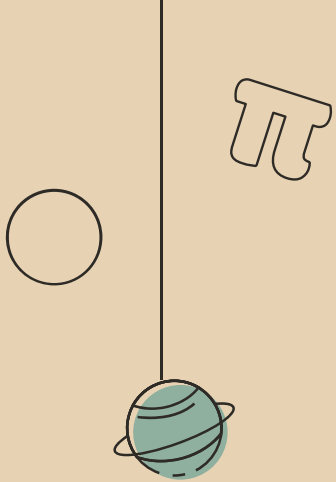
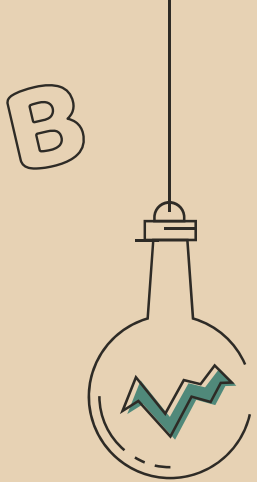




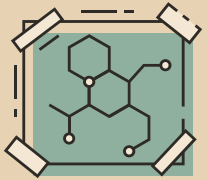
What is the atmosphere?

An Ocean of Air

“Only twenty miles above our heads is an appalling, hostile environment that would freeze us, and burn us and boil us away. And yet our enfolding layers of air protect us so completely that we don’t even realize the dangers.
We don’t just live *in* the air. We live *because of* it.”

An Ocean of Air by Gabrielle Walker

Composition of the Atmosphere



78 % Nitrogen

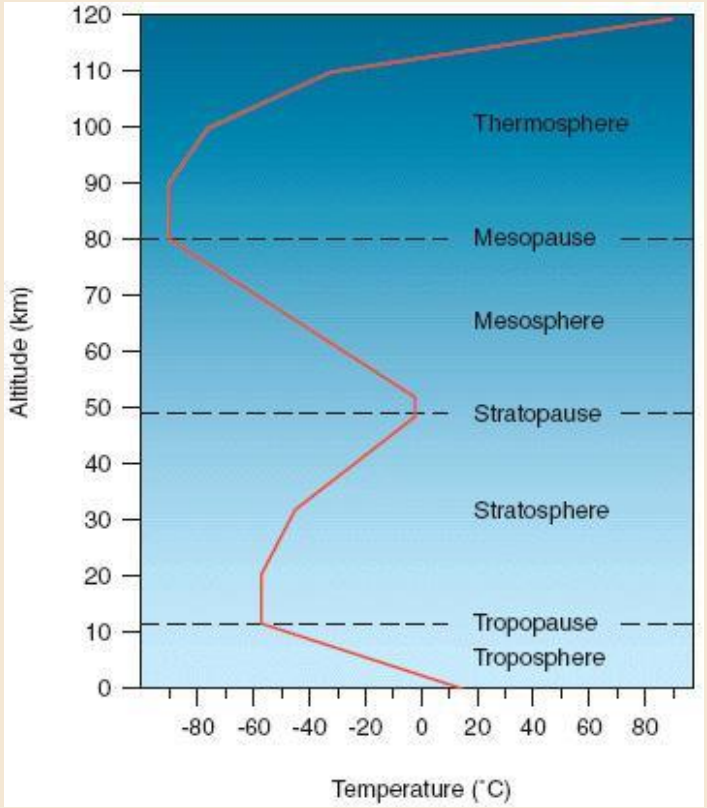
21% Oxygen

1% Other
(Argon, Carbon Dioxide, Methane, Ozone, etc.)

