Sc!ence

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Multiple Choice Questions on the Transfer of Thermal Energy

1. Which statement about the transfer of thermal energy is correct?

A All metals conduct thermal energy equally well.

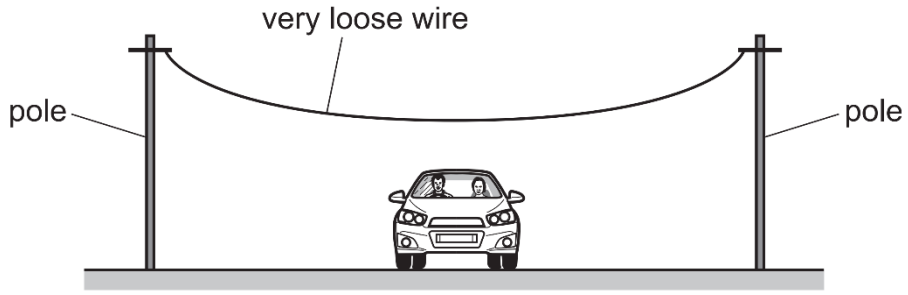
B Convection can only occur in solids or liquids.

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.

2. A telephone engineer connects a wire between two poles when the weather is very cold.

He makes the wire very loose. The wire passes over a road.



The weather changes and it becomes very hot.

What could happen to the wire and why?

	what could happen	why
A	it breaks	it contracts
B	it breaks	it expands
C	it sags and touches cars on the road	it contracts
D	it sags and touches cars on the road	it expands

3. To mark a temperature scale on a thermometer, standard temperatures known as fixed points are needed.

Which of these is a fixed point on the Celsius scale?

A Room temperature.

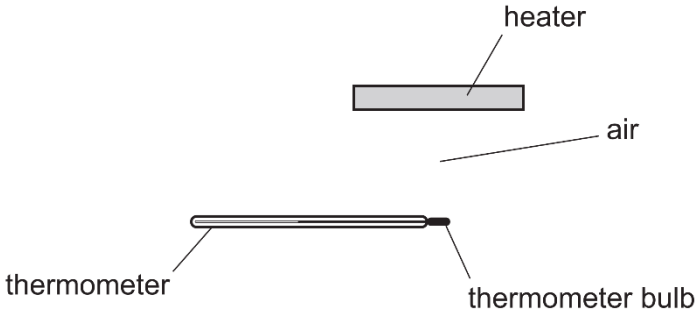
B The temperature inside a freezer.

C The temperature of pure melting ice.

D The temperature of pure warm water.

4. The diagram shows a heater above a thermometer.

The thermometer bulb is in the position shown.

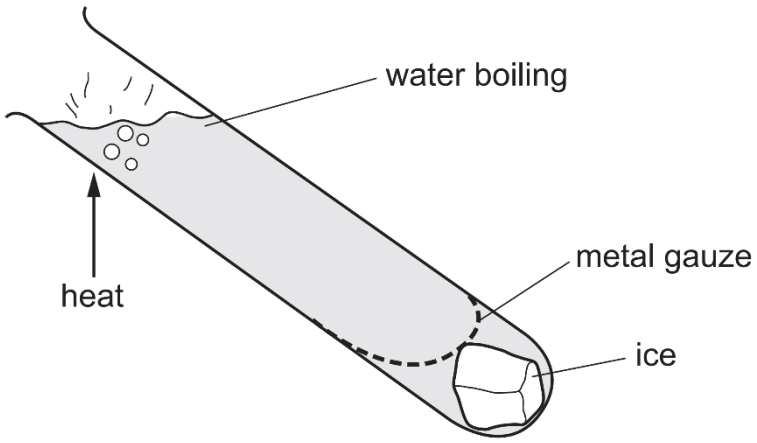


Which row shows how the heat energy from the heater reaches the thermometer bulb?

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

5. 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.

