

The background is a solid dark blue. In the corners, there are decorative clusters of geometric shapes: top-left has yellow triangles, orange circles, and a blue circle; top-right has a blue triangle, an orange circle, and a cyan circle; bottom-left has yellow and blue triangles, orange circles, and a pink circle; bottom-right has orange and pink triangles, a dashed white circle, and a white circle. A large blue triangle is on the left, and a large yellow circle is on the right, overlapping the blue triangle.

# Thermal energy transfers

PRESENTATION BY AIKYA

# Learning objectives



## Conduction

Method of energy transfer 1



## Convection

Method of energy transfer 2



## Radiation

Method of energy transfer 3



## Consequences of thermal energy transfer


The slide features a dark blue background with decorative geometric patterns in the corners. The top-left corner has yellow triangles, orange circles, and a blue circle. The top-right corner has a blue triangle, an orange circle, and a cyan circle. The bottom-left corner has yellow and blue triangles, orange circles, and a pink circle. The bottom-right corner has yellow triangles, orange circles, and a pink circle.

**1**

# **Ways of energy transfers**



## Conduction

- Energy shared by vibrating particles without actual movement
  - Transfer of energy from the hotter to colder region
  - Through direct contact
  - In solids
- 




## Convection

- Particles expand on heating and rise due to low density & colder ones settle
- Continuous currents
- Actual movement of particles
- In fluids



## Radiation

- All objects radiate heat energy
  - No contact/ movement of particles
  - No medium required
- 

# Conductors and Insulators

## Conductors

A material that allows heat energy to pass through it or conducts heat.

## Insulators



A material that doesn't conduct heat or doesn't allow heat energy to pass through it.

Conductors	Insulators
Gold	Paper
Silver	Dry Wood
Copper	Ceramic
Iron	Rubber
graphite	Dry plastic
bronze	Glass
mercury	Air
Dirty water	Pure water



# Good absorbers, good emitters



- ❑ Shiny or white surfaces are the best reflectors or the worst absorbers.
  - ❑ Matt black surfaces are the best absorbers or the worst reflectors.
  - ❑ Matt black surfaces are the best emitters
- 
- 



