U2D3 – ENERGY IN THE ATMOSPHERE

10/29

U2D3 – BELL RINGER – 10/30

Textbooks tell us that Earth's tilt causes the change of seasons. But *how* does the tile cause the seasons to change? Put an X next to any of the statements you think can help to explain how the tilt of the Earth causes it to be warmer in the summer than in the winter.

____A As the Earth circles the Sun, the direction of the tilt relative to the plane of Earth's orbit gradually changes.

____B The direction of Earth's axis always stays the same as we circle the Sun.

____C When the Northern Hemisphere tilts toward the sun, we are closer to the sun so its warmer.

____D When the Northern Hemisphere tilts toward the Sun the days are longer, so there is more time for the Earth to warm up.

____E When the Northern Hemisphere tilts toward the Sun then the Sun appears higher in the sky viewed from the USA so sunlight is more concentrated and intense.

____F The Earth's tilt causes the Sun to be directly overhead at noon in the summer when viewed from the USA.

____G As the Earth circles the Sun it changes the angle of tilt during different seasons of the year, which then changes the amount of direct sunlight the earth receives.

OBJECTIVES

Content Objective: I can explain how Earth's tilt creates seasons.

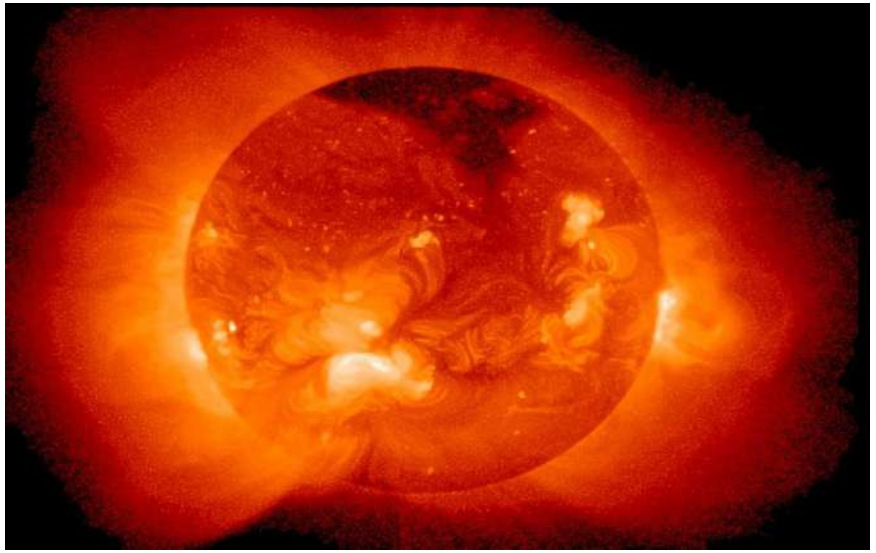
Content Objective: I can explain three types of energy and how they affect the atmosphere.

Language Objective: I can discuss opposing ideas.

Language Objective: I can cite information from a text.

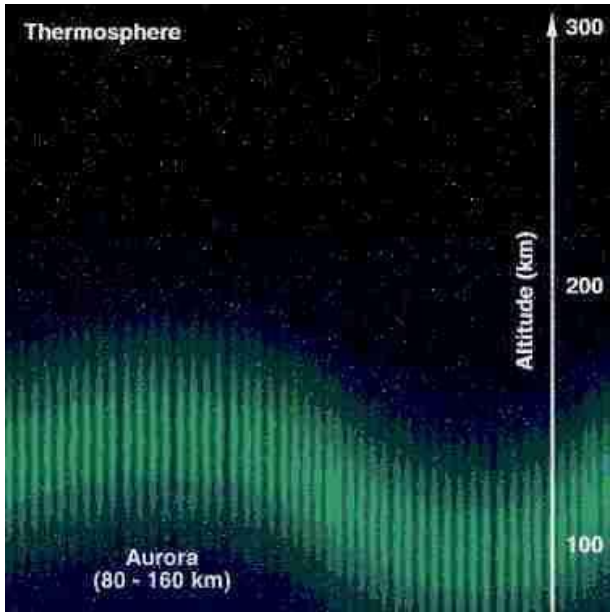
THE IONOSPHERE

- The Ionosphere is affected by solar events.
- The Sun gives off charged particles called ions. They travel out into space super fast. The cloud or gas of these ions, or charged particles is called a Plasma.
- The stream of plasma coming from the sun is known as solar wind, and the intensity of it depends on storms occurring on the sun, called sunspots.



The Ionosphere

- Huge eruptions associated with sunspots send out large amounts of radiation and ionized particles.
- Because the sun's particles are electrically charged, they are deflected by Earth's magnetic field to the North and South poles.
- The ionized particles sometimes interact with air molecules to form auroras, sometimes called "Northern Lights"



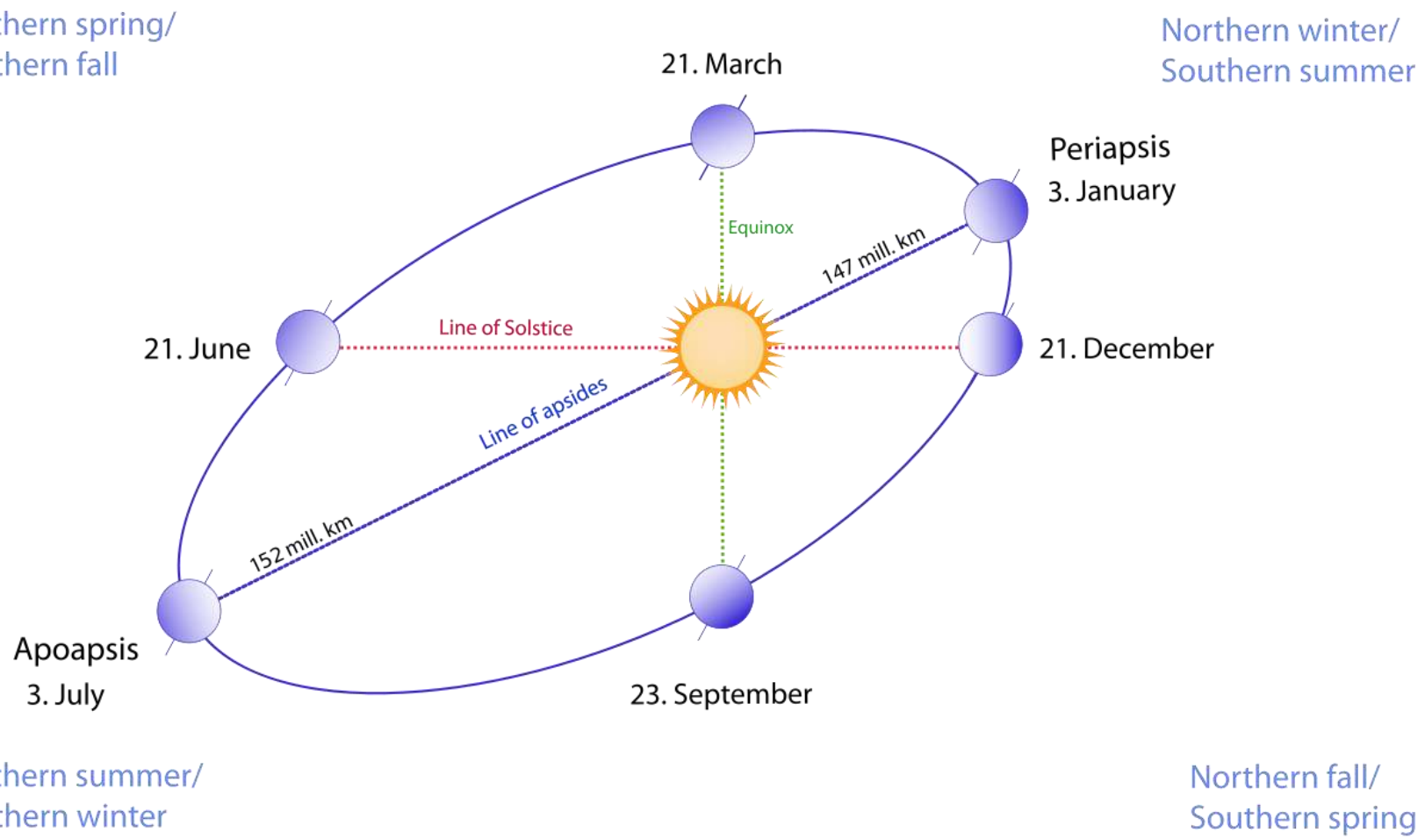
AURORA BOREALIS "NORTHERN LIGHTS“ AURORA AUSTRALIS “SOUTHERN LIGHTS”

As the electrons enter the earth's upper atmosphere, they will encounter atoms of oxygen and nitrogen at altitudes from 20 to 200 miles above the earth's surface. The color of the aurora depends on which atom is struck, and the altitude of the meeting.

