We're about to play:

PSUEDO-JEOPARDY!!!!!
(Aka "The Answer Is . . .")


And The
ANSWER IS...

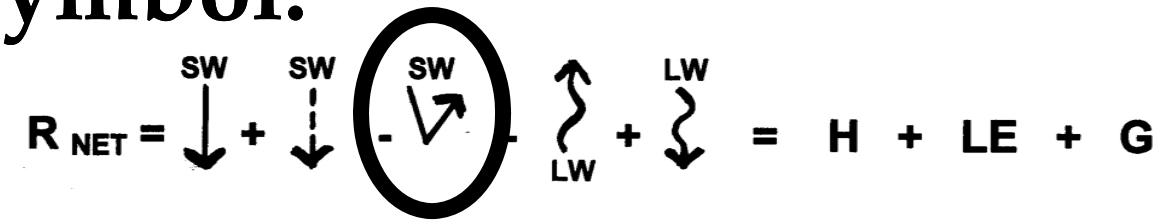
Let's Meet Our Teams…

- InfraRED Radiators
- TANGERINE Tasers
- Mellow YELLOW Reflectors
- GREEN House Gassers
- BLUE Sky Diffusers
- UltraVIOLET Zappers

Ready for a practice question?

Energy Balance

The circled symbol:



What is…

1. **Outgoing longwave radiation**
2. **Reflected infrared radiation**
3. **Libido**
4. **Albedo**

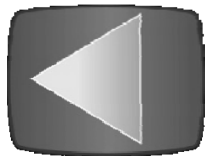
Atmospheric Structure and Composition	Energy Balance	Matter & Thermo-dynamics	Laws of Motion & Radiation	Odds & Ends
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

The gases: H_2O and CO_2.

What are…

1. **The two most abundant gases.**

2. **The two most abundant Greenhouse gases.**



3. **The two most abundant anthropogenically enhanced Greenhouse gases.**

4. **The two gases that comprise 99% of the atmosphere**

The observation that "the atmosphere is heated from below" is most evident in this layer.

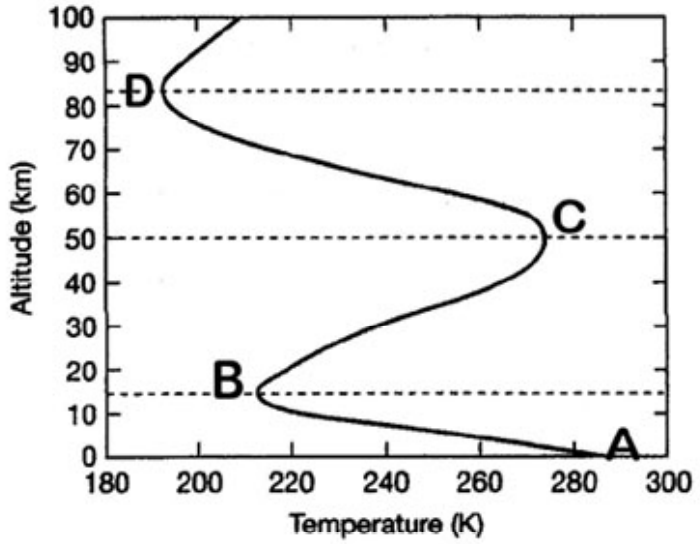
What is…

1. **Layer A - B**

2. **Layer B - C**

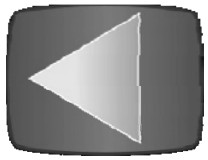
3. **Layer C - D**

4. **Layer D and above**



This gas is NOT a Greenhouse Gas.

What is …

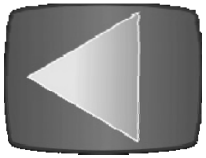
1. O_2 
2. O_3
3. CH_4
4. **Freon-11 (a CFC)**

The residence time of CO2 gas molecules, once they get into the atmosphere.

What is…

1. ~10-12 years

2. ~50 years

3. ~100 years 

4. ~ 500 years

N2, N, O and O2 are effective absorbers of extremely harmful X-ray and UVC radiation in this layer.