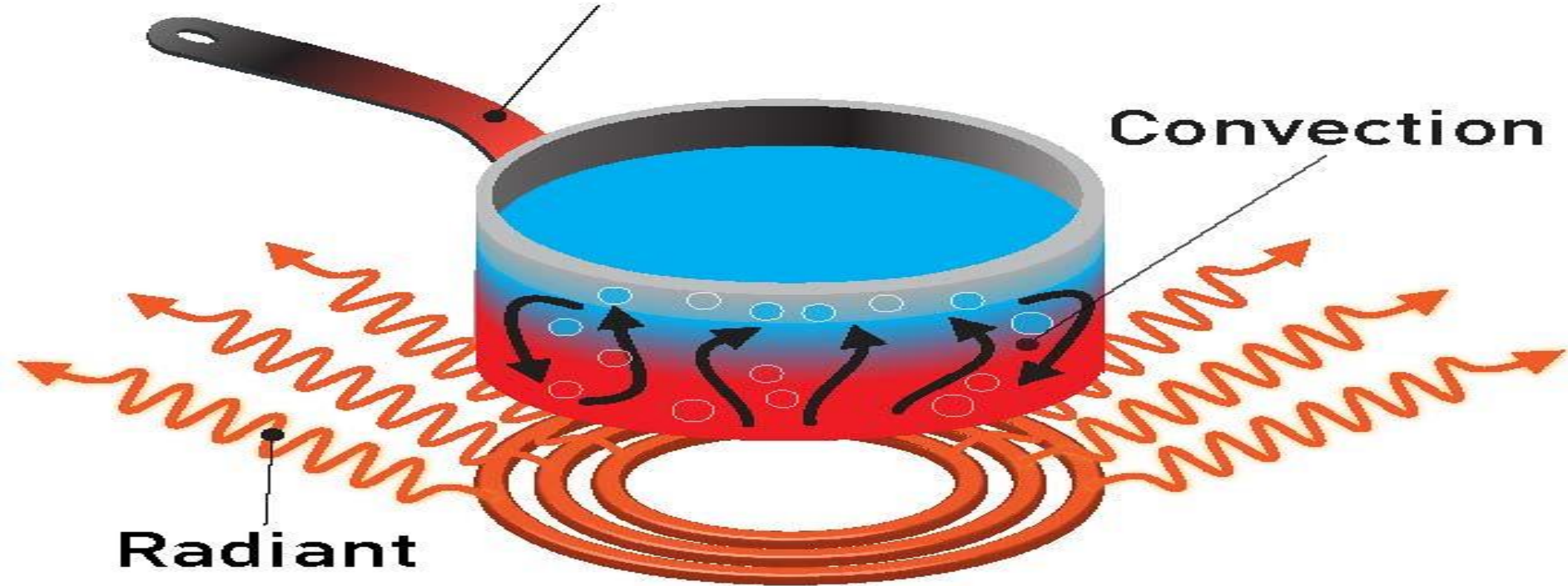
# EXAMPLES

of conduction, convection and radiation

**Conduction**

**Convection**

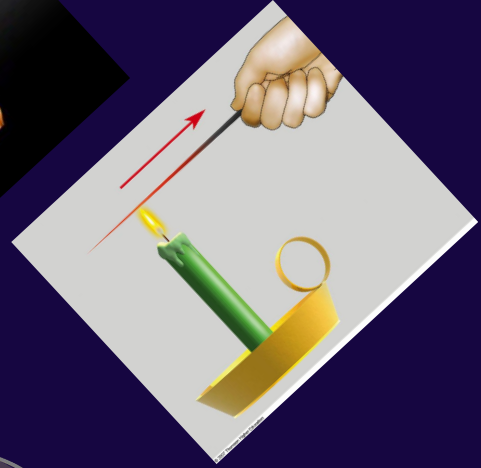
**Radiant**





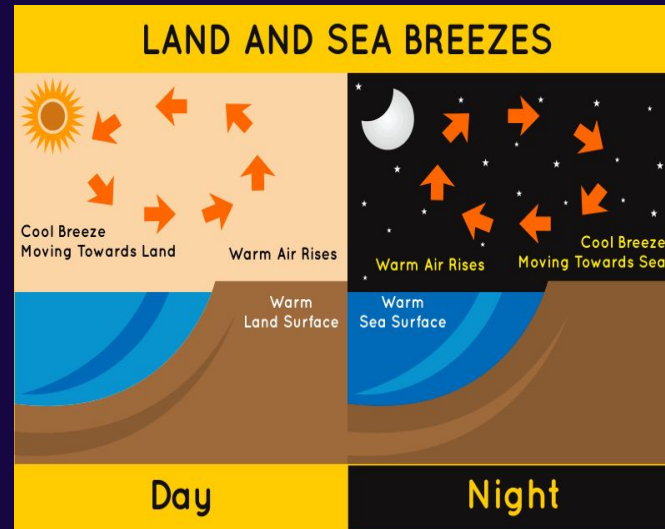
# Conduction

1. Hot handle of a hot vessel being heated
2. Hot metal heated by a candle
3. Spoon in hot coffee



# Convection

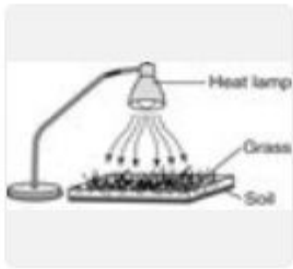
1. Land breeze and sea breeze
2. Room heaters



# Radiation

1. Hands around candle
2. Black car under sun gets hot





Q. Josh is studying how Earth is warmed by sunlight. The illustration above shows his model of the sun and Earth. Which process is **mostly** responsible for warming the soil in Josh's model?

answer choices

Conduction between the lamp and the soil causes the soil to warm.

Expansion of particles in the soil causes the soil to warm.

Convection currents between the lamp and the soil cause the soil to warm.

Radiation from the lamp reaches the soil and causes the soil to warm.