- Green - oxygen, up to 150 miles in altitude
- Red - oxygen, above 150 miles in altitude
- Blue - nitrogen, up to 60 miles in altitude
- Purple/violet - nitrogen, above 60 miles in altitude

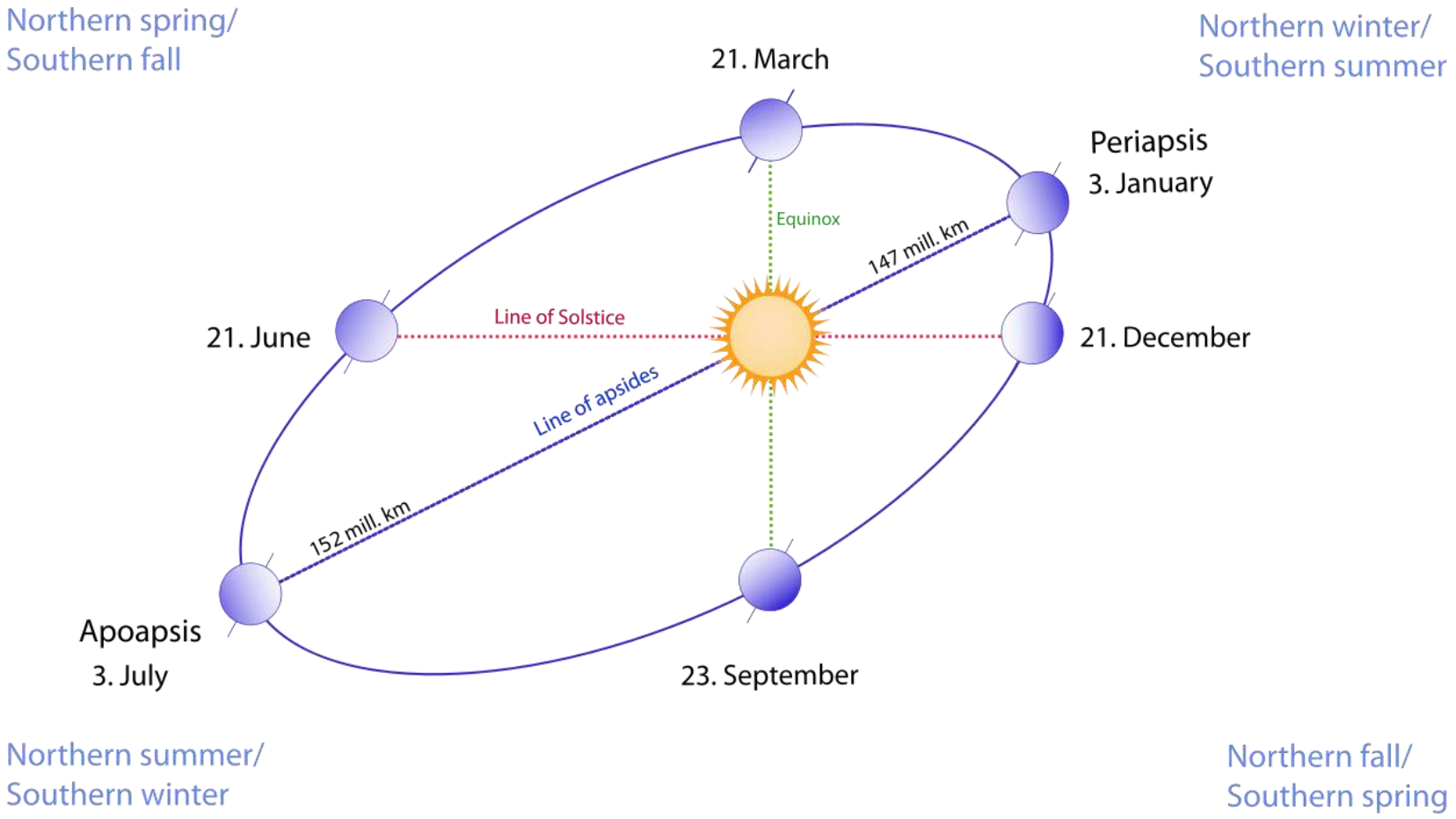
VOCAB ALERT!

- Perihelion – point where Earth is closest to the sun
- Aphelion – point where Earth is farthest from the sun.

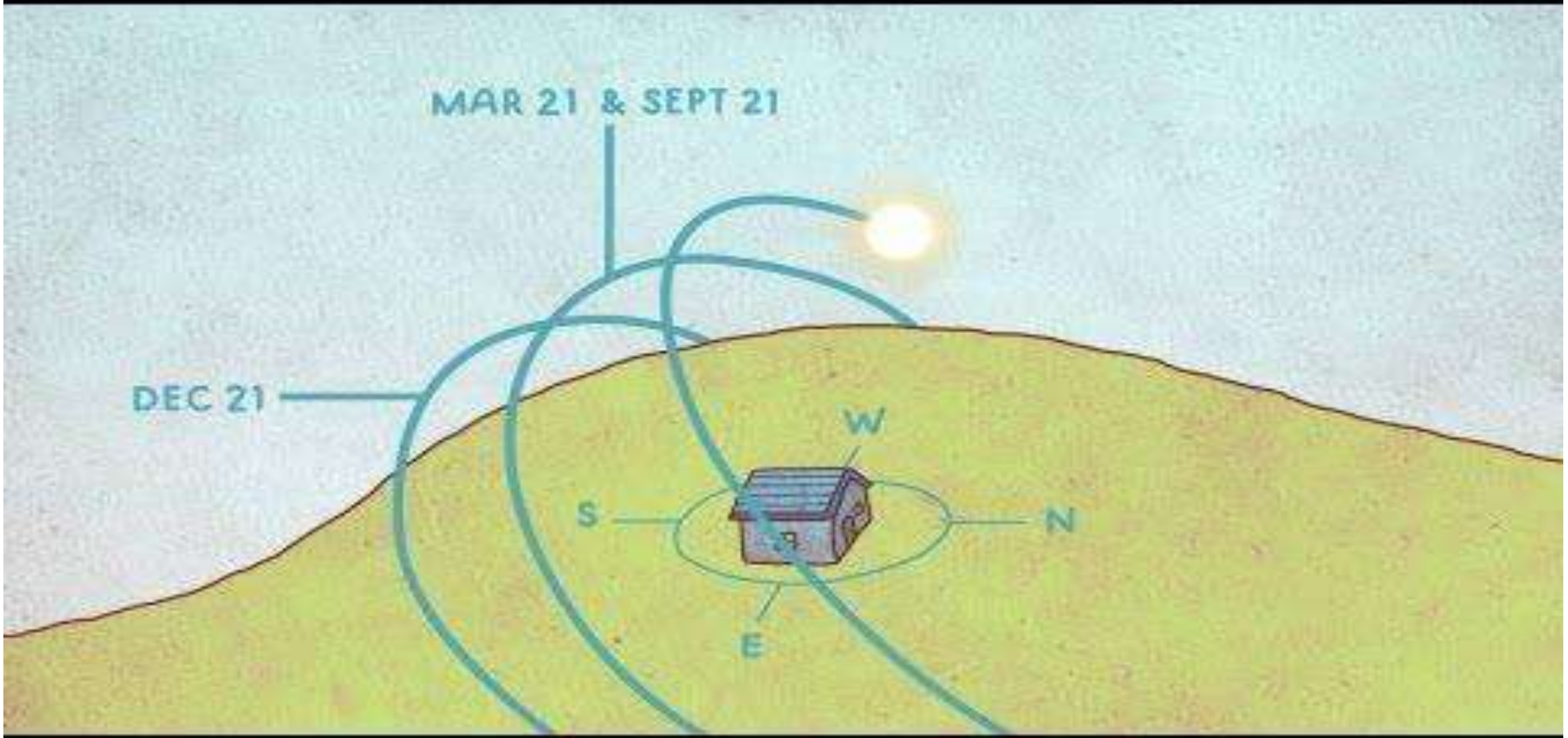


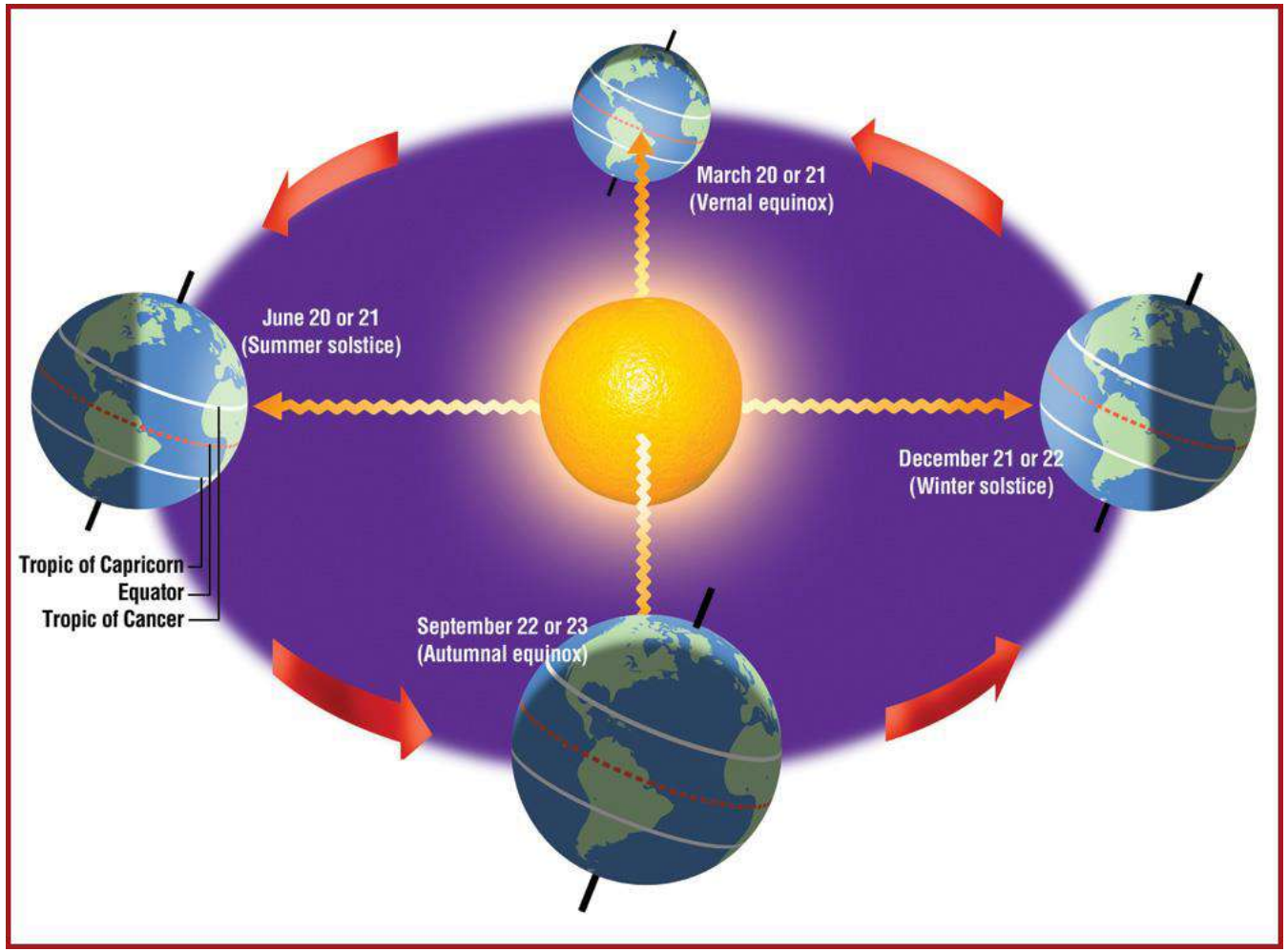
TRUE OR FALSE?

