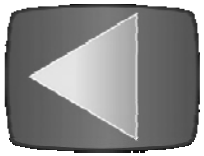
This gas is NOT a Greenhouse Gas.

What is…

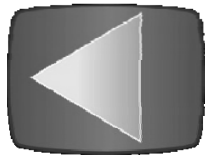
1. O_2 
2. O_3
3. CH_4
4. Freon-11 (a CFC)

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.

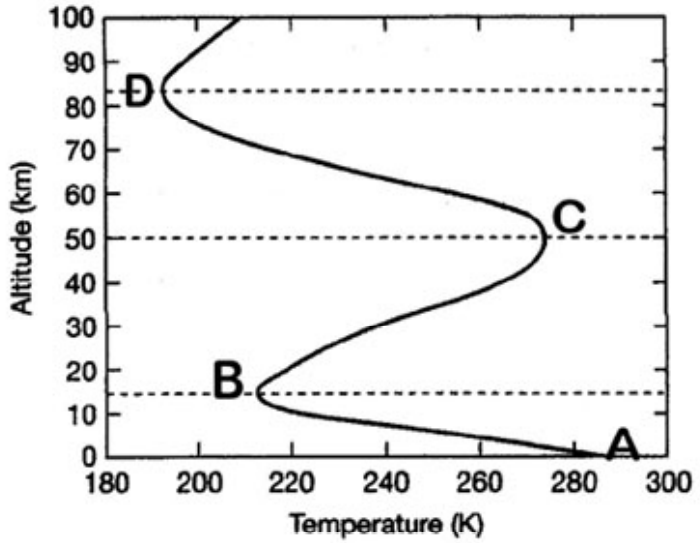
What is…

1. **Layer A - B**

2. **Layer B - C**

3. **Layer C - D**

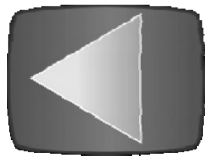
4. **Layer D and above**



The average temperature in this layer of the atmosphere gets cooler with increasing altitude.

What is the…

1. **TROPOSPHERE**



2. **TROPOPAUSE**

3. **STRATOSPHERE**

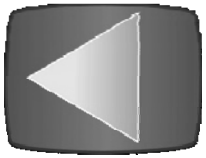
4. **THERMOSPHERE**

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.

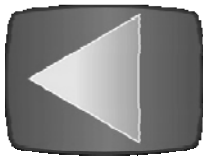
What is…

1. **Troposphere**

2. **Stratosphere**

3. **Mesosphere**

4. **Thermosphere**



The Radiation Laws that best explains why absorption curves exist.

What is…

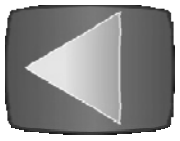
1. **The hotter the body, the shorter the wavelength** $\lambda_m = a / T$

$$E = h c / \lambda$$

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

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 reason the relatively cooler Earth radiates its energy in longwave radiation, in contrast to the Sun which radiates most of its energy in short wave radiation: **What is…**

1. **The hotter the body, the shorter the wavelength** $\lambda_m = a / T$

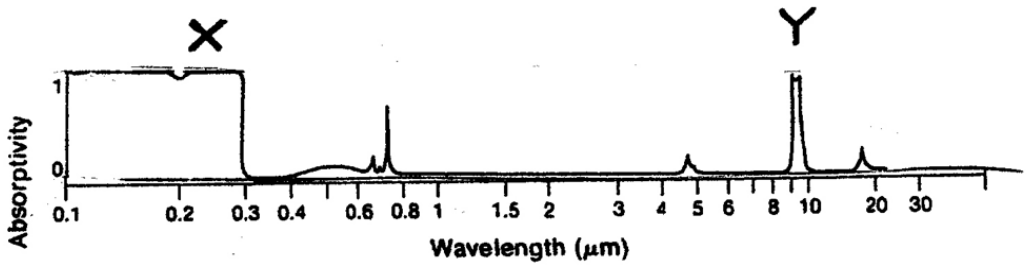
2. **Shorter electromagnetic wavelengths have higher intensity radiation than longer wavelengths** $E = h c / \lambda$