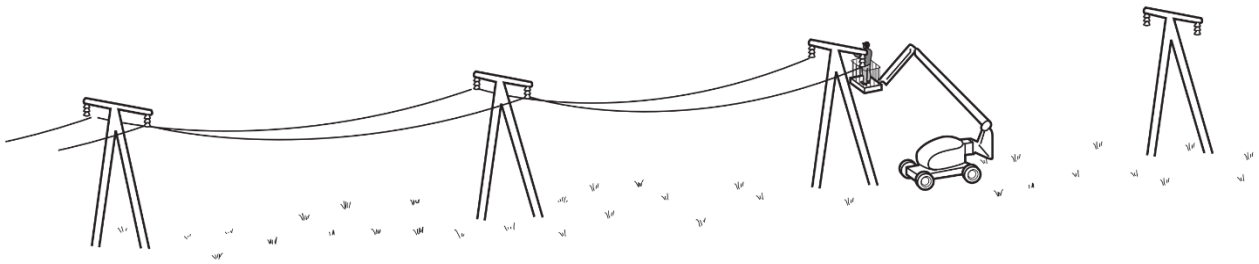
B Hot water is more dense than cold water.

C Metal gauze does not allow heat to pass through.

D Water is a poor conductor of heat.

6. The diagram shows electricity cables being put up on a warm day.

The cables are left loose between the poles, as shown in the diagram.



Why are the cables left loose?

A They will contract on cold days.

B They will contract on very warm days.

C They will expand on cold days.

D They will expand on very warm days.

7. A cotton sheet is ironed with a hot electric iron.

How is energy transferred through the metal base of the iron to the sheet?

A By conduction only.

B By convection only.

C By radiation only.

D By convection and radiation only.

8. One end of a copper rod is heated.

What is one method by which thermal energy is transferred in the copper rod?

A Free electrons transfer energy from the cooler end to the hotter end.

B Free electrons transfer energy from the hotter end to the cooler end.

C Molecules of copper move from the cooler end to the hotter end.

D Molecules of copper move from the hotter end to the cooler end.

9. When a thermometer is calibrated, the fixed points are marked.

What are fixed points?

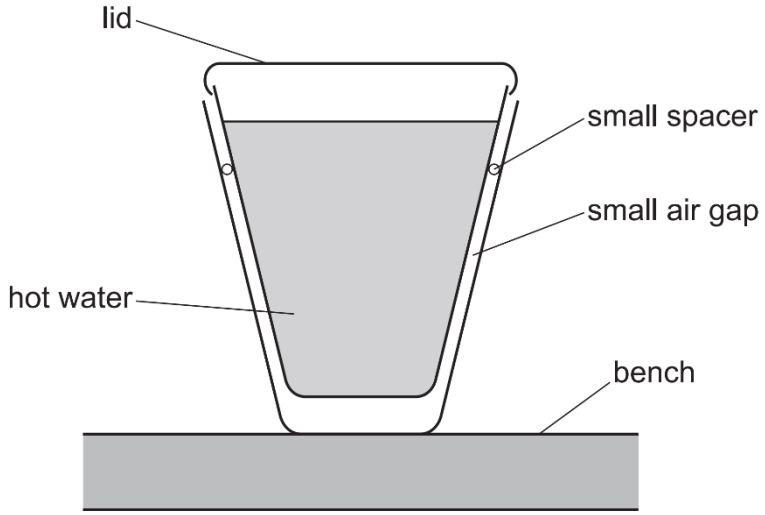
A All the marks on the temperature scale which cannot be removed.

B All the marks of the temperature scale.

C The lowest and highest temperatures shown on the thermometer.

D Two temperatures of known value which are easily reproduced.

10. Two plastic cups are placed one inside the other. A small spacer keeps the two cups separated. Hot water is poured into the inner cup and a lid is put on top, as shown.



Which statement is correct?

A The bench is heated by convection from the bottom of the outer cup.

B The lid reduces the energy lost by convection.

C There is no thermal conduction through the sides of either cup.

D Thermal radiation is prevented by the small air gap.

11. A substance can exist in three different states: solid, liquid or gas.

Each of the two statements below describes a change of state.

Change 1:	Molecules move closer together but continue to travel throughout the substance.
Change 2:	Molecules stop travelling throughout the substance and just vibrate about fixed positions.

Which changes of state do these statements describe?