- We are closest to the sun in the summer, that's why it's hotter in the summer.



WHAT MAKES SEASONS?





QUICK WRITE:

- What makes day and night?
  - Use the word rotation
- What makes the seasons?
  - Use the words revolve and tilt.

QUICK WRITE:

Word Bank: day, night, tilted, rotation, toward, away, direct, indirect, revolves, hours.

- The Earth experiences day and night because of its _____. That means it spins around on its axis. The side of the Earth facing the sun will experience _____. The side of the Earth facing away from the sun will experience _____.
- The Earth experiences seasons because it is_____ on its axis, and it _____around the sun.
- That means that during the summer in the Northern Hemisphere, are tilted_____ the sun, so we receive more _____ of sunlight and more _____ sunlight, making it warmer.
- During the winter in the northern hemisphere, we are tilted _____from the sun, so we receive fewer hours of sunlight and more indirect light, making it colder.

IN GROUPS, ON SMALL WHITEBOARD, CH 17.2 (7 MINUTES)

- 1) How are heat and temperature related?
- 2) What are the 3 major mechanisms of heat transfer?
- 3) How is the atmosphere affected by each of the heat transfer mechanisms?

ENERGY IN THE ATMOSPHERE READING GROUP ROLES

Reporter:
Shares out answers with class.

Resource Manager:
Grab whiteboards and markers. Makes sure group finds specific evidence in the text.

Facilitator:
Make sure everyone's ideas are heard.

Recorder
Writes answers on whiteboards.

01

1) How are heat and temperature related?

02

2) What are the 3 major mechanisms of heat transfer?

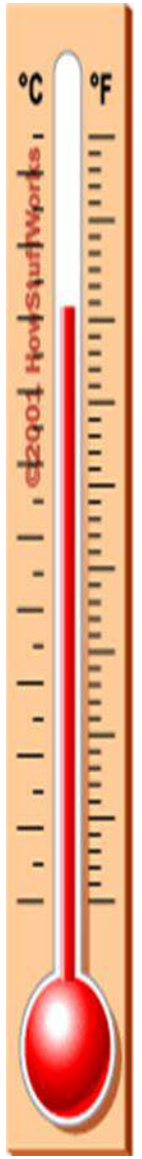
03

3) How is the atmosphere affected by each of the heat transfer mechanisms?

SHARE-OUT

HEAT AND THE ATMOSPHERE

- Heat: measure of how fast the atoms or molecules of a substance are moving.
- Temperature: is the average kinetic energy (Energy of movement)
- The faster the movement the higher the heat energy and the higher the temperature



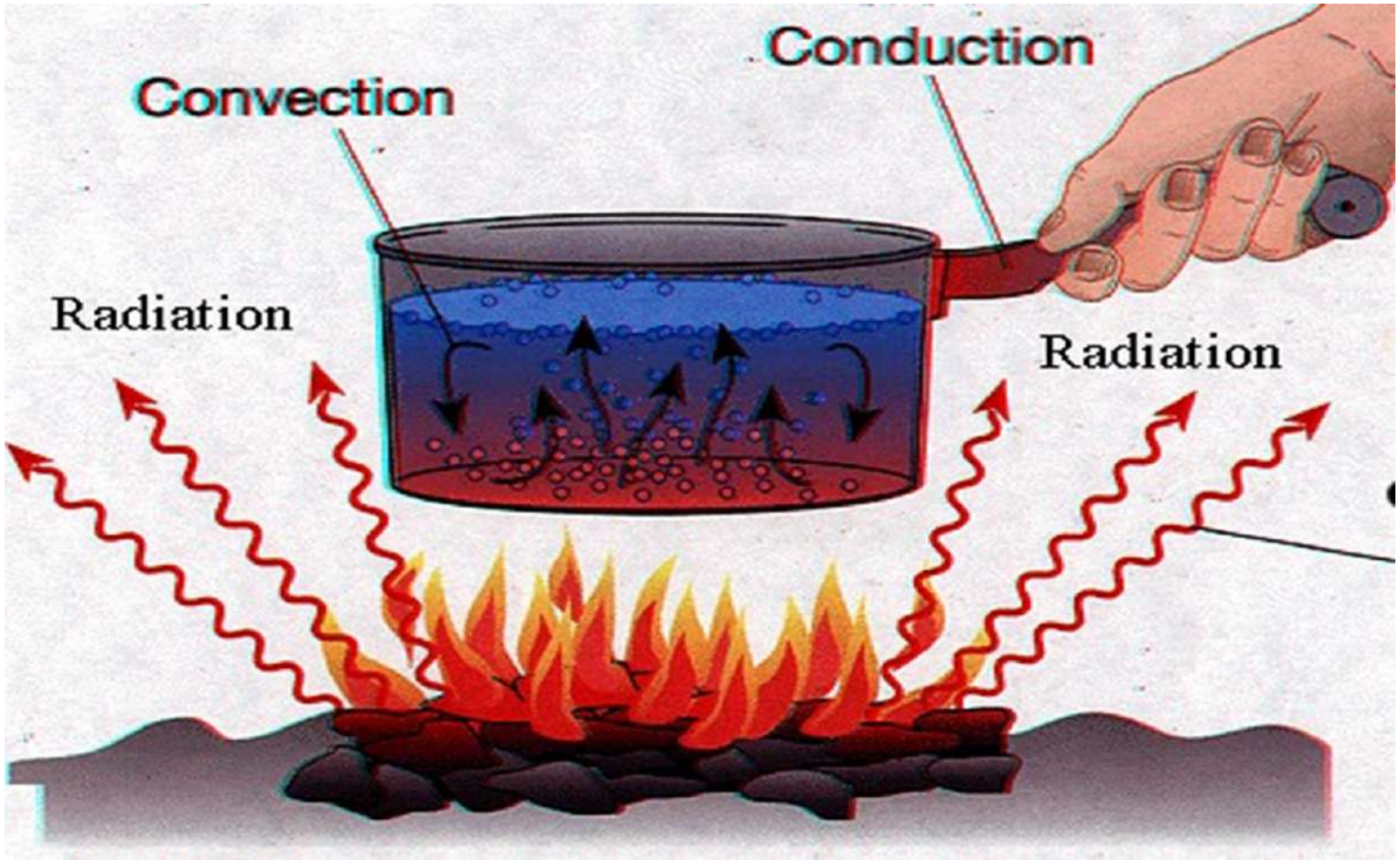
HEAT TRANSFER NOTES

- **Radiation** – the movement of energy through **empty space**
  - Light travels from a sun across the solar system to the earth
  - Heat from a fire warms your hand without touching the fire.

- **Conduction** – the movement of energy **through a substance**, on contact. Atoms or molecules **collide** with others to make them move
  - Heat moves through the handle of a hot pot to burn your hand

- **Convection** – the rising and falling of a substance due to its change in its **temperature and density**
  - Water in a pot boils, heat in a room rises, cold water sinks

HEAT TRANSFER MECHANISMS

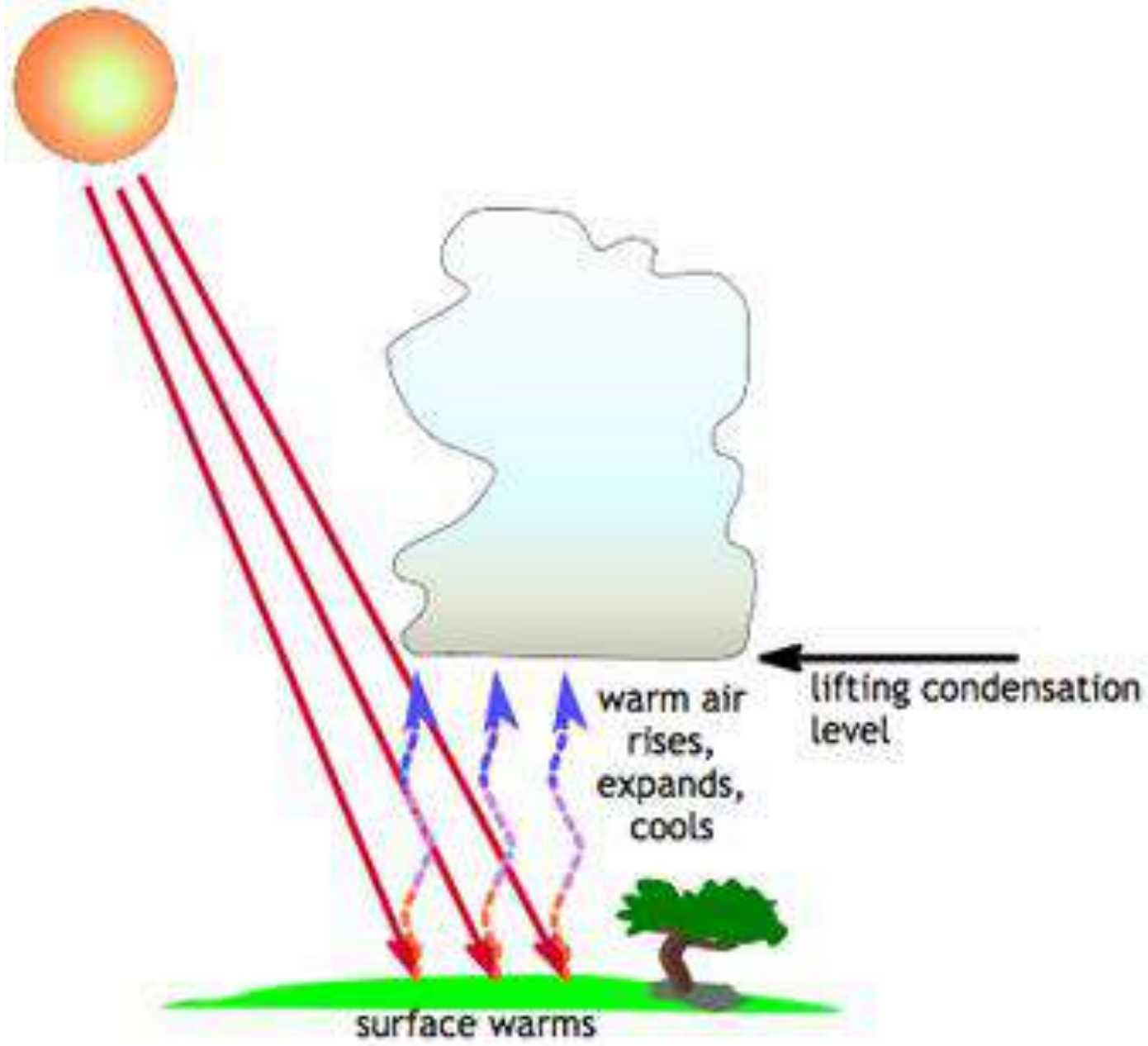


3) HOW IS THE ATMOSPHERE AFFECTED BY EACH OF THE HEAT TRANSFER MECHANISMS?

