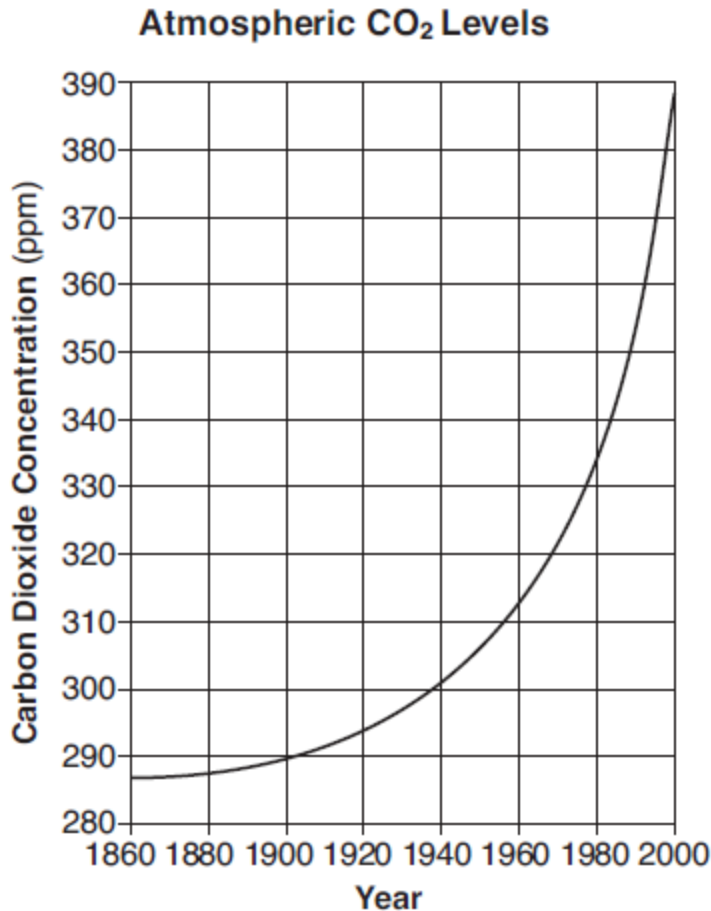


## Topic 5 - Energy

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1. The graph below shows changes in carbon dioxide concentrations in Earth's atmosphere over a 140-year period. Carbon dioxide concentrations are shown in parts per million (ppm).