**RADIATION- OPTION D**



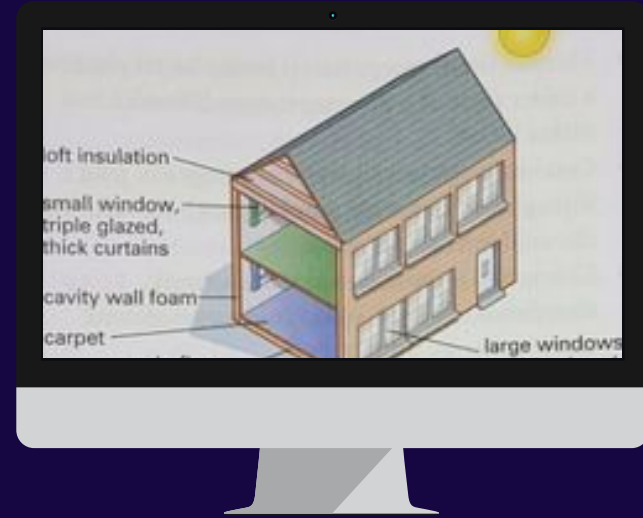
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## Consequences of energy transfers



# Insulation

- To minimise the loss of thermal energy
- From ceiling by loft insulation
- From walls by cavity wall insulation
- Underfloor by carpets
- From windows by double glazing or triple glazing (vacuum between glass panes)



# Convection, climate and weather

Warm air  
rises above  
the equator

Cold air sinks  
in subtropical  
areas

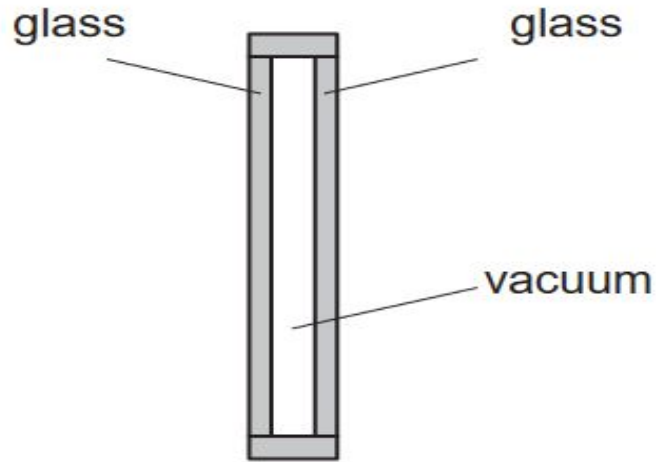
Ocean currents  
help spread  
warmth to  
colder regions

# Vacuum flasks





One type of double glazing consists of two panes of glass separated by a vacuum.



Which method or methods of energy transfer are prevented by the vacuum?

- A conduction and convection
- B conduction and radiation
- C convection and radiation
- D radiation only.