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.**

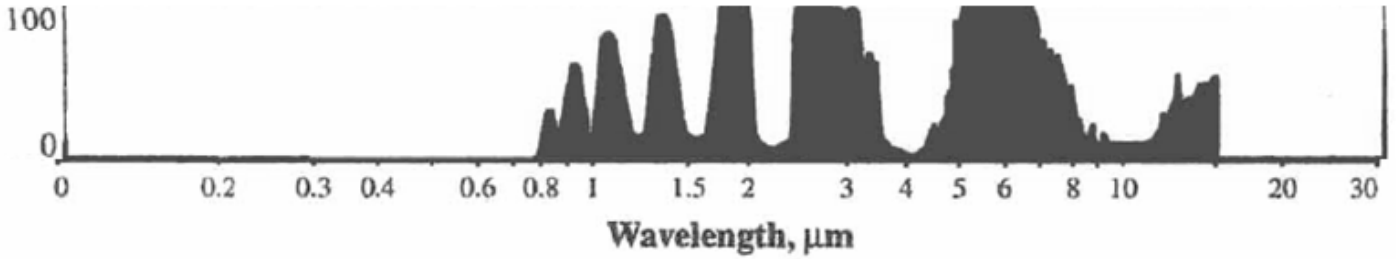
The part of this O_3 absorption curve that is linked to OZONE'S absorption of harmful UV radiation in the stratosphere.

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!**

This curve represents absorption by:



What is…

1. **A blackbody**

2. **A gas that is NOT a Greenhouse Gas**

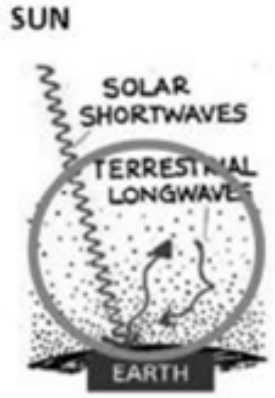
3. **All the gases in the atmosphere as a whole**

4. **A gas that absorbs ONLY infrared wavelengths of radiation**

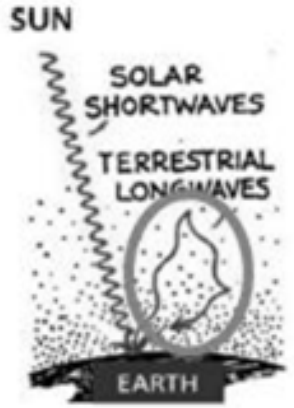
What is…

The Greenhouse Effect is best represented by the circled area in this sketch:

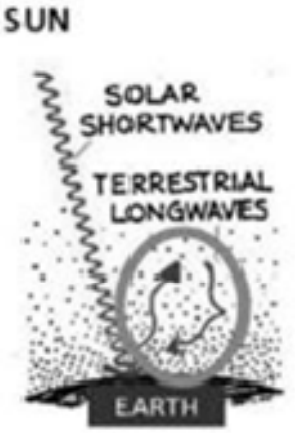
1. **This one:**



2. **This one:**



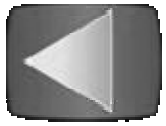
3. **This one**



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…

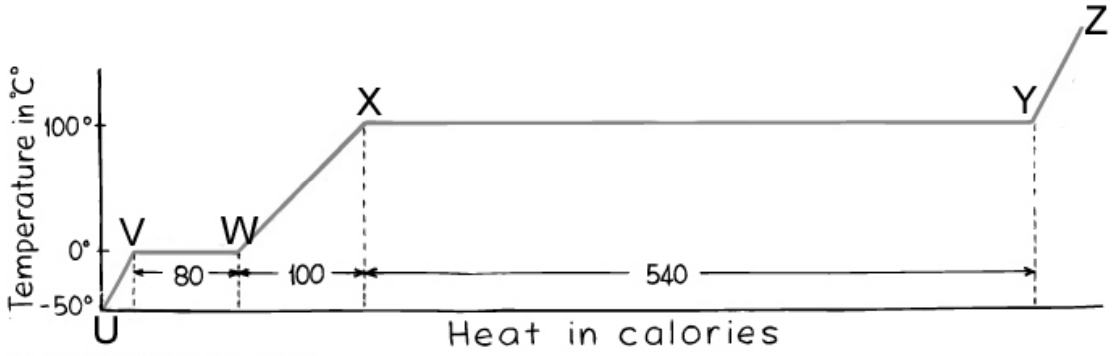
1. **The specific heat & heat capacity of WATER is higher than that of SOIL, hence water heats up more slowly than soil.**



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

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

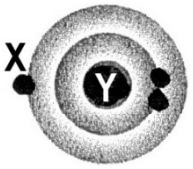
The segments of this graph that represent LATENT energy (LE)



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 nucleus of this neutral lithium atom contains.