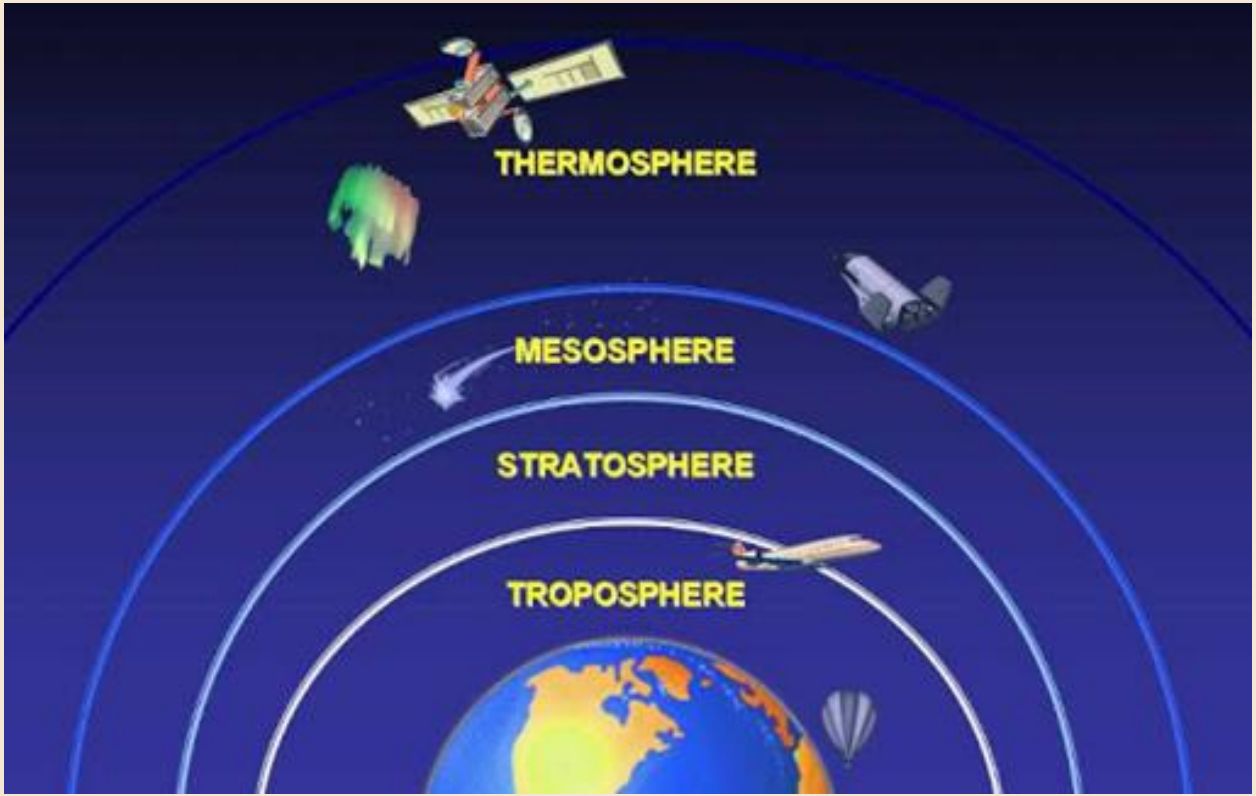
Thought Question

If the composition (78% / 21% / 1%) is the same throughout the whole atmosphere, why are there different layers?

Temperature vs Altitude



Layers of the Atmosphere




6
WHAT DOES THE ATMOSPHERE DO?

Layers Review

01

Troposphere

Colder as you go up

Less pressure as you go up

02

Stratosphere

Warmer as you go up (ozone)