	Change 1	**Change 2**
A	condensation	melting
B	condensation	solidification
C	solidification	condensation
D	solidification	melting

12. Four thermometers, with their bulbs painted different colours, are placed at equal distances from a radiant heater.

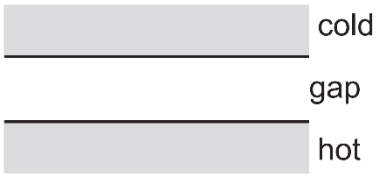
Which thermometer shows the slowest temperature rise when the heater is first switched on?

A Matt black **B** Matt white

C Shiny black **D** Shiny white

13. The diagram shows the gap between a hot surface and a cold surface.

The gap can contain air, solid iron, a vacuum or liquid water.



Which row shows whether heat can be transferred between the surfaces by conduction and convection?

	gap	conduction	convection
A	air (gas)	yes	no
B	iron (solid)	yes	no
C	vacuum	no	yes
D	water (liquid)	yes	no

14. Four objects, made of the same material and having the same mass, are at the same temperature. The objects have different surfaces and different surface areas.

Which object emits infra-red radiation at the greatest rate?

	surface	surface area
A	dull	large
B	dull	small
C	shiny	large
D	shiny	small

15. On a cold day, a metal front-door knob **X** and a similar plastic knob **Y** are at the same temperature.

Why does **X** feel cooler to the touch than **Y**?

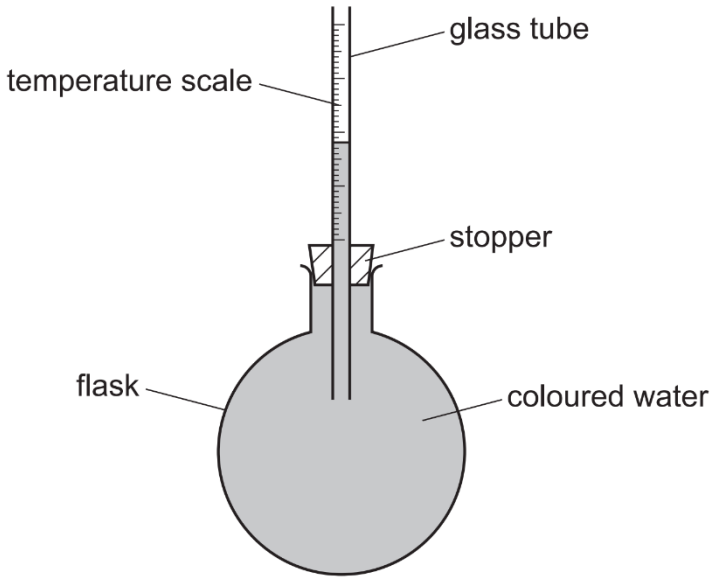
A **X** convects thermal energy better than **Y**.

B **X** is a better thermal conductor than **Y**.

C **X** is a better insulator than **Y**.

D **X** is a better radiator of thermal energy than **Y**.

16. A model thermometer consists of a flask of coloured water and a stopper with a glass tube passing through it, as shown.



The model thermometer can be changed in one of two ways.

- The flask can be replaced with a larger one full of coloured water.
- The glass tube can be replaced with one with a larger internal diameter.

Which statement is correct?

A Only using a larger flask increases the sensitivity.

B Only using a wider tube increases the sensitivity.

C Using a larger flask increases the sensitivity and using a wider tube increases the sensitivity.

D Neither using a larger flask nor using a wider tube increases the sensitivity.

17. On a warm day, a carton of fresh milk is covered with a wet cloth.

Why does this help to reduce the temperature of the milk?

A Some water evaporates from the cloth so the remaining water becomes cooler.

B The water has a very high thermal capacity.

C The water insulates the milk from the warm air around it.

D Water is always colder than the air around it.

18. A liquid is heated and it expands.

How does this lead to the formation of a convection current?