- Radiation is either absorbed or reflected by Earth's surface. Some of it is absorbed by plants for photosynthesis.
- Conduction happens between Earth's surface and the air directly in contact with Earth's surface because air is a poor conductor of heat.
- Convection affects the atmosphere because heat acquired by radiation and conduction is transferred through the atmosphere by convection currents.

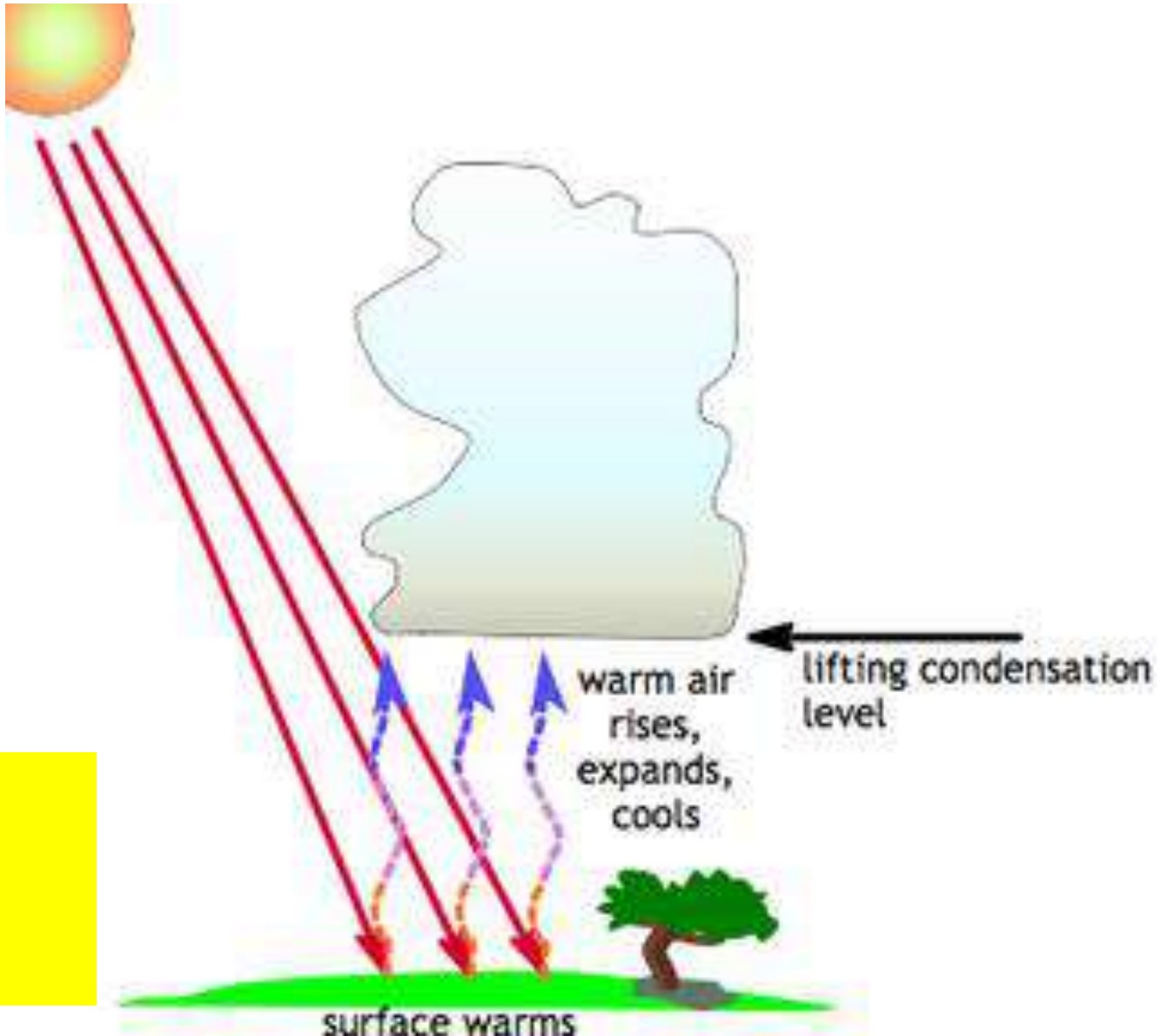
ATMOSPHERIC HEATING AND ENERGY

- All energy comes from the sun
- About 50% absorbed by land and sea-the rest radiated back to space
- Sun heats ground, ground heats the air
- Warm air rises, expands and cools
  - Clouds!!



REVISIT YESTERDAY'S QUICK WRITE:

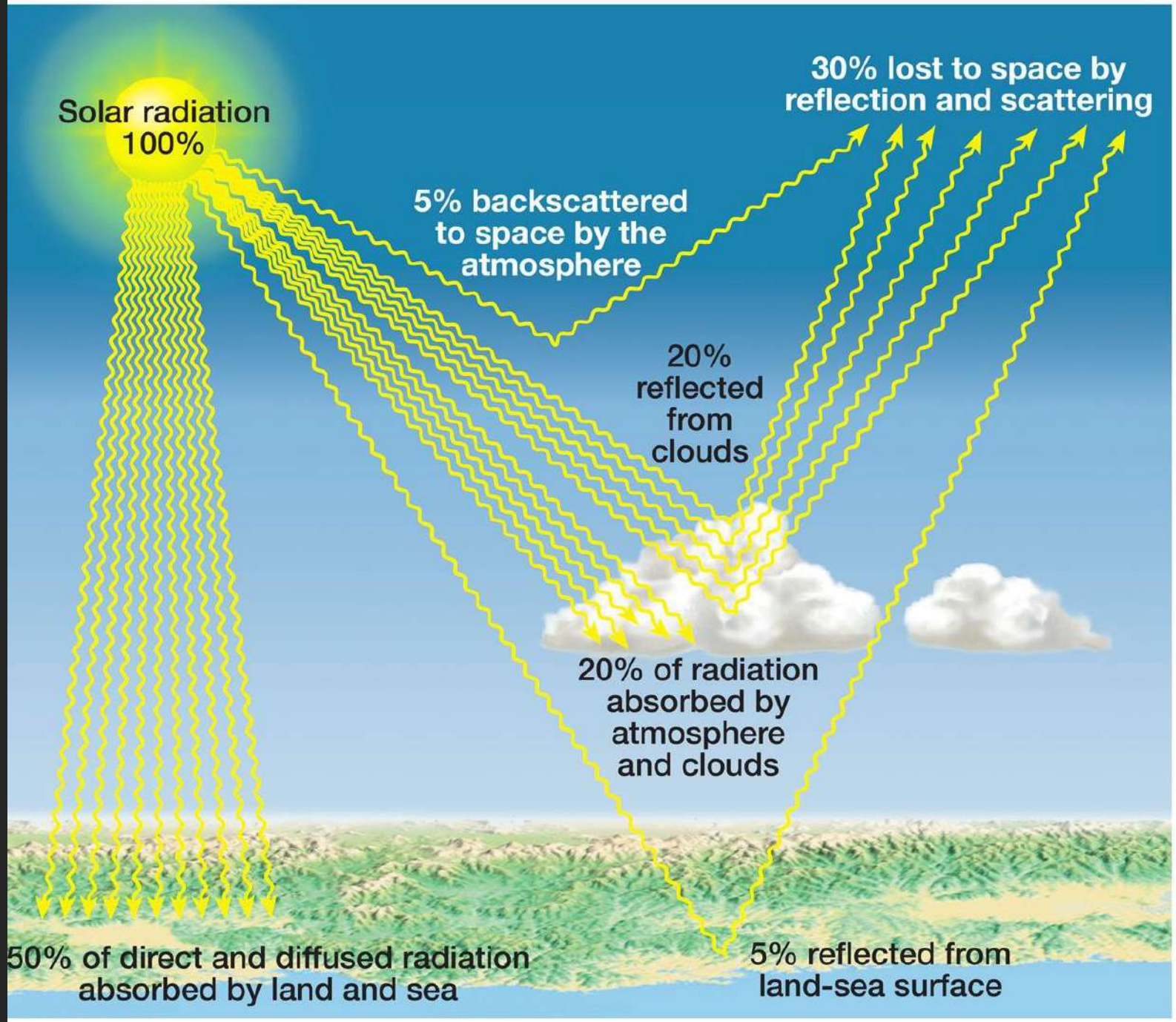
WHY DOES TEMPERATURE DECREASE AS YOU GO HIGHER IN THE TROPOSPHERE?



The temperature decreases as you go higher in the troposphere because…
The sun warms the _____ by _____.
The surface warms the air right above it by _____,
And the warm air rises, expands and cools, by _____,
making the temperature decrease higher in the troposphere.