Less pressure as you go up

03

Mesosphere

Colder as you go up

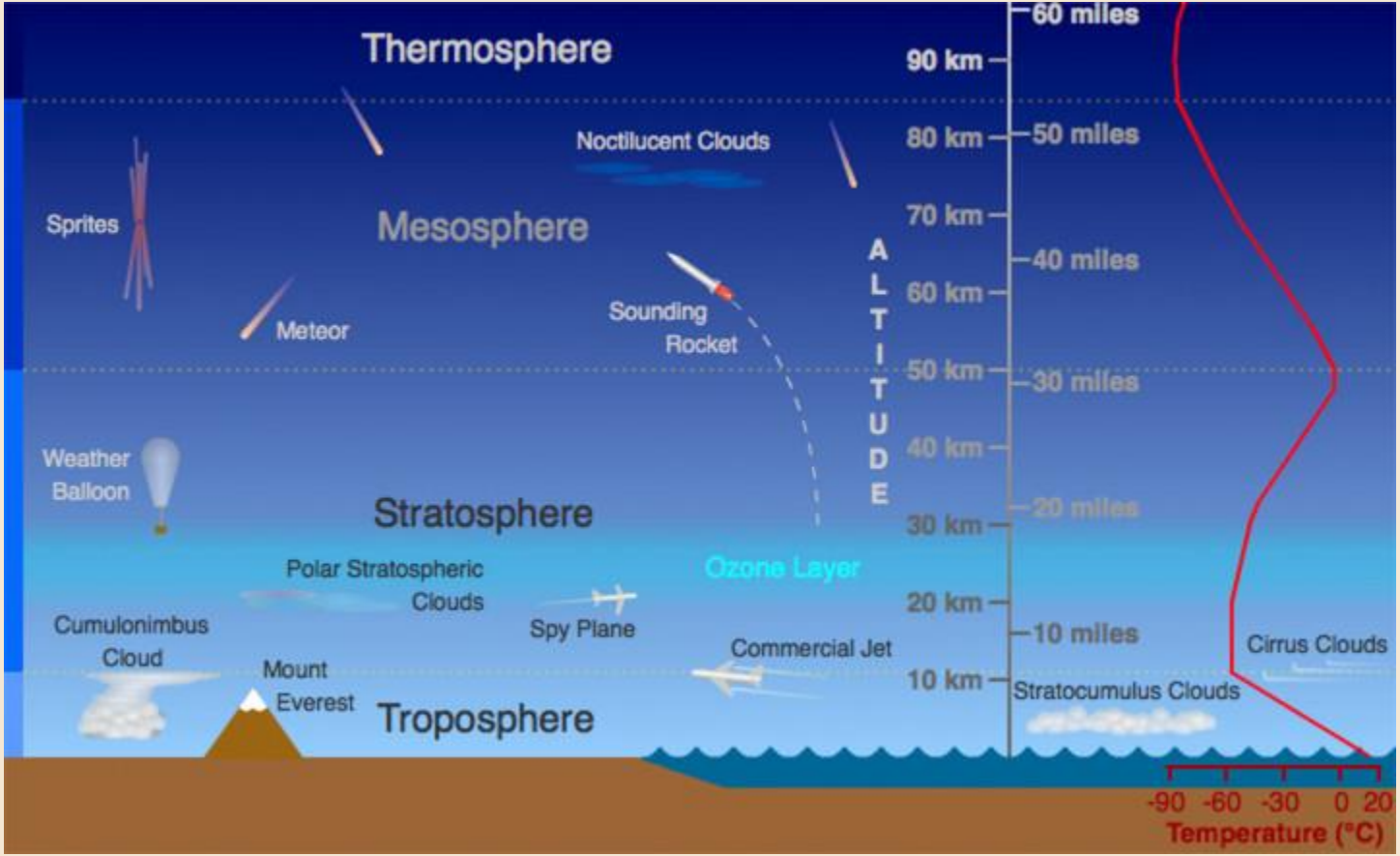
Less pressure as you go up

04

Thermosphere

‘Warmer’ as you go up

Less pressure as you go up


Thermosphere
Noctilucent Clouds
Sprites
Mesosphere
Meteor
Sounding Rocket
Weather Balloon
Stratosphere
Polar Stratospheric Clouds
Ozone Layer
Cumulonimbus Cloud
Spy Plane
Commercial Jet
Mount Everest
Troposphere
ALTITUDE
90 km
80 km
70 km
60 km
50 km
40 km
30 km
20 km
10 km
60 miles
50 miles
40 miles
30 miles
20 miles
10 miles
Cirrus Clouds
Stratocumulus Clouds
-90 -60 -30 0 20
Temperature (°C)

Layers Assignment

Choices for layers assignment

01

Layers Story

Write a story traveling through each of the layers giving details of each layer throughout

02

Layers CER

Create a detailed CER with the claim: The Earth's atmosphere is important.