What is…

1. **One**

2. **Two**

3. **Three**

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

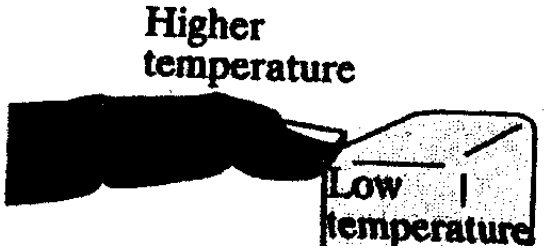
Energy transfer by means of vibrational energy from one molecule to the next through a substance.

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

<u>What is…</u>

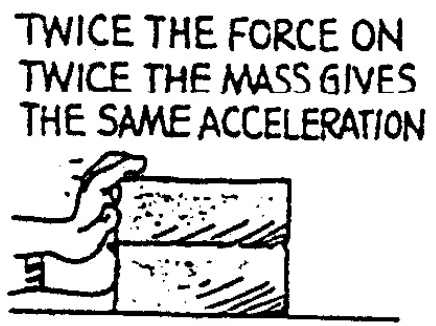


1. **By means of CONVECTION**

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 <u>need ½ as much force</u> as the Echo**

2. **The Echo will need <u>½ as much force</u> as the Hummer**

3. **The Hummer & Echo will need <u>the same</u> amount of force**

4. **The Echo will need <u>twice as much force</u> as the Hummer**

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

<u>What is…</u>

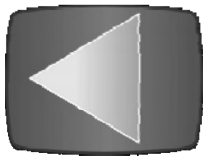
1. **The Inverse Square Law**

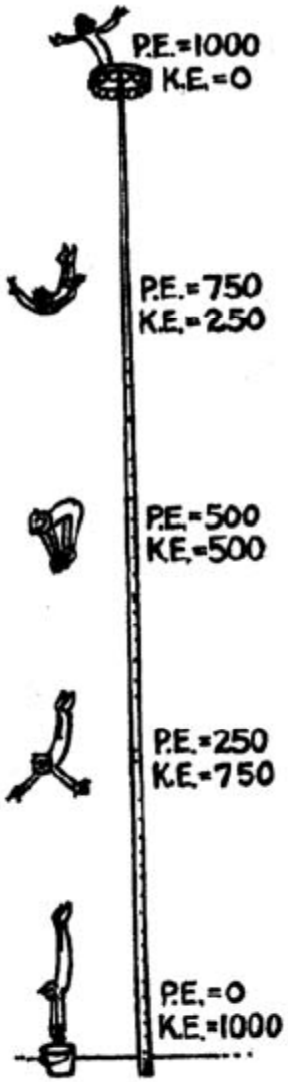
2. **The Law of Inertia**

3. **The 2nd Law of Thermodynamics.**

The term used to describe <u>motion-related</u> energy.

<u>What is…</u>

1. **Potential energy**
2. **Impulse**
3. **Kinetic energy** 
4. **Gravitational energy**



The Law of Physics illustrated by this diagram of the diver's plunge to the ground is:

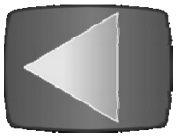
What is…

1. **Stefan-Boltzmann**
2. **Irreversibility**
3. **Sustainability**
4. **Conservation of Energy**

The word that best completes this sentence:
"Energy may not be destroyed,
but it can become _____."

What is…

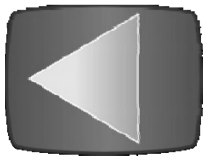
1. **Matter**
2. **Mass**
3. **Inefficient**



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**

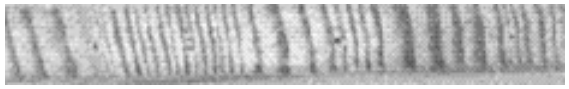
3. **They easily reflect IR radiation back to the Earth's surface**

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

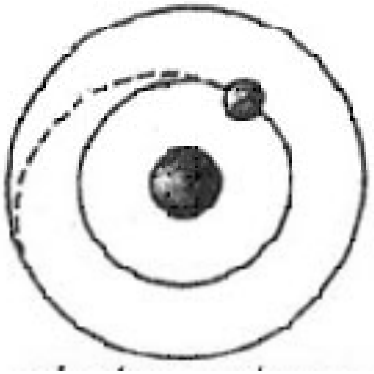
The tree ring core that represents a tree that is highly SENSITIVE to climate & good for crossdating:

What is…

1. **This one:** 

2. **This one:** 

What occurs in an atom when an electron takes a quantum leap from a higher to a lower energy level.



What is…

1. **A photon is emitted**
2. **A photon is absorbed**
3. **There is no change because energy is conserved.**

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.**