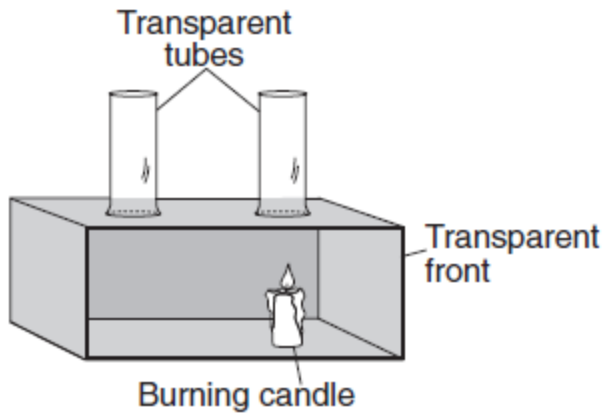


This significant change in CO<sub>2</sub> concentration is most likely caused by

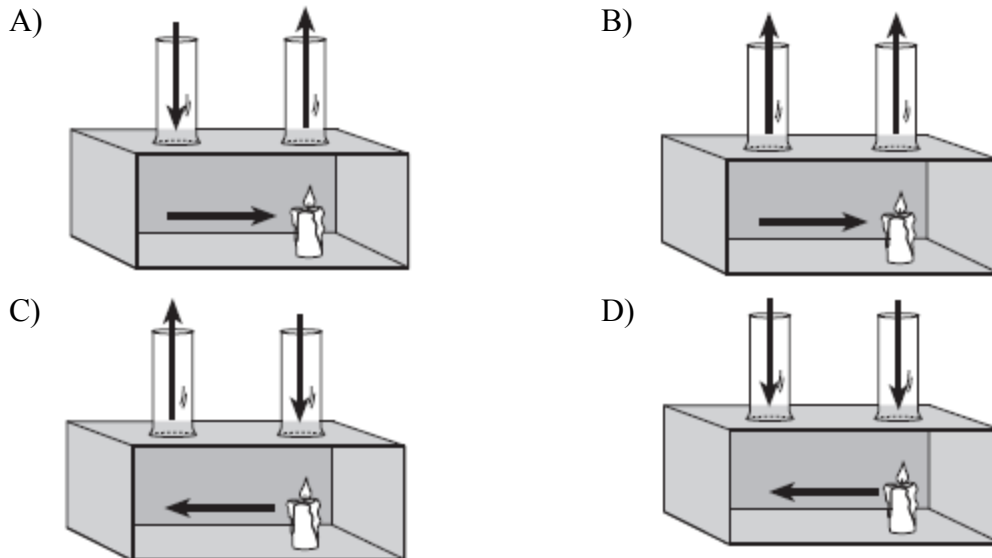
- A) decreased cloud cover, and is predicted to decrease average global temperatures
  - B) decreased volcanic activity, and is predicted to increase average global temperatures
  - C) increased use of fossil fuels, and is predicted to increase average global temperatures
  - D) increased El Niño activity, and is predicted to decrease average global temperatures
- 
2. If large amounts of dust are added to the atmosphere, the average air temperature will most likely
- A) decrease due to increased reflection of insolation
  - B) decrease due to increased infrared absorption
  - C) increase due to increased reflection of insolation
  - D) increase due to increased infrared absorption
3. What is the primary method of heat transfer through solid rock during contact metamorphism?
- A) advection
  - B) convection
  - C) absorption
  - D) conduction
4. When visible light strikes a snow-covered, flat field at a low angle, most of the energy will be
- A) absorbed by the snow
  - B) refracted by the snow
  - C) reflected by the snow
  - D) radiated by the snow
5. Conduction is the transfer of heat energy by
- A) density differences
  - B) molecular contact
  - C) electromagnetic waves
  - D) movement through a vacuum
-

## Topic 5 - Energy

6. The diagram below shows a laboratory box used to demonstrate the process of convection in the atmosphere.



Which diagram has arrows that show the direction of airflow that occurs when the candle is burning?



7. Water vapor crystallizes in the atmosphere to form snowflakes. Which statement best describes the exchange of heat energy during this process?

- A) Heat energy is transferred from the atmosphere to the water vapor.
- B) Heat energy is released from the water vapor into the atmosphere.
- C) Heat energy is transferred equally to and from the water vapor.
- D) No heat energy is exchanged between the atmosphere and the water vapor.

8. Which statement is the best example of heat energy transfer by conduction?

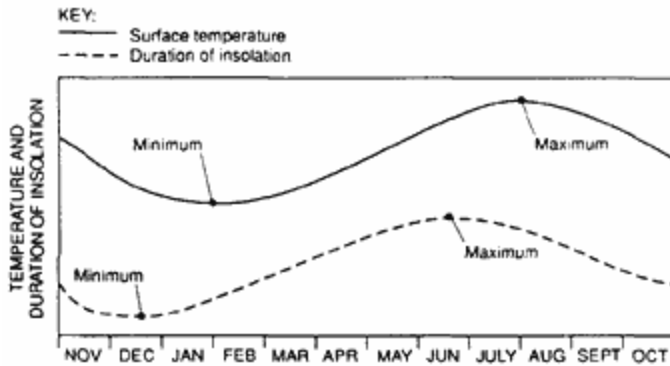
- A) Heat energy is transferred from the bottom to the top of a lake.
- B) Heat energy is transferred from the surface soil to the rocks below.
- C) Heat energy is transferred from the Earth's surface to the upper atmosphere.
- D) Heat energy is transferred from the Sun to the Earth.