03

Layers Poster

Create a poster showing all the layers and facts about each using pictures and words

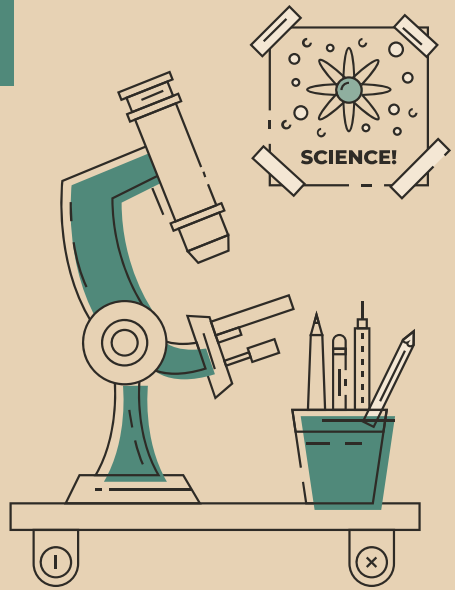
04

Layers Cartoon

Create a comic/cartoon about a meteor going through all of the layers and what it would encounter

What questions do you have about this assignment?

?



Done Early?

Check out the interactive and the free fall described in the Done Early part of the assignment.

If you have a slinky, bring it for tomorrow's class!