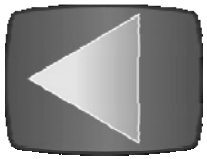
What is…

1. **Troposphere**

2. **Stratosphere**

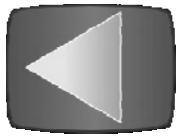
3. **Mesosphere**

4. **Thermosphere**



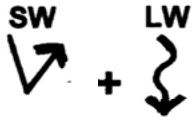
Evaporation and transpiration are represented by this symbol.

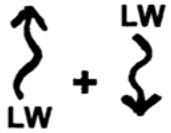
What is…

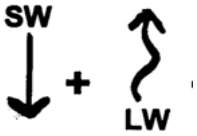
1. **LW**
2. **SW**
3. **H**
4. **LE** 
5. **G**

The Greenhouse effect is represented by this symbol.

What is…

1. **This one:** 

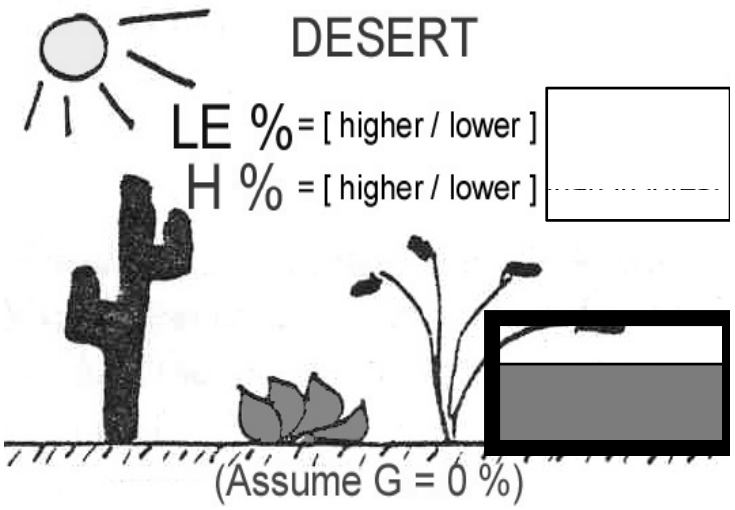
2. **This one:** 

3. **This one:** 

4. **H + G**

5. **None of the above**

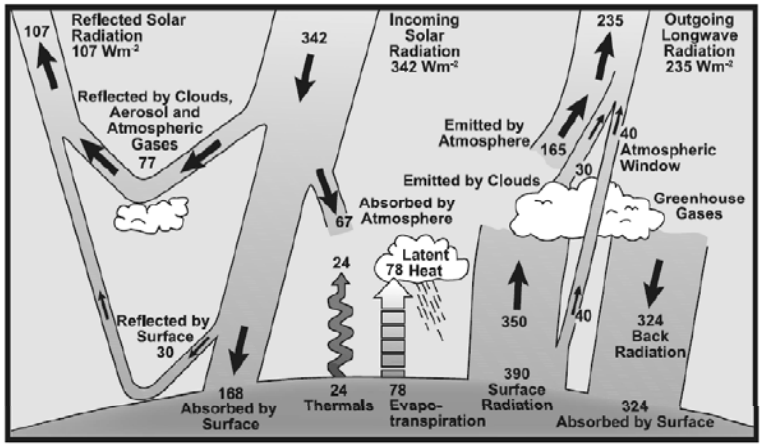
This will happen after a canal or reservoir is built in a desert.



Who is…

1. **No change in H or LE**
2. **More energy goes into H, making it hotter.**
3. **More energy goes into LE, making it hotter.**
4. **More energy goes into LE, making it cooler.**

Of these 4 choices, THIS part of the energy balance and its pathways involves the <u>MOST</u> units of energy. (HINT: see p 64 in Class Notes



<u>What is…</u>

1. **UV energy absorbed by ozone in stratosphere**

2. **Solar energy reflected back to space by clouds, atmosphere, & surface <u>combined</u>.**

3. **IR energy radiated from the Earth's surface directly out to space**

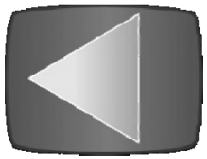
4. **IR energy re-radiated to the Earth's surface after being absorbed in the atmosphere.**

If the Earth had NO atmosphere, the amount of energy in THIS component of the Energy Balance would be minor compared to the other components