9. When water vapor condenses, how much heat energy will be released into the atmosphere?

- A) 2260 joules/gram
- B) 334 joules/gram
- C) 4.18 joules/gram
- D) 2.11 joules/gram

## Topic 5 - Energy

10. The graph below shows the average daily temperatures and the duration of insolation for a location in the mid-latitudes of the Northern Hemisphere during a year.



Compared to the date of maximum duration of insolation, the date of maximum surface temperature for this location is

- A) earlier in the year  
B) later in the year  
C) the same day of the year
11. Which type of surface absorbs the greatest amount of electromagnetic energy from the Sun?
- A) smooth, shiny, and light colored  
B) smooth, shiny, and dark colored  
C) rough, dull, and light colored  
D) rough, dull, and dark colored
12. Ozone gas in the Earth's atmosphere helps to protect life on the Earth. This protection is due to the ability of ozone to absorb
- A) radio waves  
B) ultraviolet radiation  
C) gamma radiation  
D) visible light
13. What is the primary source of energy for Earth's weather systems?
- A) incoming solar radiation  
B) subtropical jet streams  
C) precipitation from clouds  
D) heat from Earth's interior

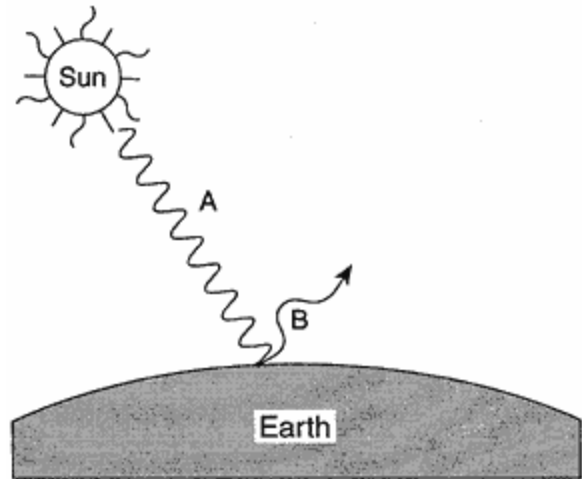
14. During which phase change will the greatest amount of energy be absorbed by 1 gram of water?

A) melting                      B) freezing  
C) evaporation                D) condensation

15. Which of the following Earth surfaces usually reflects the most incoming solar radiation?

A) snow cover                B) green grass  
C) dark soil                    D) lake water

16. The diagram below represents energy being absorbed and reradiated by the Earth.



Which type of energy is represented by the radiation at B?

A) insolation                B) visible light  
C) ultraviolet rays        D) infrared energy

17. Heat energy from the lower latitudes is transferred to colder Earth regions by planetary wind circulation mainly through the process of

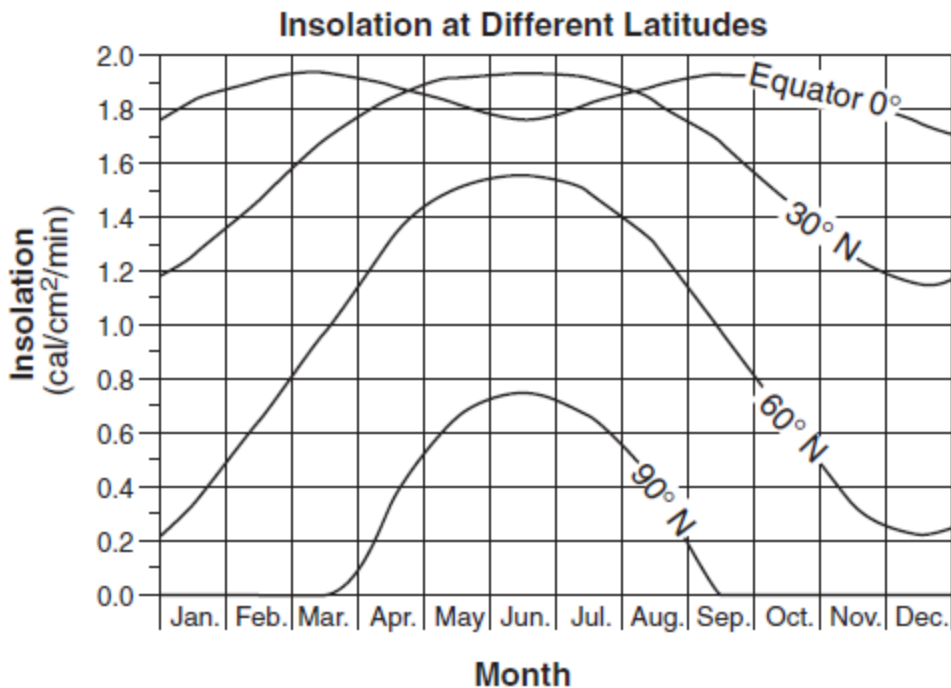
A) conduction                B) radiation  
C) convection                D) reflection