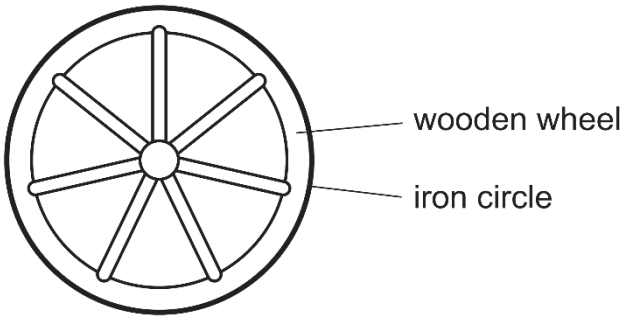
A The density of the heated liquid decreases.

B The density of the heated liquid increases.

C The mass of the heated liquid molecules decreases.

D The mass of the heated liquid molecules increases.

19. A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

A Cooling the iron circle.

B Heating the iron circle.

C Heating the wooden wheel and cooling the iron circle.

D Heating the wooden wheel but not heating or cooling the iron circle.

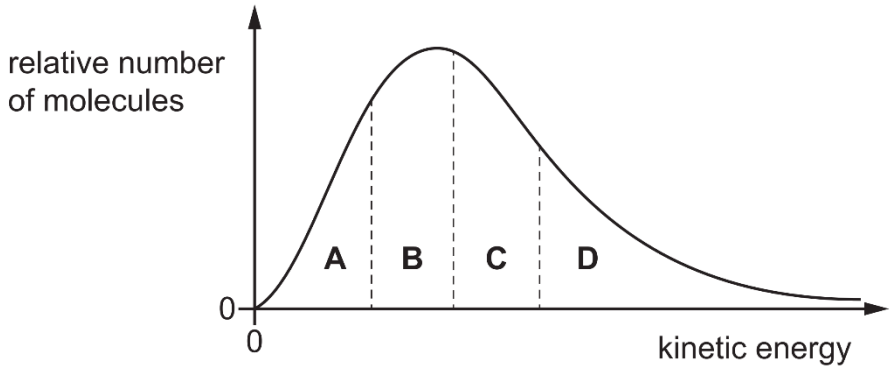
20. Which row gives the correct name for each change of state shown?

	change of state		
	gas to liquid	liquid to solid	solid to liquid
A	condensation	melting	solidification
B	condensation	solidification	melting
C	evaporation	melting	solidification
D	evaporation	solidification	melting

21. The diagram shows the relative number of molecules in a liquid that have a given kinetic energy.

The graph is divided into sections so that each section contains the same number of molecules.

From which section does the greatest number of molecules escape from the liquid per unit time?



22. A pure liquid is left in an open beaker and some of the liquid molecules escape by evaporation.

Which statement about this process is correct?

A None of the escaping molecules return to the liquid.

B The escaping molecules are generally the more energetic ones.

C The rate of escape of the molecules can be increased by increasing the depth of the liquid in the beaker.

D The temperature of the remaining liquid is unaffected by the escape of the molecules.

23. When a liquid evaporates, some molecules escape.

The temperature of the remaining liquid changes.

What is the effect on the temperature and from where do the molecules escape?

	temperature of the liquid	molecules escape from
A	decreases	everywhere within the liquid
B	decreases	the surface only
C	increases	everywhere within the liquid
D	increases	the surface only

24. The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

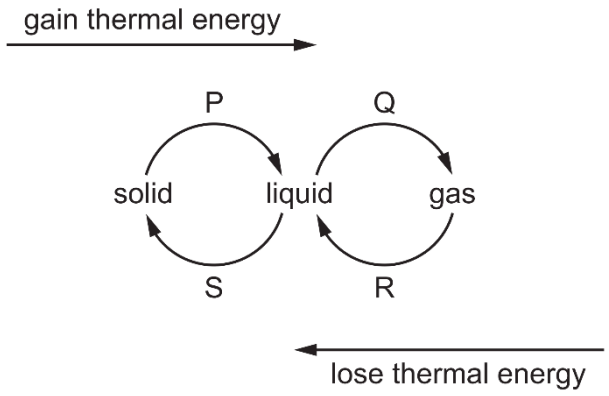
A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

25. The diagram shows the changes of state **P**, **Q**, **R** and **S** that occur in solids, liquids and gases when they gain or lose thermal energy.



What is the name of change **R**?