What is…

- **LW up**

- **SW diffuse**



- **Direct SW down**

- **Energy escaping thru the IR Atmospheric window**

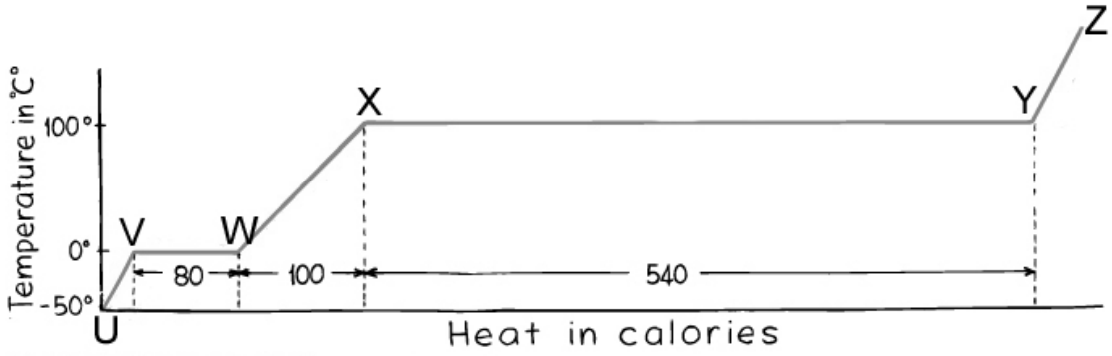
The reason why -- if Global Warming is occurring -- we should be able to detect it FIRST in LAND SURFACE temperatures rather than OCEAN SURFACE temperatures. **What is…**

1. **The specific heat & heat capacity of WATER is higher than that of SOIL, hence water heats up more slowly than s**

2. **The specific heat & heat capacity of SOIL is higher that that of LAND, hence soil heats up more slowly than water.**

3. **The albedo of WATER is higher than that of SOIL, hence it will absorb more radiation**

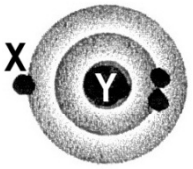
The segments of this graph that represent LATENT energy (LE)



What are:

1. **U-V, W-X, and Y-Z**
2. **V-W and X-Y**
3. **V-W and W-X**
4. **V- X and X - Z**

The number of positively charged protons the nucleaus of this neutral lithium atom contains.



What is…

1. **One**

2. **Two**

3. **Three**

4. **None - the nucleus contains photons, not protons!**

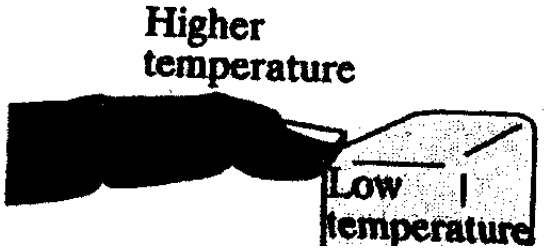
Energy transfer by means of vibrational energy from one molecule to the next through a substance.

What is…

1. **Convection**
2. **Conduction**
3. **Radiation**
4. **Latent Energy**

How thermal energy will flow in this diagram, based on the 2nd Law of Thermodynamics

What is…

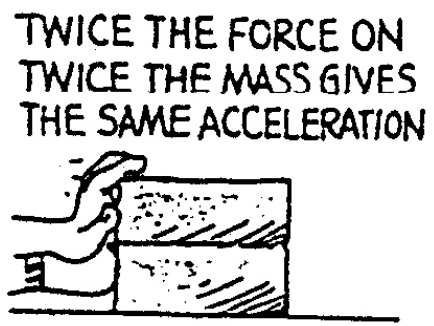


1. **By means of CONVECTION**

2. **From the ICE CUBE to the FINGER**

3. **From the FINGER to the ICE CUBE**

Based on the Newton's Law shown in this figure, the force (via consumption of gas) needed by either a Hummer or an Echo, to make <u>both accelerate equally</u> from a position at rest if the Hummer has 2 times the mass of the Echo.



