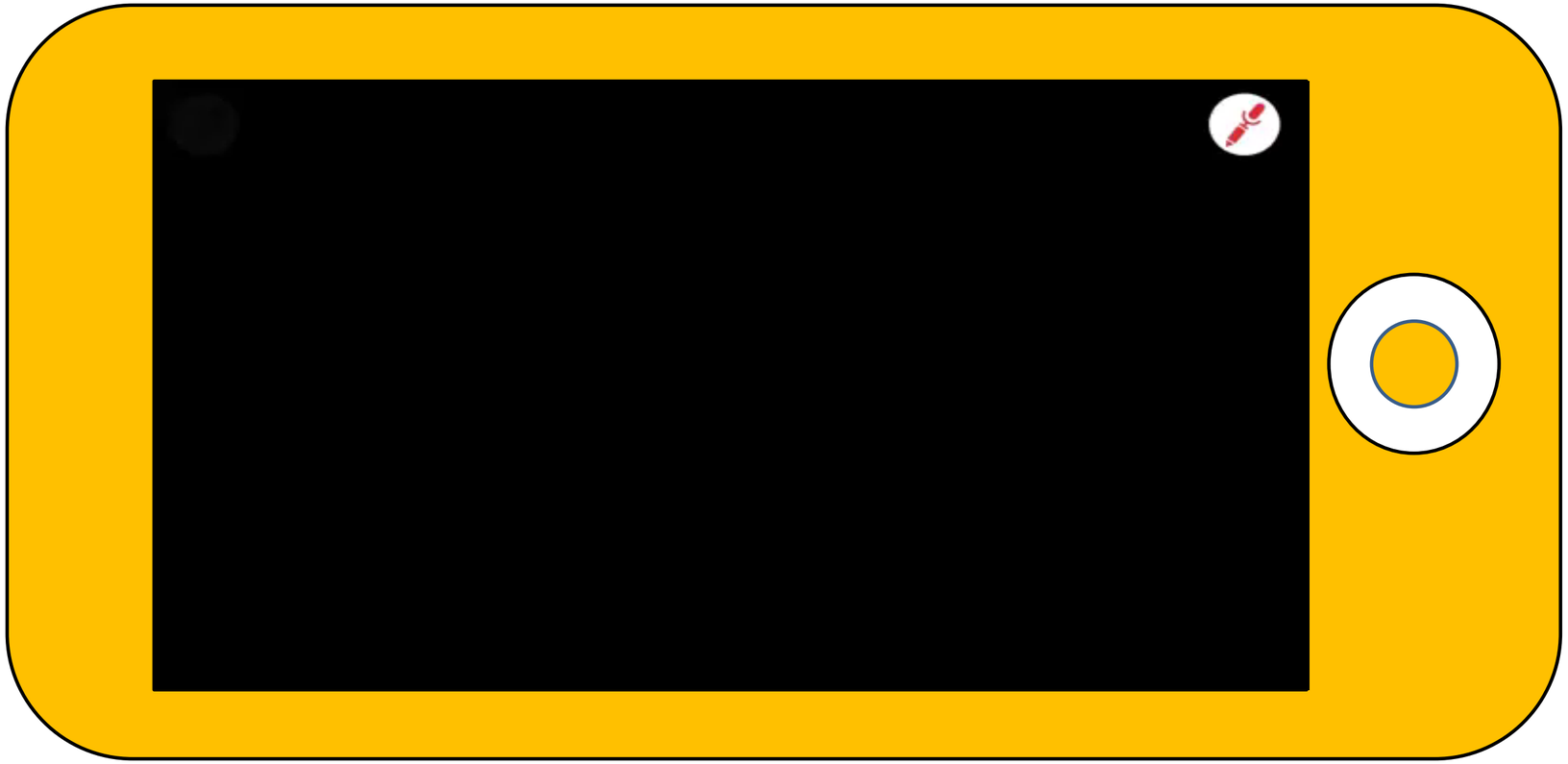
✓Therefore this layer is also called the ionosphere; it is very effective in reflecting radio waves.

✓Over about 500–1000 km above the Earth's surface (depending on solar activity), the collisions between atmospheric constituent become negligible.

✓This layer is often called as exosphere, which gradually merge into interplanetary space.



Reference Videos



See You at Next Class!!!!