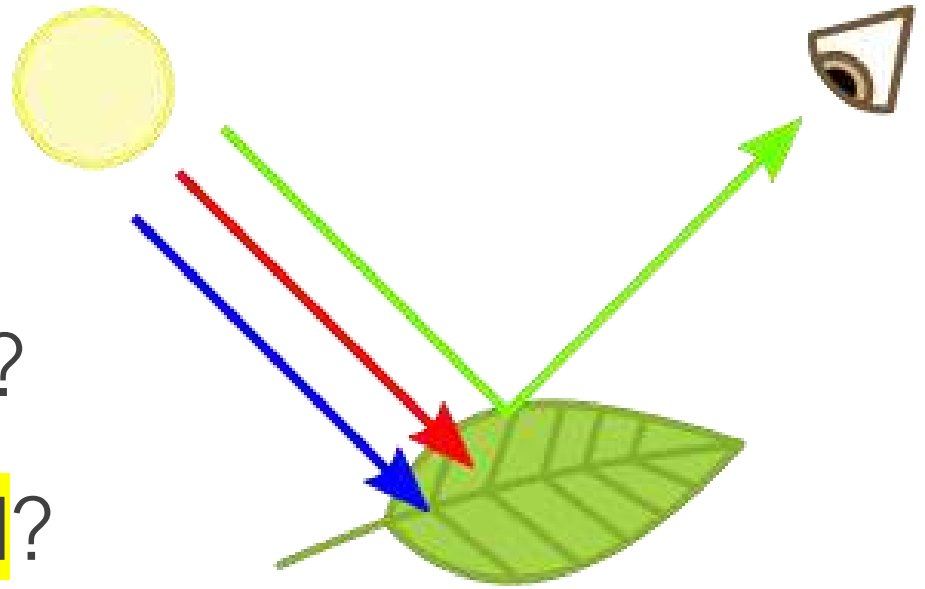
SURFACE HEATING AND RADIATION:

WHAT CAN HAPPEN TO RADIATION THAT IS NOT ABSORBED BY THE SURFACE?



VOCAB PRACTICE

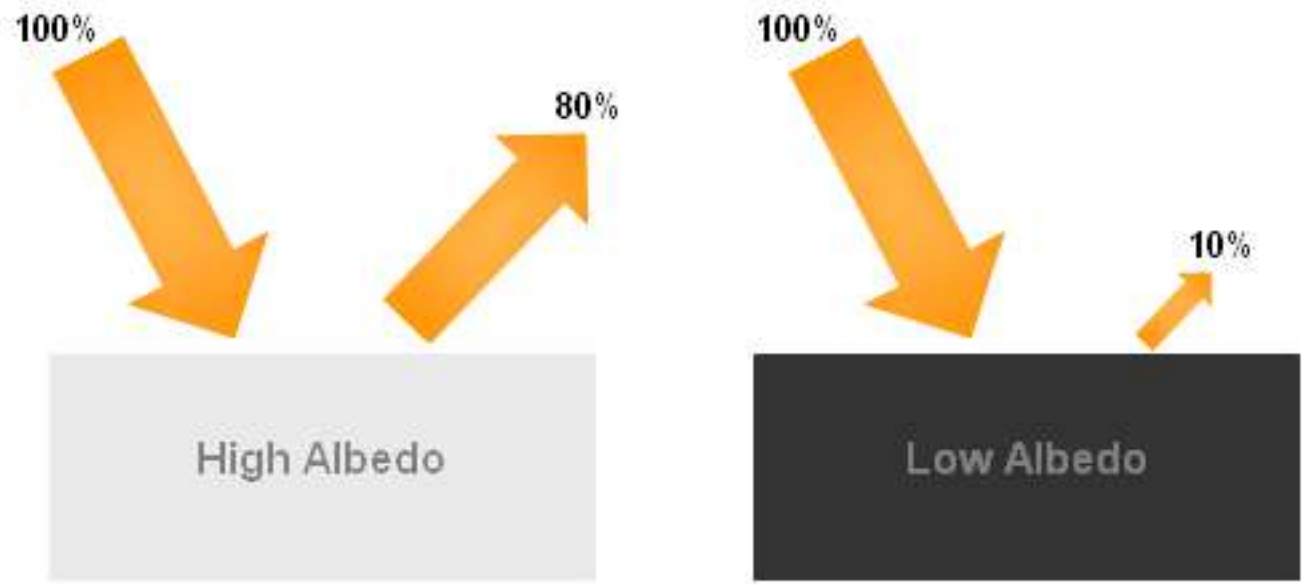
- What does it mean if light is reflected?
- What does it mean if light is absorbed?



ALBEDO

Measure of a surfaces' **reflectivity**

- Very dark colors have an albedo close to zero (or close to 0%).
- Very light colors have an albedo close to 100%

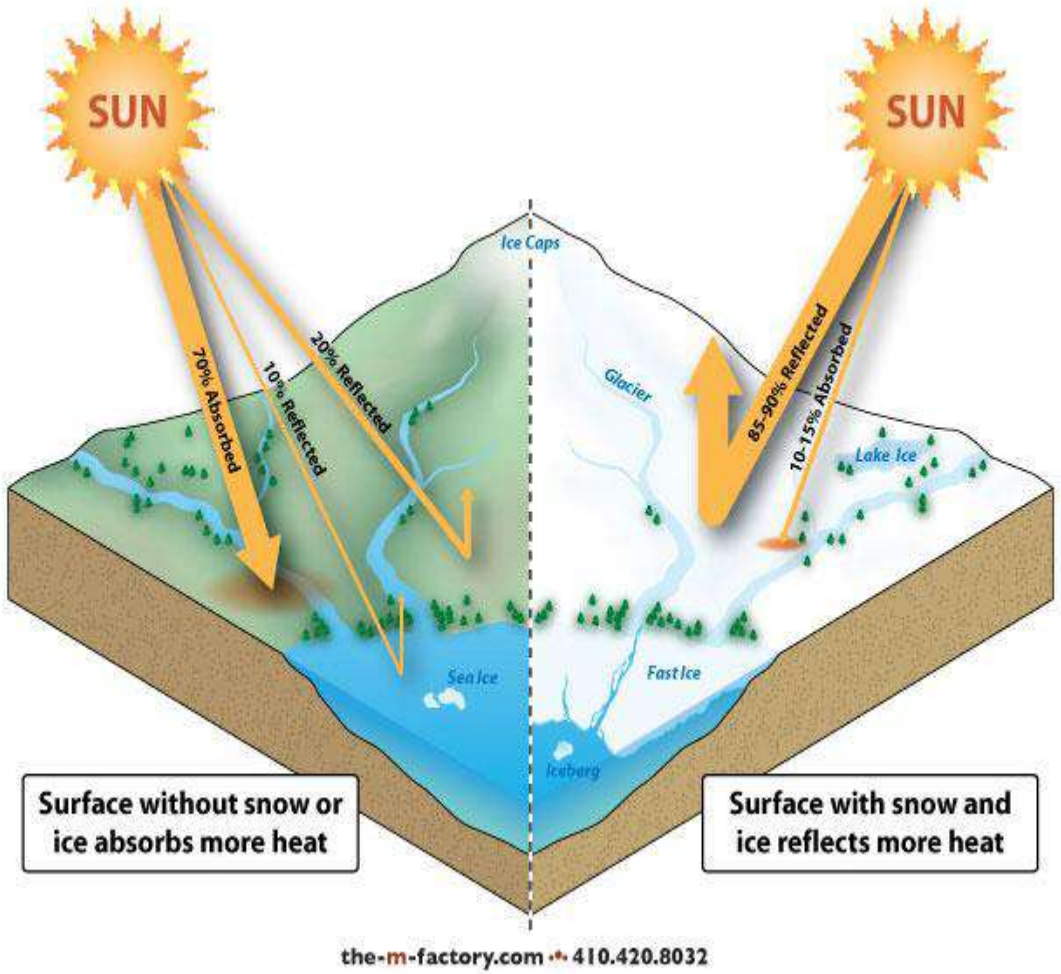


GROUND SURFACE HEATING

Albedo vs **absorption**

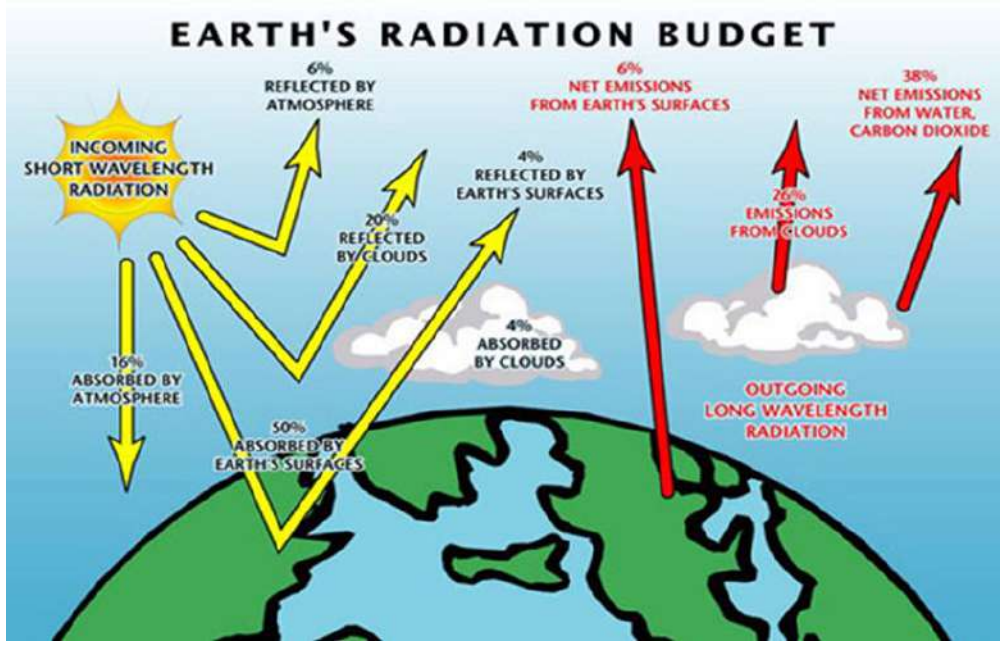
Albedo

- Solar energy reflected from Earth back into space
- Albedo-cool temps
- Absorption-warm temps