A Condensation

B Solidification

C Boiling

D Melting

26. Vacuum flasks usually have silvered walls that help to keep the contents of the flask hot.

Why are the walls silvered?

A To absorb thermal energy from the air around the flask.

B To increase the rate of convection inside the flask.

C To reduce energy loss to the surroundings by conduction.

D To reflect thermal radiation back into the flask.

27. On a hot summer day, the level of the water in a pond falls.

Which statement explains this?

A The least energetic water molecules escape from the surface and do not return.

B The least energetic water molecules escape from the surface and then return.

C The most energetic water molecules escape from the surface and do not return.

D The most energetic water molecules escape from the surface and then return.

28. A person holds an empty glass beaker and pours hot water into it.

Why does it take a few seconds before her hand starts to feel hot?

A Glass is a poor conductor of heat.

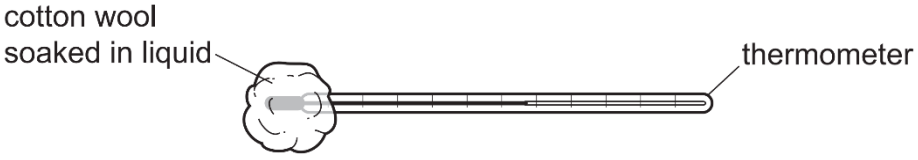
B Water is a poor conductor of heat.

C Glass is a better conductor of heat than water.

D Water is a better conductor of heat than glass.

29. A student is investigating evaporation. She soaks a piece of cotton wool in a liquid and attaches this to the bulb of a thermometer.

As the liquid evaporates the temperature reading on the thermometer changes.



Which statement is correct?

A The more energetic molecules leave the liquid and the temperature reading decreases.

B The more energetic molecules leave the liquid and the temperature reading increases.

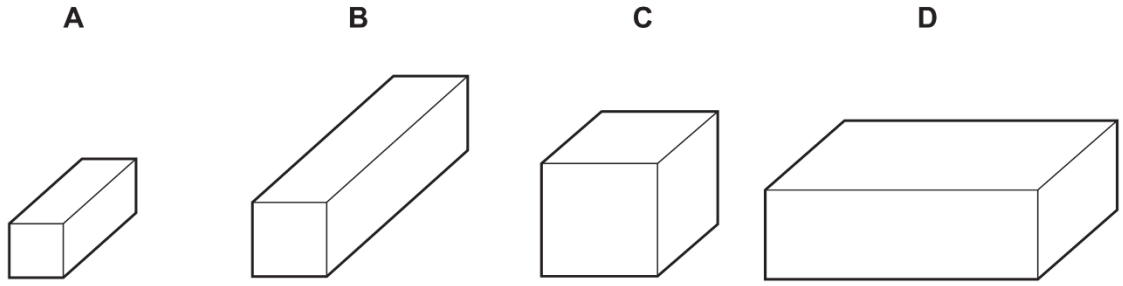
C The less energetic molecules leave the liquid and the temperature reading decreases.

D The less energetic molecules leave the liquid and the temperature reading increases.

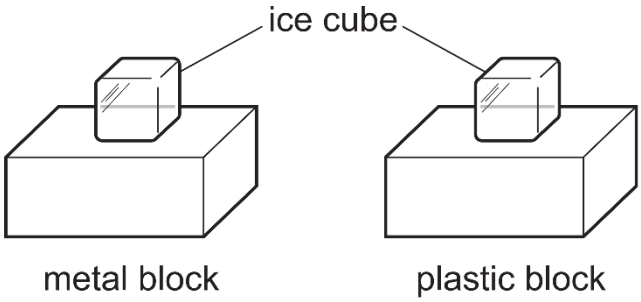
30. The diagrams show four blocks of steel. The blocks are all drawn to the same scale.

The same quantity of thermal energy is given to each block.

Which block shows the greatest rise in temperature?



31. One ice cube is placed on a metal block. An identical ice cube is placed on a plastic block. The blocks are left next to each other on a table in a laboratory.



Which ice cube melts first and why?

A The ice cube on the plastic block melts first because plastic is a good insulator of thermal energy.