18. The upward movement of air in the atmosphere generally causes the temperature of that air to

A) decrease and become closer to the dewpoint  
B) decrease and become farther from the dewpoint  
C) increase and become closer to the dewpoint  
D) increase and become farther from the dewpoint

## Topic 5 - Energy

19. Base your answer to the following question on the graph below, which shows the amount of insolation during one year at four different latitudes on Earth's surface.

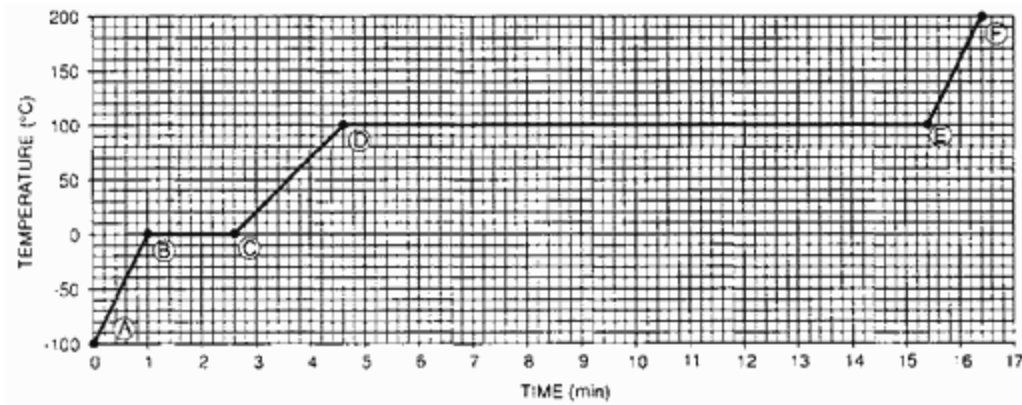


Why is insolation 0 cal/cm<sup>2</sup>/min from October through February at 90° N?

- A) Snowfields reflect sunlight during that time.  
B) Dust in the atmosphere blocks sunlight during that time.  
C) The Sun is continually below the horizon during that time.  
D) Intense cold prevents insolation from being absorbed during that time.
20. An ice cube is placed in a glass of water at room temperature. Which heat exchange occurs between the ice and the water within the first minute?
- A) The ice cube gains heat and the water loses heat.  
B) The ice cube loses heat and the water gains heat.  
C) Both the ice cube and the water gain heat.  
D) Both the ice cube and the water lose heat.
21. Energy is transferred from the Sun to Earth mainly by
- A) molecular collisions  
B) density currents  
C) electromagnetic waves  
D) red shifts
22. The diagram below shows a solid iron bar that is being heated in a flame.
- 
- The primary method of heat transfer in the solid iron bar is
- A) convection                      B) conduction  
C) absorption                      D) advection

## Topic 5 - Energy

23. Base your answer to the following question on "the graph below which shows the temperatures recorded when a sample of water was heated from  $-100^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ . The water received the same amount of heat every minute.