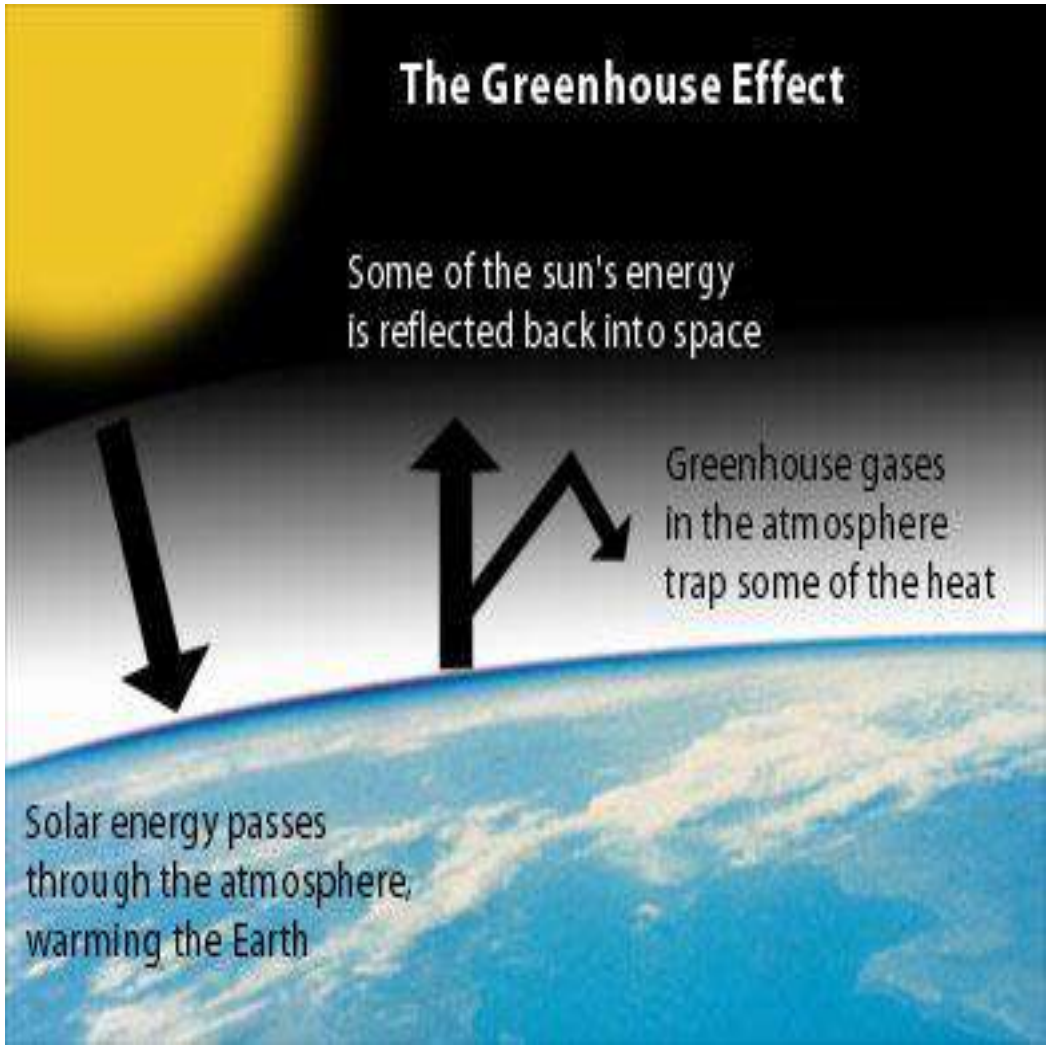
ALBEDO VS ABSORPTION CONTINUED

- Two surfaces-Land and Water
  - Dark materials (most land surfaces) absorb more heat
- Trees-low albedo, high absorption
- Snow-high albedo, low absorption
  - temperature feedback
  - Clouds

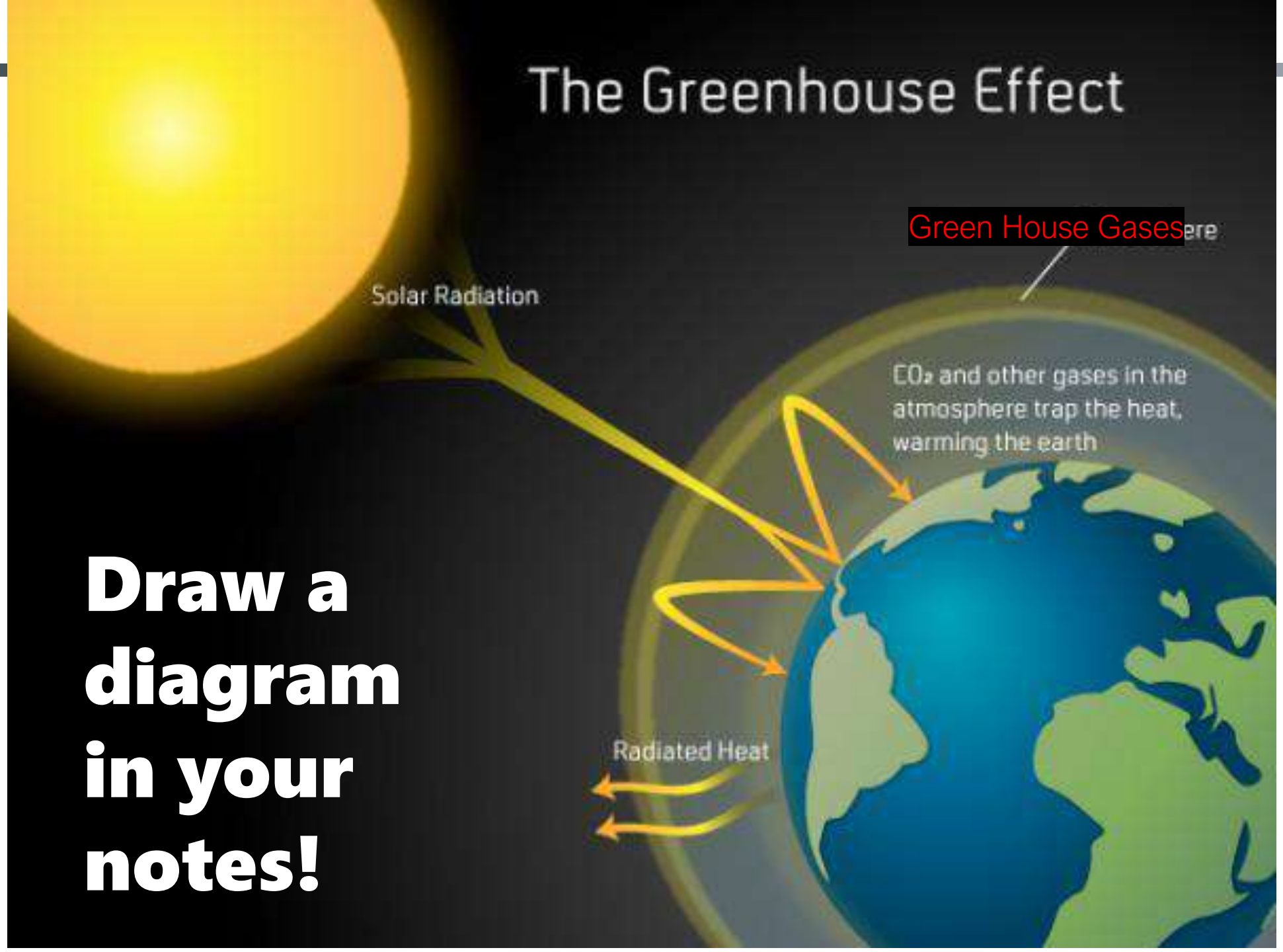


THE GREENHOUSE EFFECT

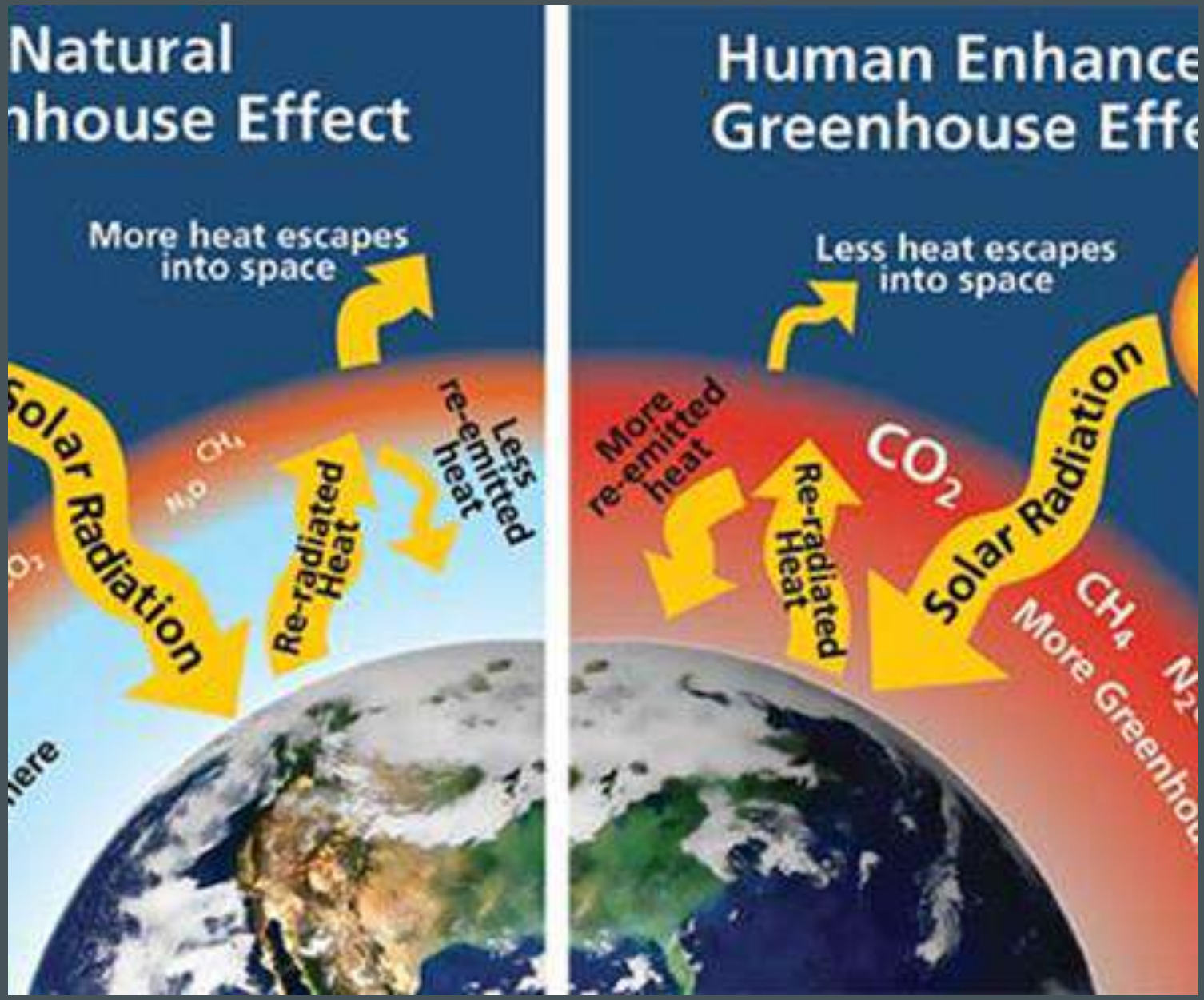
The earth's temperature is naturally regulated by a layer of gases in the atmosphere which act like the glass in a greenhouse. This layer of gases—**Greenhouse Gases (GHGs)**—such as carbon dioxide (CO_2), methane , and nitrous oxide, let in sunlight but tend to trap the heat reflected from the earth's surface. Thus, the earth is naturally warmed by the greenhouse effect.