B The ice cube on the plastic block melts first because plastic is a good conductor of thermal energy.

C The ice cube on the metal block melts first because metal is a good conductor of thermal energy.

D The ice cube on the metal block melts first because metal is a good insulator of thermal energy.

32. A metal block is left overnight in a cool, shady room. In the morning, the metal block is moved into warm surroundings.

Which statement about the metal block is correct in the morning?

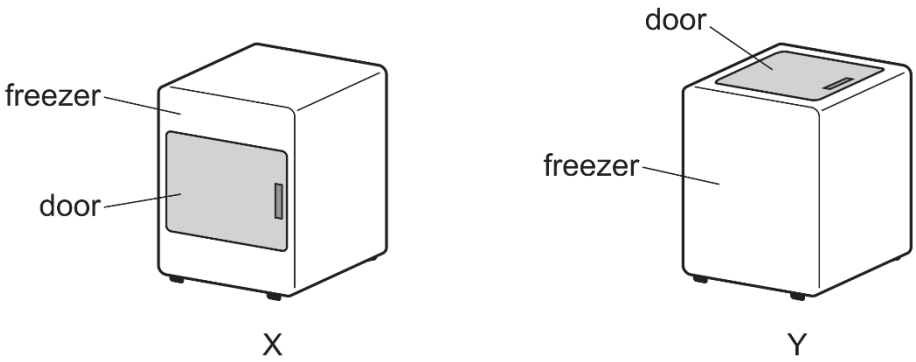
A The internal energy of the metal block increases.

B The temperature of the metal block decreases.

C Convection transfers energy throughout the metal block.

D The metal contracts slightly.

33. Two freezers **X** and **Y** are identical except that one has a door opening at the front and the other has a door opening at the top.

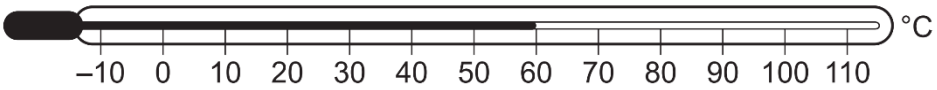


Both doors are the same size and are opened for the same amount of time.

Which freezer gains the least amount of thermal energy in this time and why?

	freezer gaining the least thermal energy	reason
A	**X**	cold air falls
B	**X**	warm air falls
C	**Y**	cold air falls
D	**Y**	warm air falls

34. The diagram shows a liquid-in-glass thermometer.



What is the temperature difference between the two fixed points on the Celsius scale?

A 10 °C **B** 100 °C **C** 110 °C **D** 120 °C

35. Two similar liquid-in-glass thermometers **P** and **Q** are placed in direct sunlight.

The bulb of thermometer **P** is painted white. The bulb of thermometer **Q** is painted black.

How and why would the thermometer readings differ?

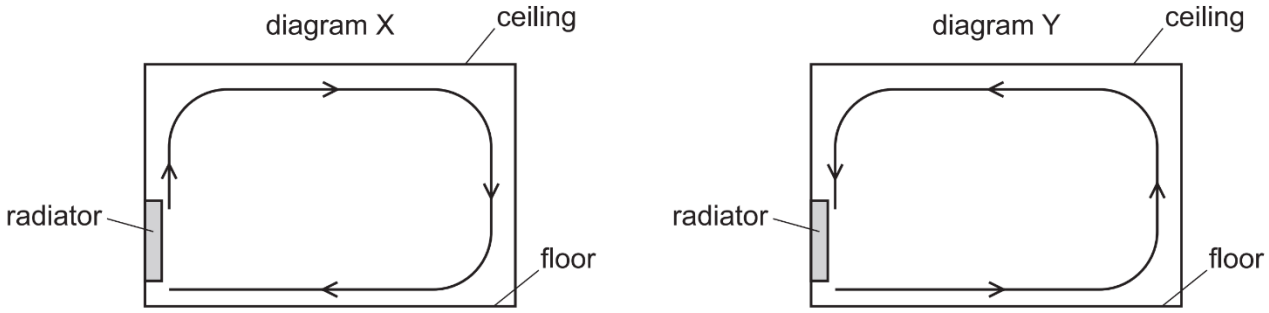
A **P** would read higher than **Q** because black is a good absorber of radiation.