The greatest amount of energy was absorbed by the water between points

- A) *A* and *B*      B) *B* and *C*      C) *C* and *D*      D) *D* and *E*
24. The diagram below shows four surfaces of equal area that absorb insolation.



Which letter represents the surface that most likely absorbs the greatest amount of insolation?

- A) A      B) B      C) C      D) D

## Topic 5 - Energy

25. The air above a burning candle is heated and rises. Which table correctly identifies the type of heat transfer within the rising air and the change in air density above the burning candle?

A) 

Type of Heat Transfer	Change in Air Density
conduction	density increases

B) 

Type of Heat Transfer	Change in Air Density
conduction	density decreases

C) 

Type of Heat Transfer	Change in Air Density
convection	density increases

D) 

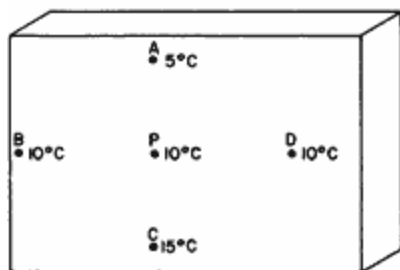
Type of Heat Transfer	Change in Air Density
convection	density decreases

26. The data table below shows the temperatures of two similar objects for 10 minutes after the objects were placed near each other.

Time (minutes)	Temperature (°C)	
	Object A	Object B
0	32	18
2	29	19
4	26	20
6	25	20
8	24	21
10	23	21

Which statement is best supported by the data?

- A) Some of the heat energy lost by object *B* was gained by object *A*.  
 B) Most of the heat energy lost by object *A* was gained by the environment.  
 C) Both objects lost heat energy.  
 D) Both objects gained heat energy.
27. The diagram below shows temperature values at various points in a solid piece of aluminum. Toward which point will heat flow from point *P*?



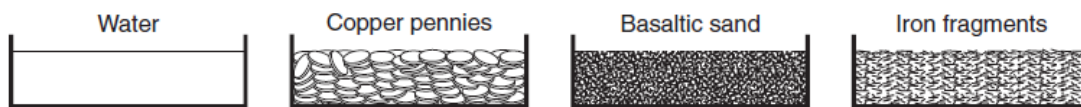
- A) *A*    B) *B*    C) *C*    D) *D*

28. By which process is heat energy transferred when molecules within a substance collide?

- A) conduction                      B) convection  
 C) radiation                        D) sublimation
29. Most insolation striking a smooth, light-colored, solid surface is
- A) refracted                        B) transmitted  
 C) reflected                        D) absorbed
30. The intensity of insolation at solar noon from November 1 to February 1 in New York State will
- A) decrease, only  
 B) increase, only  
 C) decrease, then increase  
 D) increase, then decrease
31. Infrared, ultraviolet, and visible light are all part of the solar spectrum. The basic difference between them is their
- A) wavelength                      B) speed  
 C) source                            D) temperature
32. As the temperature of an object approaches absolute zero (0° K), the amount of electromagnetic energy radiated by the object will
- A) decrease                        B) increase  
 C) remain the same
33. Which source provides the most energy for atmospheric weather changes?
- A) radiation from the Sun  
 B) radioactivity from the Earth's interior  
 C) heat stored in ocean water  
 D) heat stored in polar ice caps