Key Concepts of Lesson 1

Electromagnetic Spectrum

Energy Budget

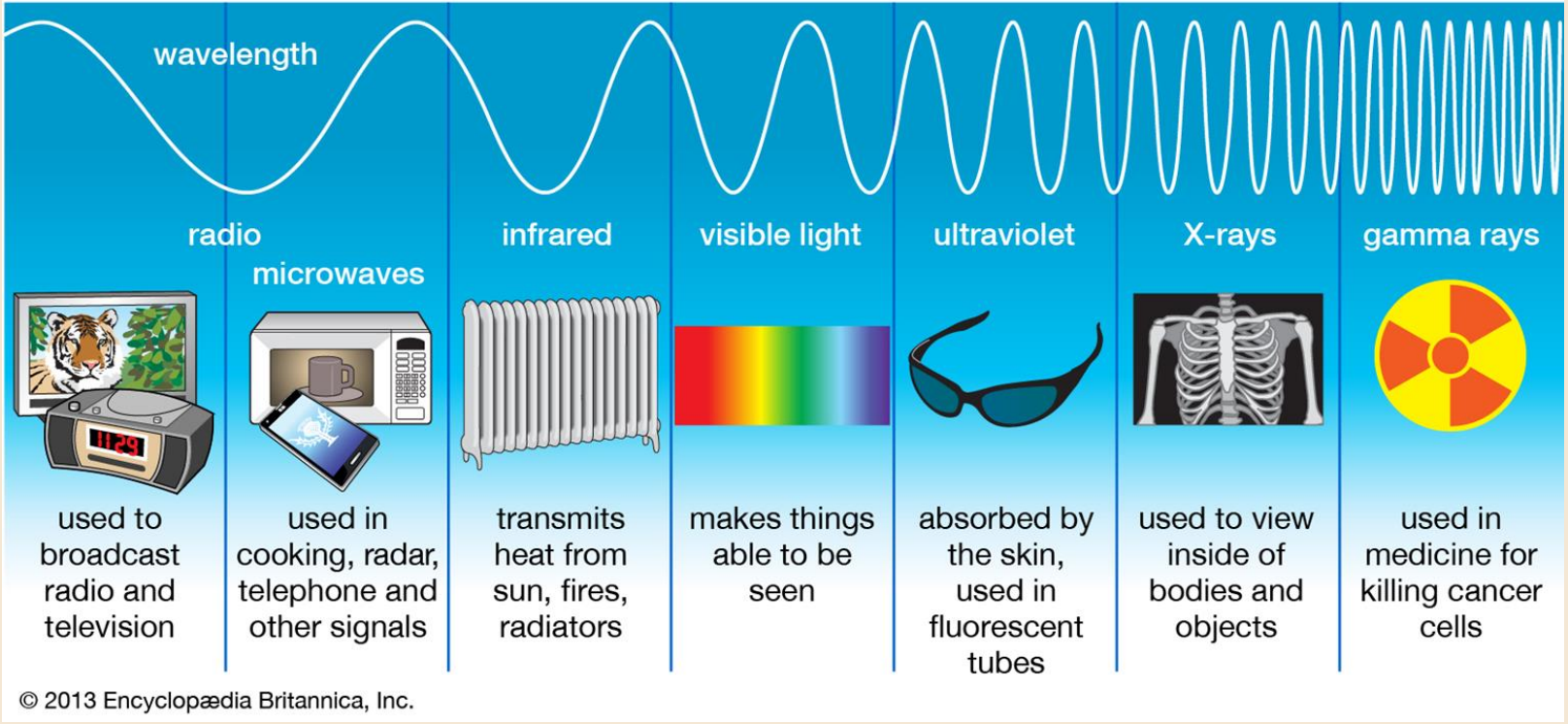
Greenhouse Effect

Conduction

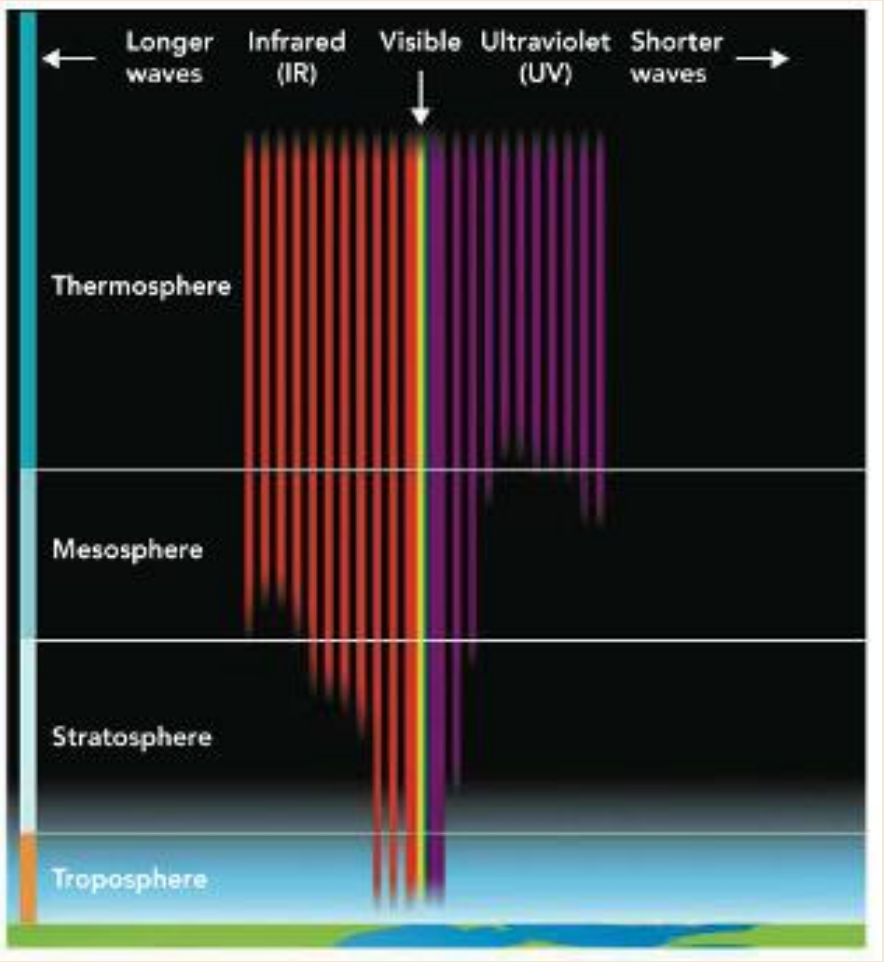
Convection

Radiation

Types of Electromagnetic Radiation



Good websites
here and here

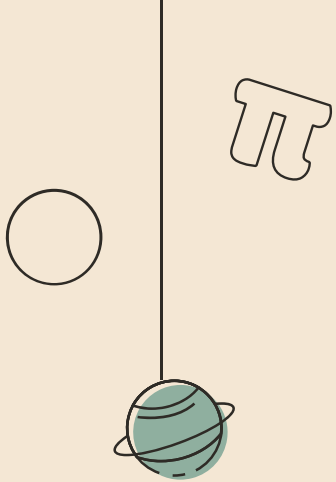

Longer waves
Infrared (IR)
Visible
Ultraviolet (UV)
Shorter waves
Thermosphere
Mesosphere
Stratosphere
Troposphere