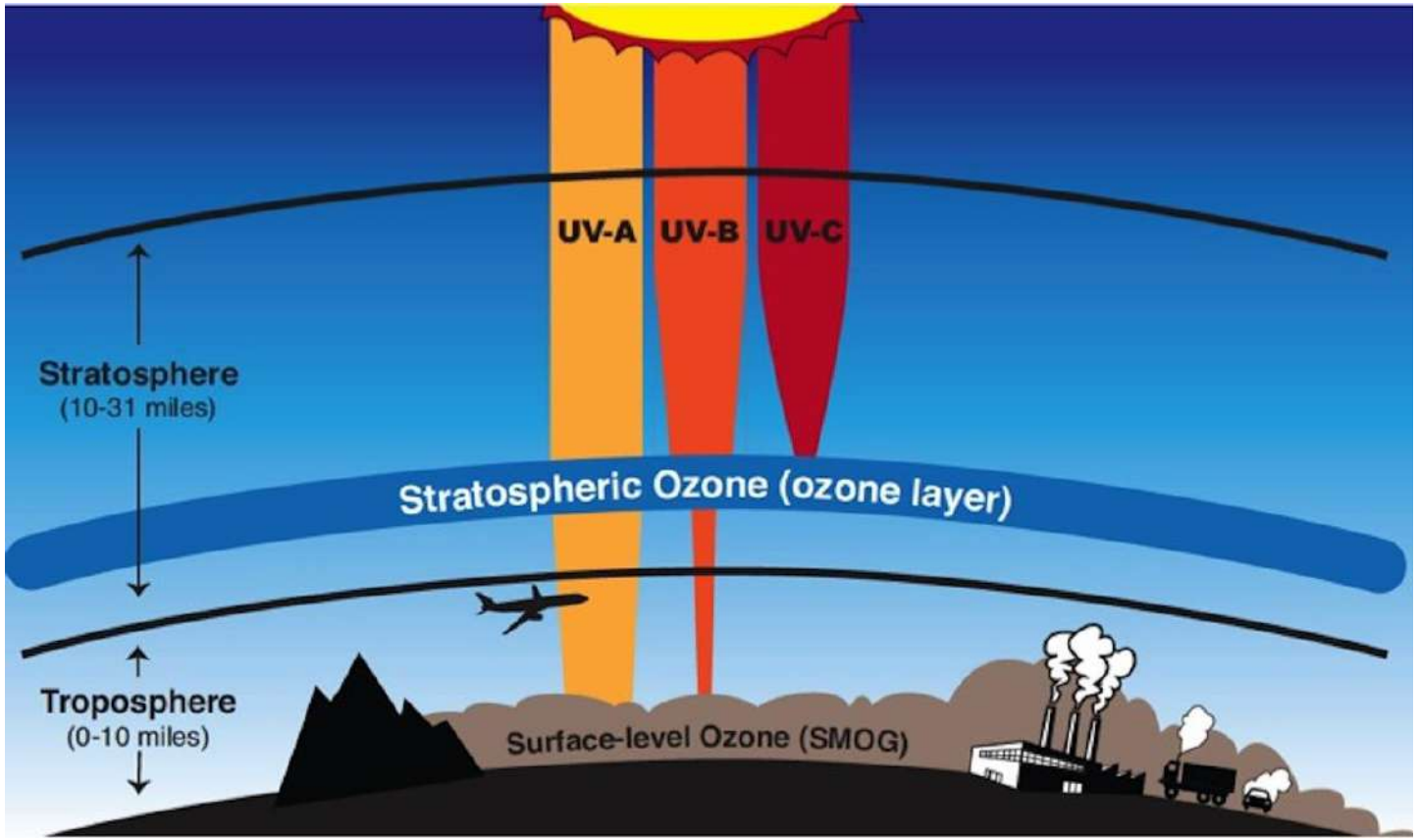
https://www.youtube.com/watch?v=sTvqlijqvTg


The Greenhouse Effect
Green House Gases
Solar Radiation
CO₂ and other gases in the atmosphere trap the heat, warming the earth
Radiated Heat
Draw a diagram in your notes!

GREENHOUSE EFFECT ARTICLE

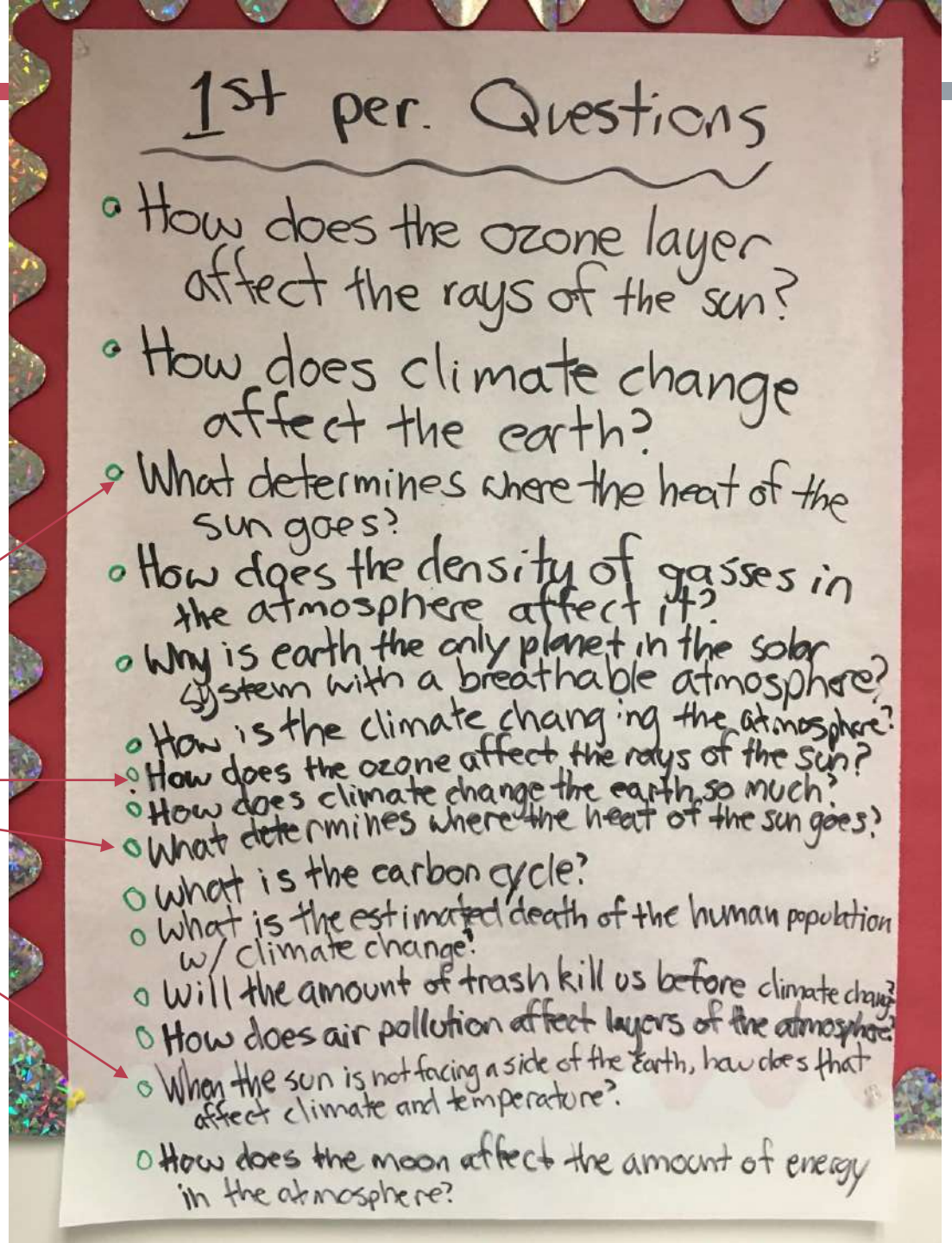


HOW DOES THE OZONE PROTECT US?



EXIT TICKET: IN YOUR NOTEBOOK

- Choose 1 of the questions from our question list that has to do with energy in the atmosphere and answer it.