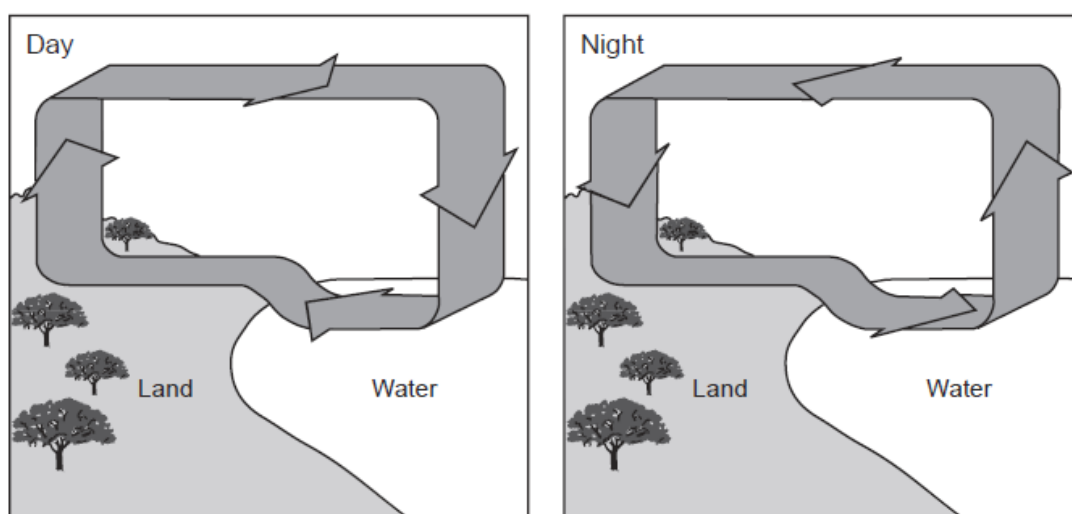
## Topic 5 - Energy

34. Equal volumes of the four samples shown below were placed outside and heated by energy from the Sun's rays for 30 minutes.



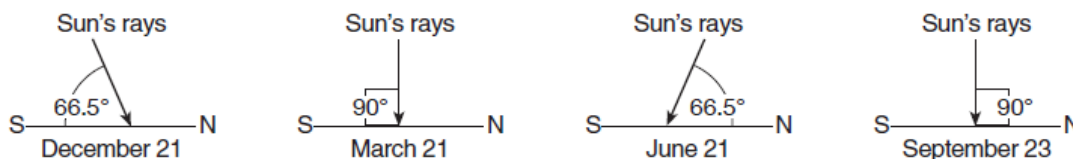
The surface temperature of which sample increased at the *slowest* rate?

- A) water      B) copper pennies      C) basaltic sand      D) iron fragments
35. The diagram below represents the circulation of air above Earth's surface at a coastal location during the day and at night.



This local air movement is best described as an example of

- A) conduction between Earth's surface and the atmosphere above it  
B) condensation of water vapor during the day, and evaporation of water during the night  
C) convection resulting from temperature and pressure differences above land and water  
D) greater radiation from the warmer ocean during the day and from the warmer land at night
36. The diagrams below represent the compass direction and altitude of the Sun's rays at noon for a location on Earth on four different dates.