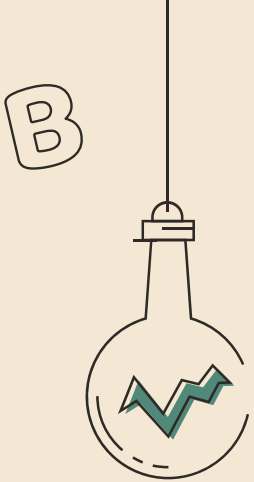
Grab your slinky!

1. Create a gamma wave
2. Create a visible light wave
3. Create a radio wave

Bottom Line

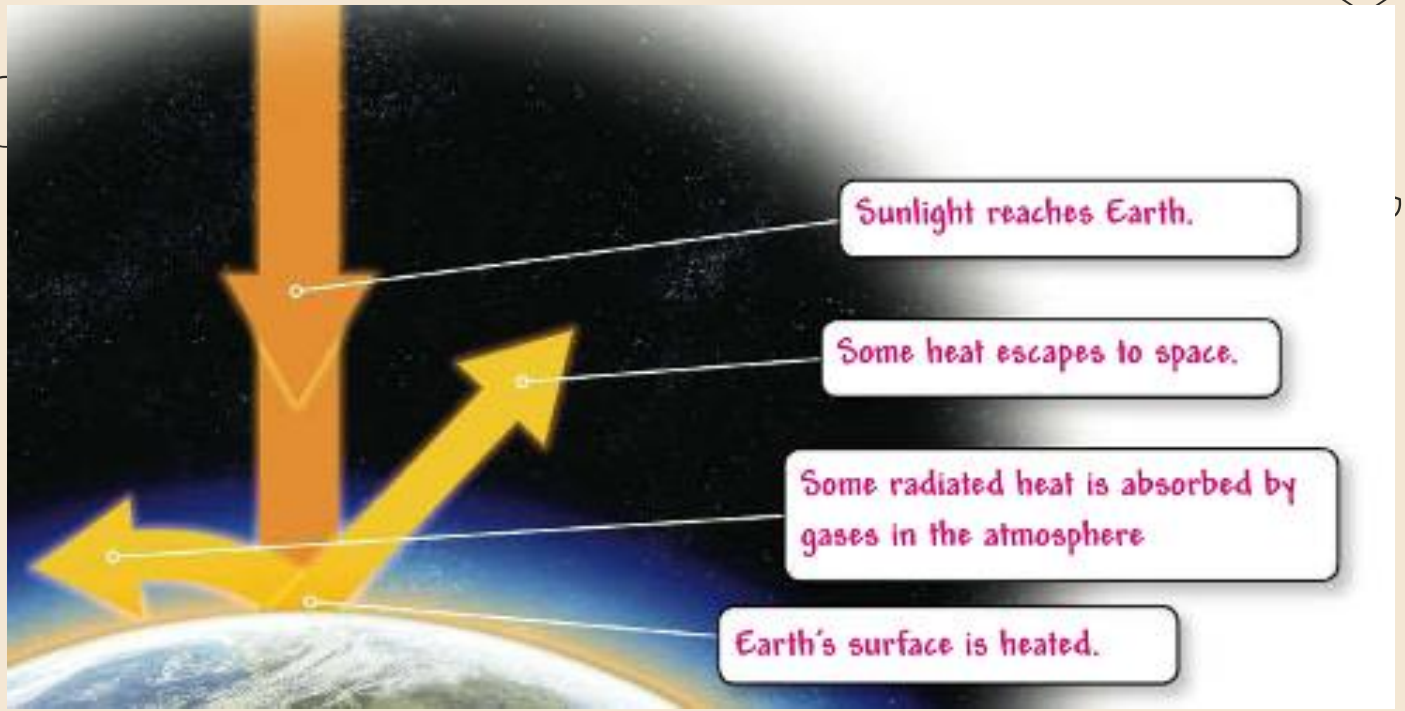
Sunscreen is important!