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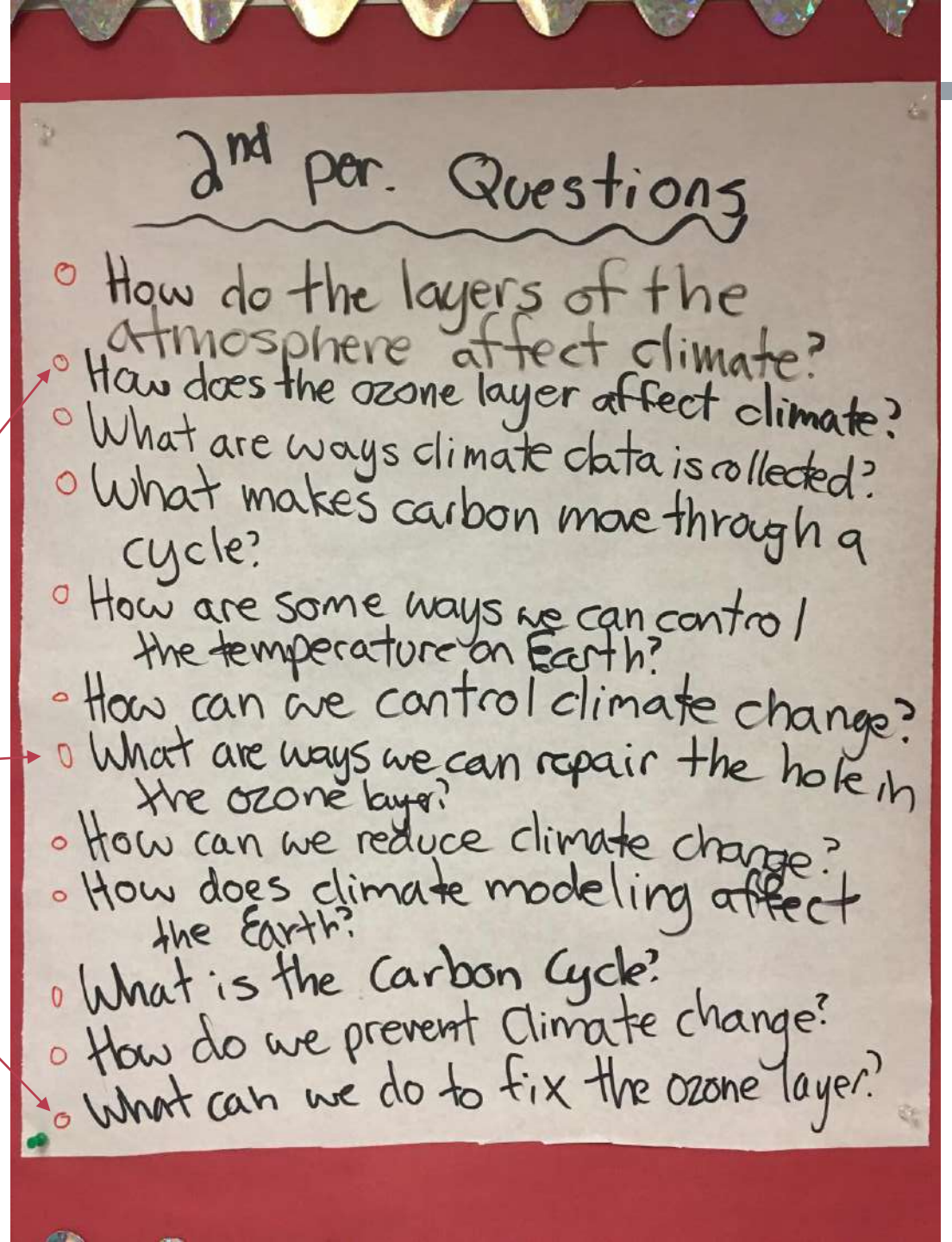

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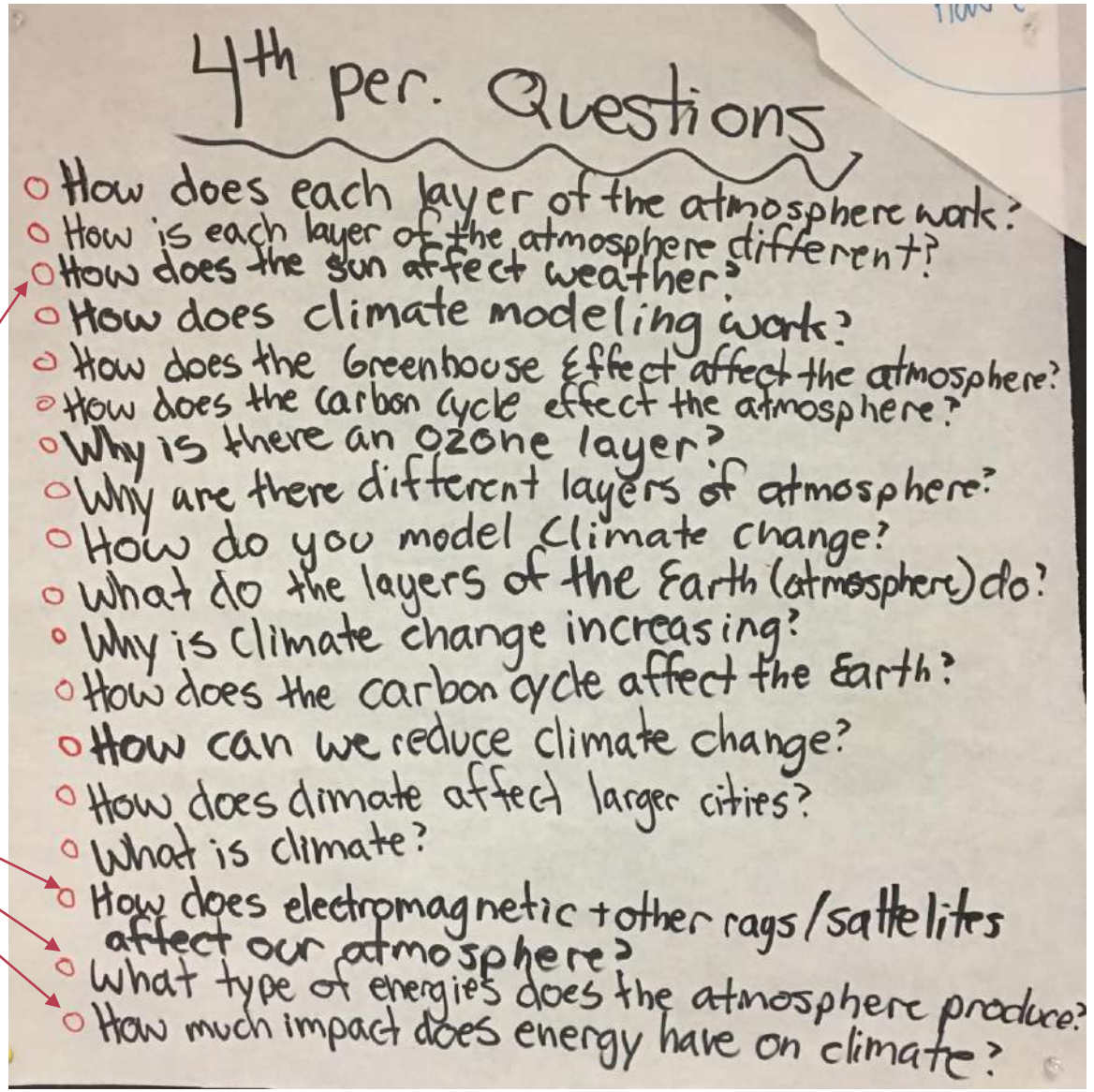

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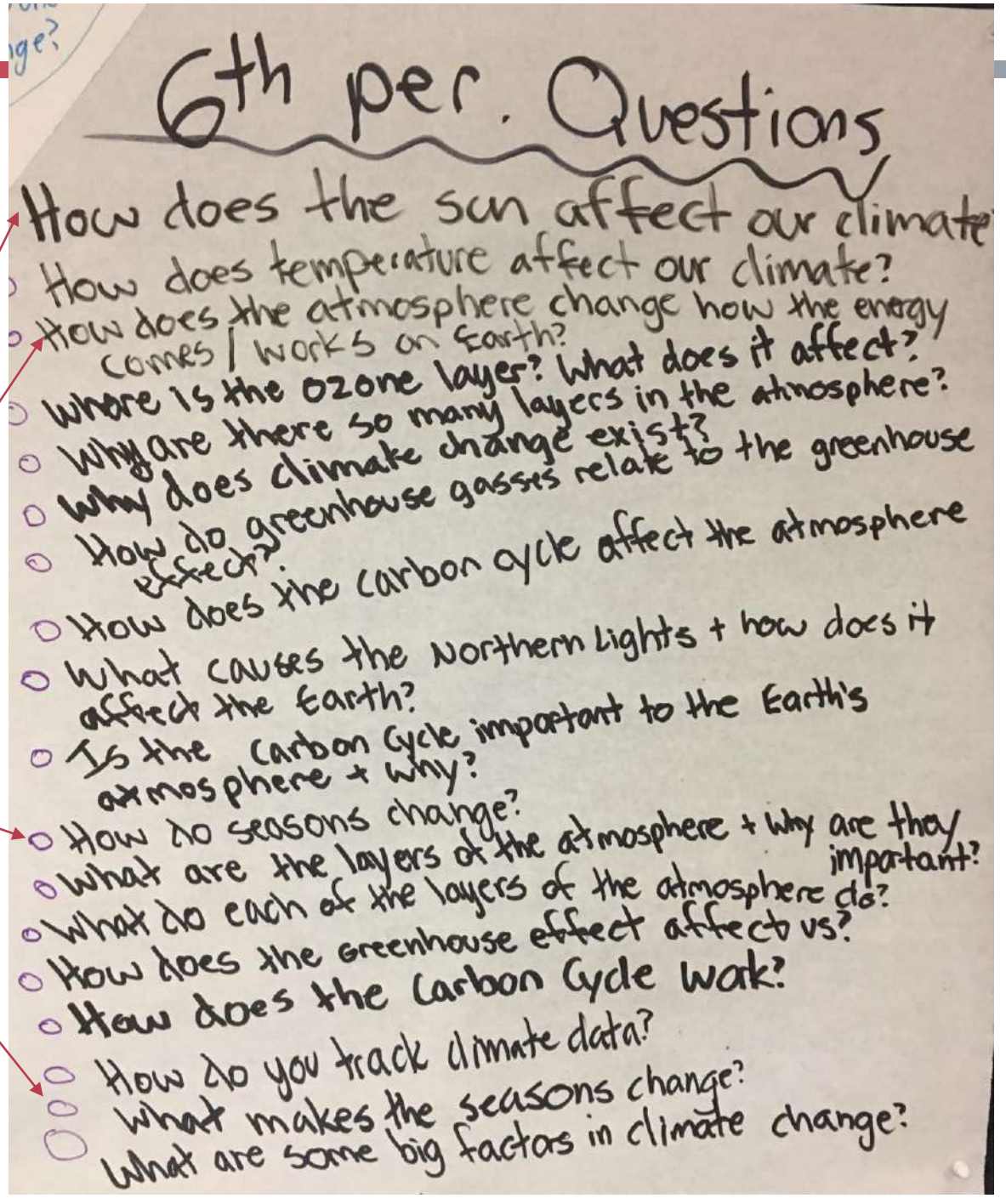

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