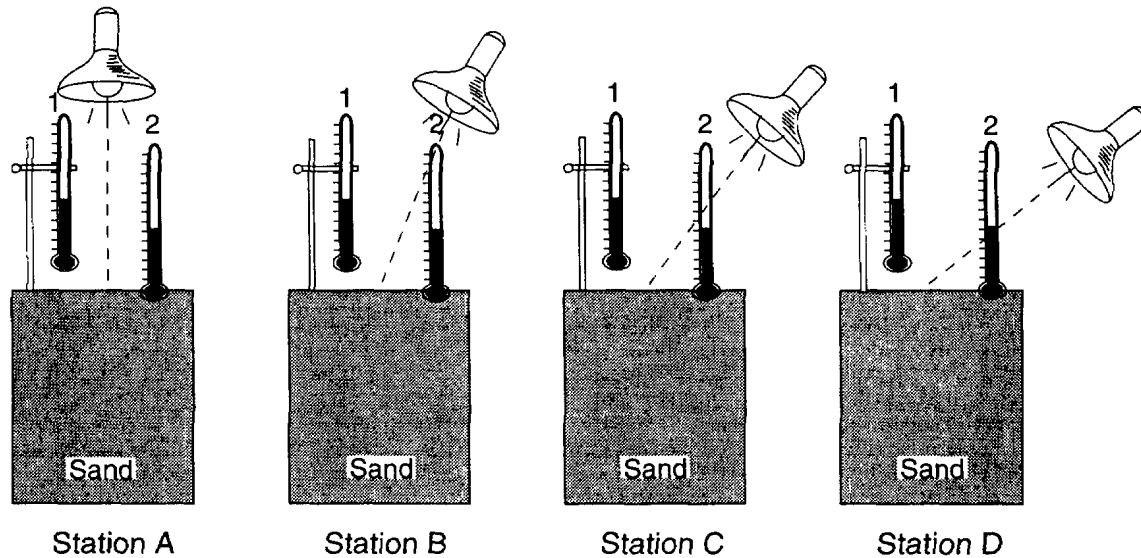


What is the latitude of this location?

- A) 0°      B) 23.5° N      C) 23.5° S      D) 90° N

## Topic 5 - Energy

37. Base your answer to the following question on the diagram below, which represents four stations, *A*, *B*, *C*, and *D*, in a laboratory investigation in which equal volumes of sand at the same starting temperature were heated by identical light sources. The light sources were the same distance from each station, but at different angles to the surfaces. Two thermometers were used at each station, one just above the surface and the other just below the surface. The lights were turned on for 30 minutes and then removed for the next 30 minutes. Temperatures were recorded each minute for the 60 minutes.



(Not drawn to scale)

Most of the energy from the light sources was transferred to the sand by the process of

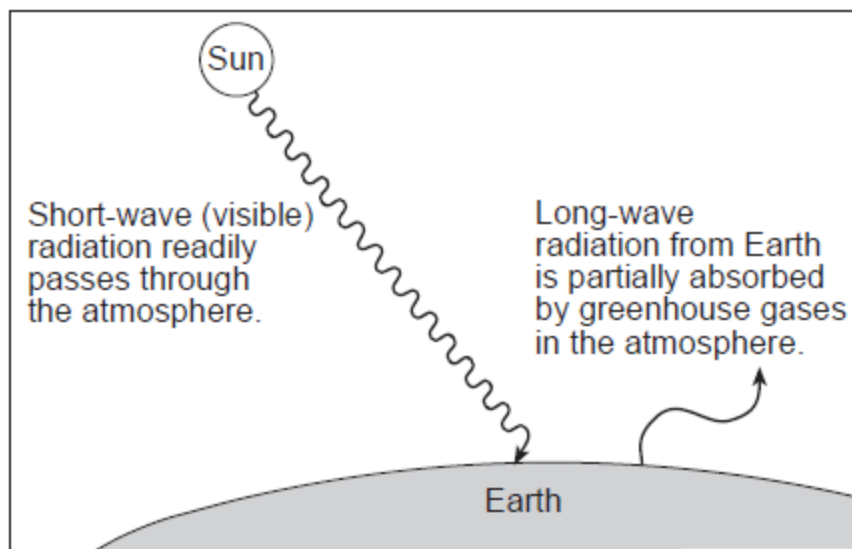
- A) conduction    B) convection    C) radiation    D) transpiration
- 
38. Which statement best describes the major heat flow associated with an iceberg as it drifts south from the Arctic Ocean into warmer water?
- A) Heat flows from the water into the ice.  
B) Heat flows from the ice into the water.  
C) A state of equilibrium exists, with neither ice nor water gaining or losing energy.  
D) Heat flows equally from the ice and the water into the surrounding air.
39. By which process do light rays pass through window glass?
- A) conduction    B) convection  
C) radiation    D) compression
40. An increase in which gas would cause the most greenhouse warming of Earth's atmosphere?
- A) nitrogen    B) oxygen  
C) carbon dioxide    D) hydrogen



## Topic 5 - Energy

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41. Base your answer to the following question on the diagram below, which represents the greenhouse effect in which heat energy is trapped in Earth's atmosphere



(Not drawn to scale)

The Earth surface that best absorbs short-wave solar radiation has which characteristics?

- A) black and rough
- B) black and smooth
- C) white and rough
- D) white and smooth