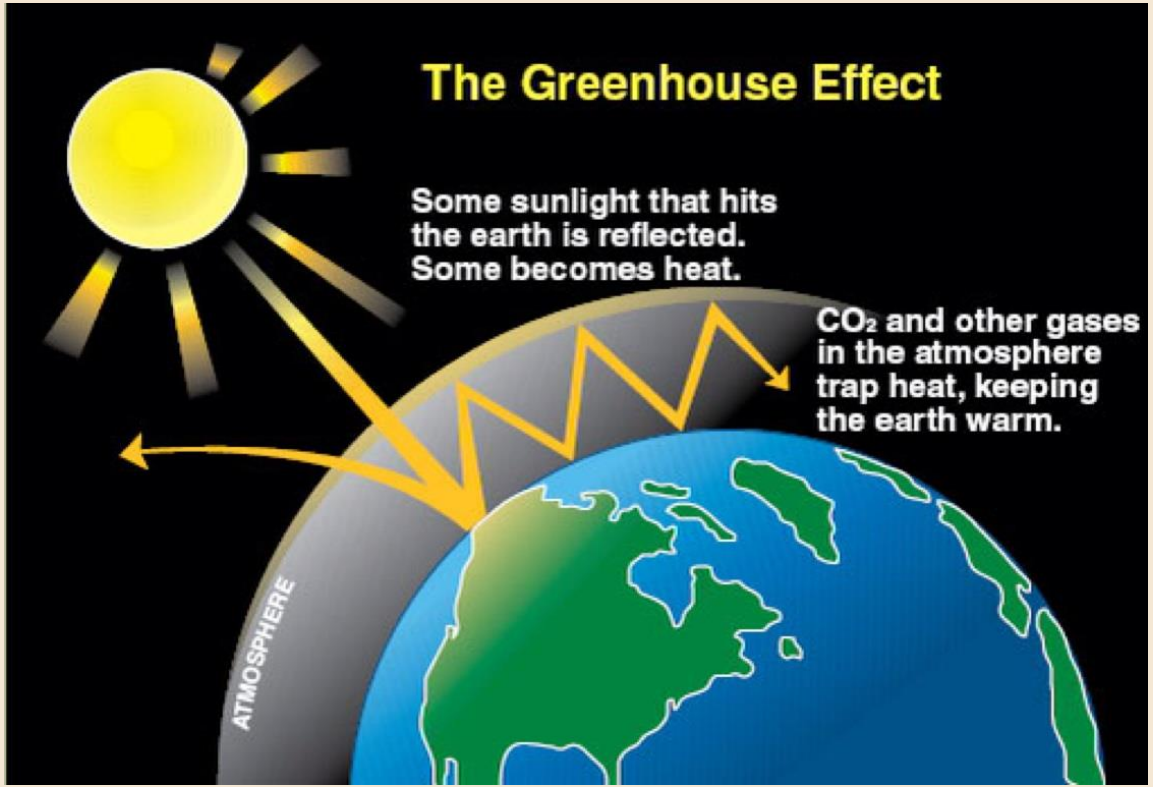
What is a budget?