**OPTION A**



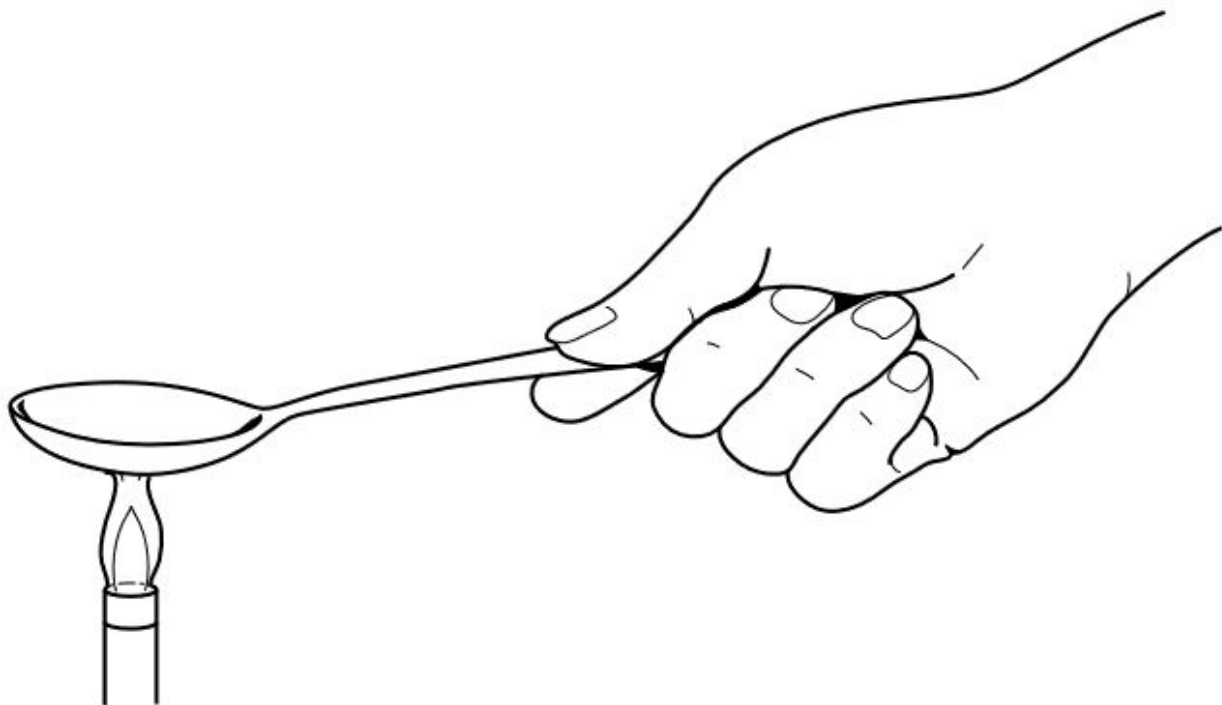
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**SOLVED EXAMPLES**



An archaeologist digging at an ancient site discovers a spoon. The spoon is made from an unidentified material.

- (a) The archaeologist suspects that the spoon is made of metal. She places it above a flame, as shown in Fig. 1.1.



- 
- 
- a) She notices that the handle of the spoon quickly becomes very hot. State why this observation supports the suggestion that the spoon is made of metal.

**ANS-METALS ARE GOOD CONDUCTORS OF HEAT**

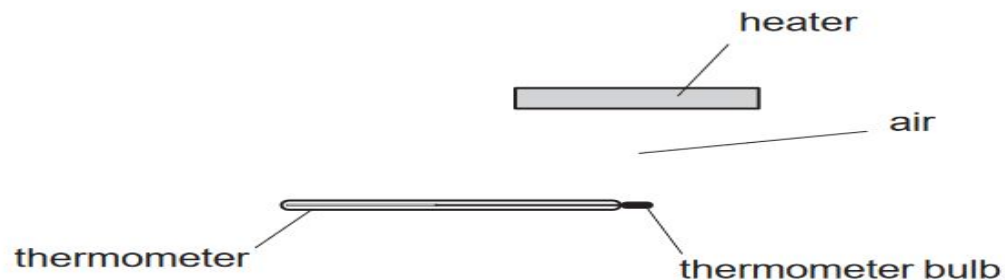
- b) Describe, in terms of its atoms, how thermal energy is transferred through a metal.

**ANS-**

**THE HEATED ATOMS SHARE THEIR ENERGY WITH THE SURROUNDING ATOMS. THE PARTICLES START VIBRATING AND THE TRANSFER OF ENERGY TO THE COLDER REGION BY CONDUCTION.**



The diagram shows a heater above a thermometer. The thermometer bulb is in the position shown.