<u>What is…</u>

1. **The Hummer will need ½ as much force as the Echo**

2. **The Echo will need ½ as much force as the Hummer**

3. **The Hummer & Echo will need the same amount of force**

4. **The Echo will need twice as much force as the Hummer**

The Radiation Laws that best explains why absorption curves exist. What is…

1. **The hotter the body, the shorter the wavelength**

$$\lambda_m = a / T$$

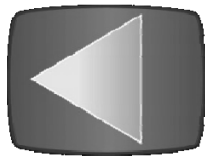
2. **Shorter electromagnetic wavelengths have higher intensity radiation than longer wavelengths**

$$E = h c / \lambda$$

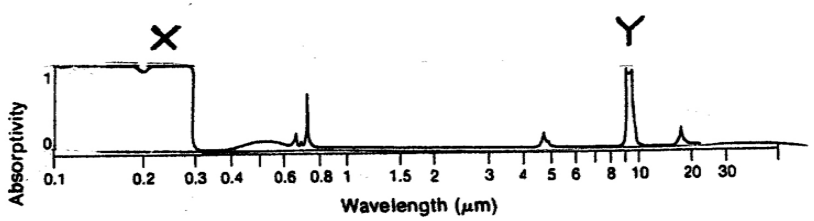
3. **The hotter the body, the (much) greater the amount of energy flux or radiation**

$$E = \sigma T^4$$

4. **Some substances emit and absorb radiation at certain wavelengths only.**



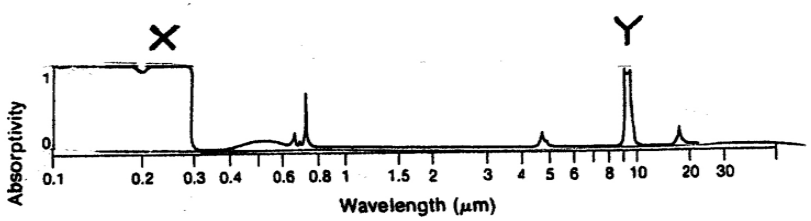
The part of this O_3 absorption curve that is linked to OZONE'S absorption of harmful UV radiation in the stratosphere.



What is…

1. **Part X of the absorption curve**
2. **Part Y of the absorption curve**
3. **Both Parts X & Y working together**
4. **Neither X or Y – this is NOT an absorption curve!**

The part of this O_3 absorption curve that is linked to OZONE operating as a GREENHOUSE GAS.



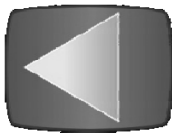
What is…

1. **Part X of the absorption curve**
2. **Part Y of the absorption curve**
3. **Both Parts X & Y working together**
4. **Neither X or Y – OZONE is NOT one of the Greenhouse Gases!**

What ozone does in the troposphere vs. stratosphere.

What is…

1. **Ozone absorbs IR in the troposphere (acting as a GHG) and absorbs harmful UV in the stratosphere (NOT acting as a GHG).**

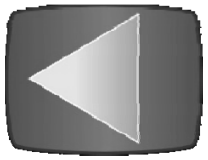


2. **The Ozone Hole in the stratosphere allows more SW radiation to reach the Earth's surface and this leads DIRECTLY to an increase in the GREENHOUSE EFFECT.**

3. **BOTH of the above**

The wavelength range of infrared radiation.

What is…

1. **< 0.4 micrometers**
2. **> 0.7 micrometers** 
3. **400 – 700 nanometers**
4. **Longer wavelengths than microwaves**

The key factor that makes certain gases act as greenhouse gases!

What is…

1. **They are diatomic**

2. **They absorb shortwave radiation and emit longwave radiation**

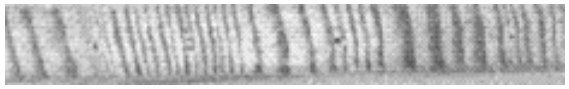
3. **They easily reflect IR radiation back to the Earth's surface**

4. **They absorb and emit infrared radiation**

The tree ring core that represents a tree that is highly SENSITIVE to climate & good for crossdating:

What is…

1. **This one:** 

2. **This one:** 

The Newton's Law that is illustrated in this cartoon:

What is…

1. **The Inverse Square Law**
2. **The Law of Inertia**
3. **The Law of Entropy**

Quantum behavior of certain molecules (bending, rotation, vibrations)

What is…

1. **Why photons leap to higher energy states**

2. **Behavior explained by Newton's Laws**

3. **The reason LE is not sensed as heat**

4. **The reason some gases are greenhouse gases and others are not.**