Atmosphere's Energy Budget



When it’s not equal it leads to…

The Greenhouse Effect



Good websites
here and here

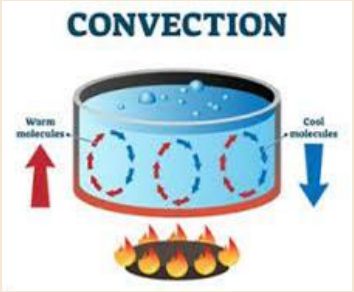
Heat Transfer

Conduction
Convection
Radiation

Three Types of Heat Transfer

Conduction

Heat transfer when the molecules are in direct contact (usually in solids)



Convection

Heat transfer by the movement of a fluid when the particles move from one place to another

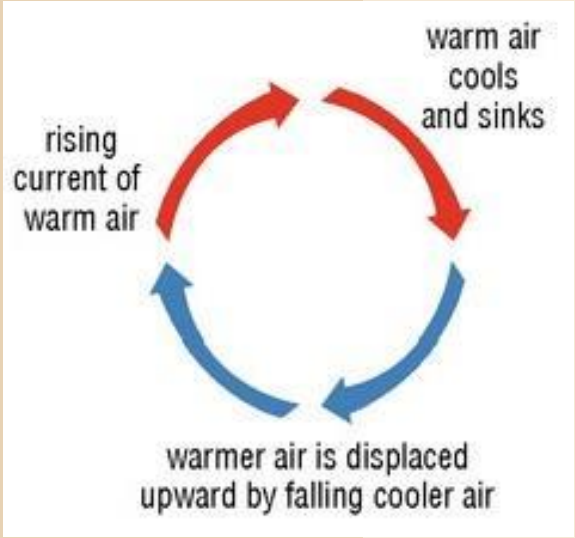
Radiation

Heat transfer by electromagnetic waves (usually light and heat)

Try it!

Go to this interactive and read through to review the three types of heat transfers

How does all of this heat affect the air and the oceans of Earth?



Convection Currents

Hot air rises

Cools off

So it sinks

Then heats up and rises

Cools off and sinks

(and the cycle continues...)


Convection
Currents
Experiment

Explore More

- https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html
- https://science.nasa.gov/ems/01_intro
- https://www.dcceew.gov.au/climate-change/policy/climate-science/understanding-climate-change
- https://climatekids.nasa.gov/greenhouse-effect/
- https://contrib.pbslearningmedia.org/WGBH/conv16/conv16-int-thermalenergy/index.html#/intro

More on that tomorrow!

For now, explore more about the energy budget, the greenhouse effect, conduction, convection, and radiation!

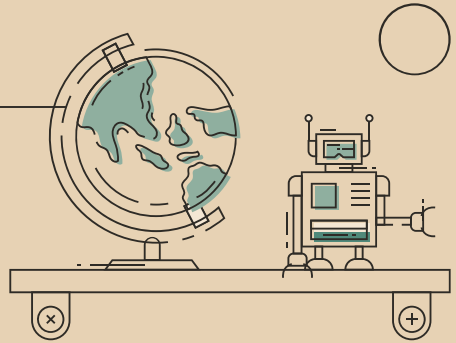
Cause of the Winds

The high or low air pressures are caused by unequal heating of the atmosphere because hot air rises and that leads to lower air pressure.

-Page 73

Local Winds

Winds that blow over a short distance and affect local weather



Global Winds

Patterns of winds that are moving around the whole globe


8
WHERE DOES
WIND COME FROM?

Local Winds

Winds that blow over a short distance and affect local weather are called local winds.

- ★ Sea Breezes - land’s warm air rises so the cool air moves in from the sea to take the warm air’s place
- ★ Land breezes - the sea’s warm air rises so the cool air moves off the land towards the sea

Page 75 in your textbook


Local Winds

Global Winds

Patterns of winds that are moving around the whole globe

Radiation from the Sun is less direct at the poles so winds at Earth's surface blow from the poles towards the equator

- ★ Polar Easterlies
- ★ Prevailing Westerlies
- ★ Horse Latitudes
- ★ Trade Winds

More info here

Page 76 & 78 in your textbook

ALL ABOUT GLOBAL WINDS

Explore More!

01

Info

Check out the wind patterns

02

Visualization

See the winds on Earth at this moment in time

03

Definitions

Good site for basic definitions

04

Other Planets?

How about wind patterns on other planets?

Final Thought:

We know that human ships have used these wind patterns in the past. What about migrating animals like birds?...