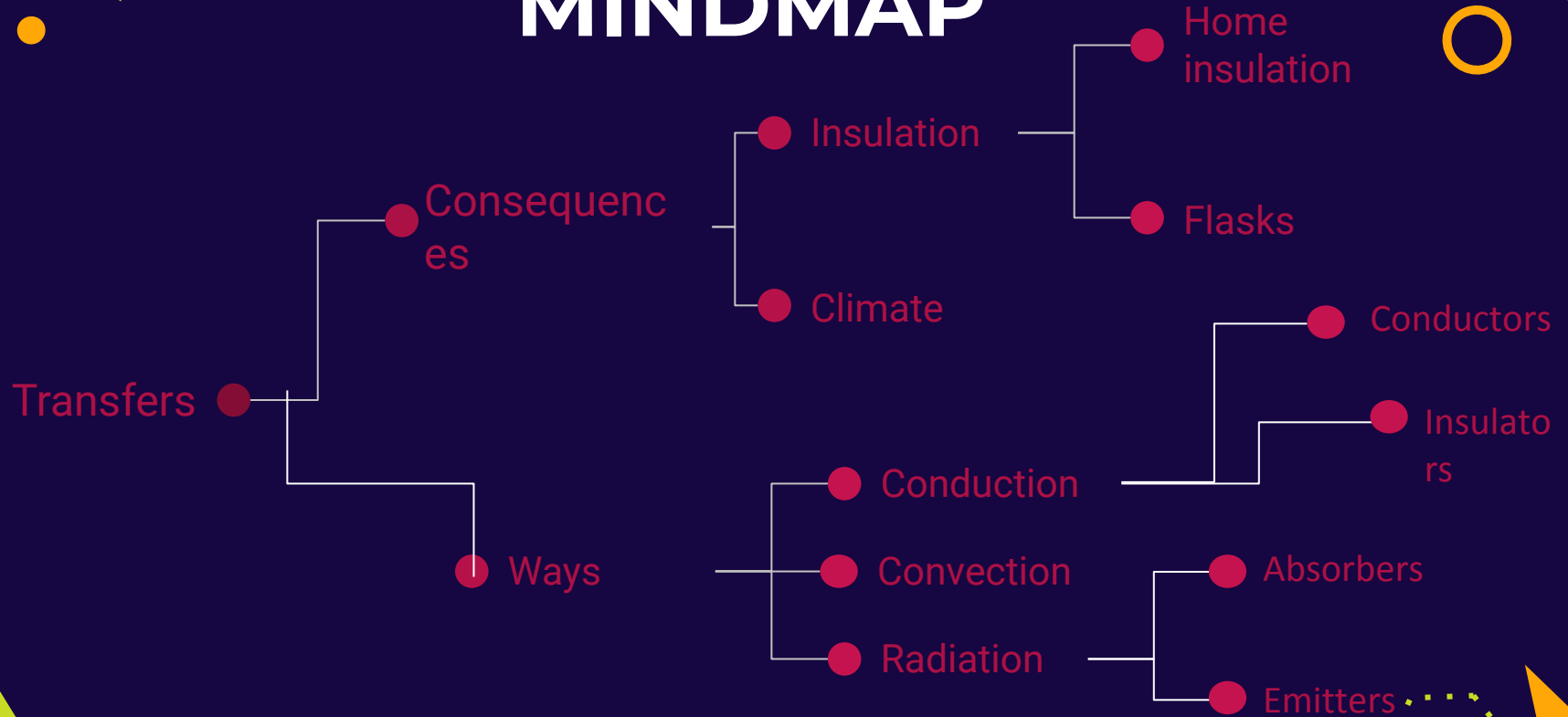


Which row shows how the heat energy from the heater reaches the thermometer bulb?

	conduction	convection	radiation
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

OPTION D

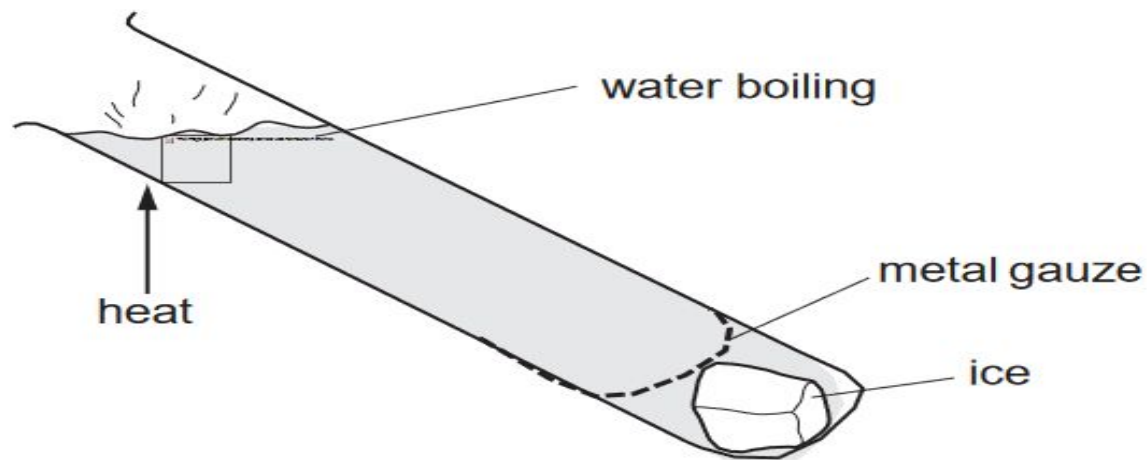
# MINDMAP



The image features a dark blue background with the text "ITS YOUR TURN NOW! READY FOR SOME QUESTIONS?" in large, white, sans-serif capital letters. The text is centered and occupies the middle portion of the frame. In the four corners, there are decorative clusters of geometric shapes. The top-left corner has yellow triangles, orange circles, and a blue circle. The top-right corner has a blue triangle, an orange circle, and a cyan circle. The bottom-left corner has yellow and blue triangles, pink circles, and a yellow circle. The bottom-right corner has yellow and orange triangles, a pink circle, and a dashed yellow circle.

ITS YOUR TURN  
NOW! READY FOR  
SOME QUESTIONS?

Ice is trapped by a metal gauze at the bottom of a tube containing water. The water is heated strongly at the top, but the ice only melts very slowly.



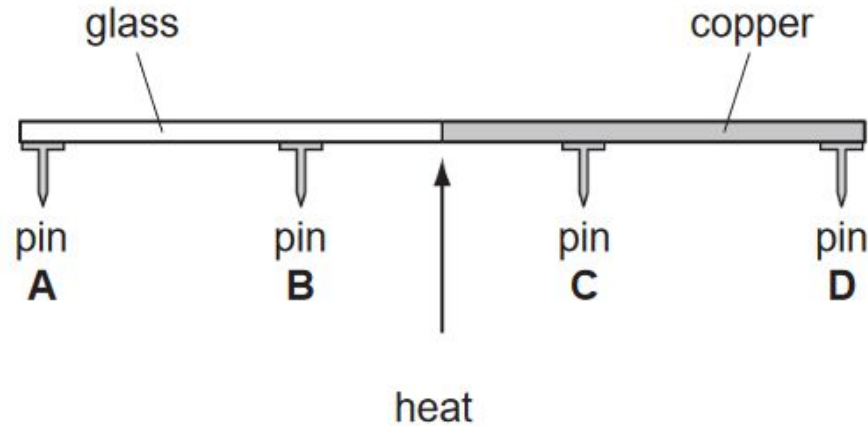
Why does the ice melt so slowly?

- A. Heat energy always travels upwards.
- B. Hot water is more dense than cold water.
- C. Metal gauze does not allow heat to pass through.
- D. Water is a poor conductor of heat.



A rod is made half of glass and half of copper. Four pins, A, B, C and D are attached to the rod by wax. The rod is heated in the centre as shown.

Which pin falls off first?



Four identical metal plates, at the same temperature, are laid side by side on the ground. The rays from the Sun fall on the plates.

One plate has a matt black surface.

One plate has a shiny black surface.

One plate has a matt silver surface.

One plate has a shiny silver surface.

State which plate has the fastest-rising temperature when the sunlight first falls on the plates.

Which statement about the transfer of thermal energy is correct?

- A. All metals conduct thermal energy equally well.
- B. Convection can only occur in solids or liquids.
- C. Convection occurs in liquids because hot liquid is more dense than cold liquid.
- D. The radiation that transfers thermal energy is a type of electromagnetic radiation.



# Thanks

Any questions?