B **P** would read higher than **Q** because black is a poor absorber of radiation.

C **P** would read lower than **Q** because black is a good absorber of radiation.

D **P** would read lower than **Q** because black is a poor absorber of radiation.

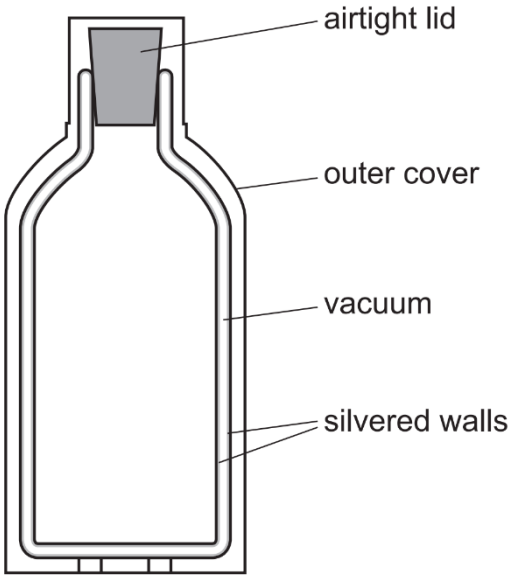
36. A room is heated by a radiator. The diagrams **X** and **Y** show two possible circulations of hot air, which heat the room.



Which diagram and reason explain the heating of the room by convection?

	diagram	reason
A	**X**	air density decreases when air is heated
B	**X**	air density increases when air is heated
C	**Y**	air density decreases when air is heated
D	**Y**	air density increases when air is heated

37. The diagram shows a vacuum flask used to keep a liquid warm.



Which methods of heat loss are reduced by the **vacuum** between the silvered walls?

A Conduction only.

B Conduction and convection only.

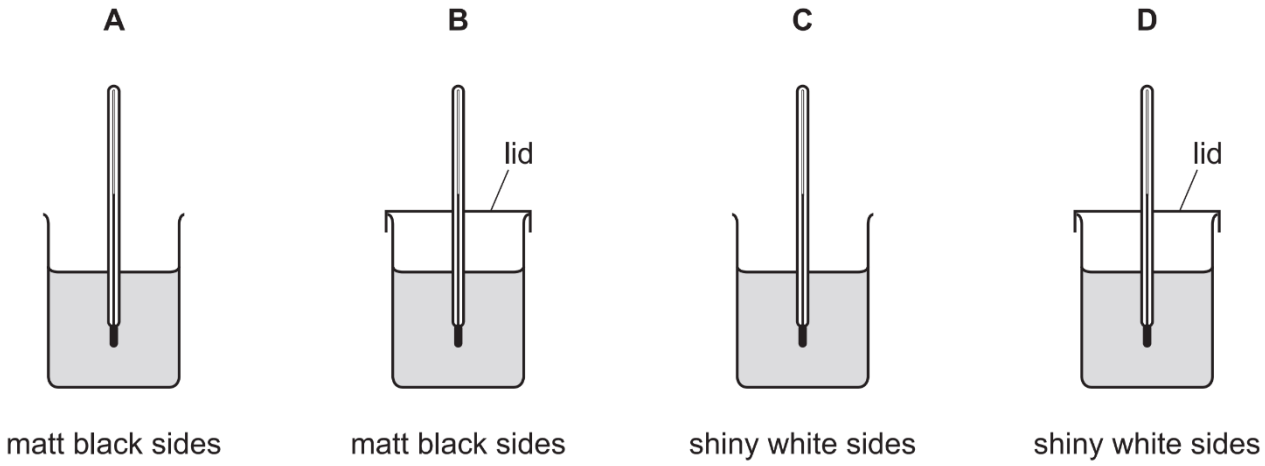
C Convection and radiation only.

D Conduction, convection and radiation.

38. Equal volumes of water at 100°C are put in four containers. Two containers have matt black sides and two containers have shiny white sides. One of each type of container has a lid.

The containers are left for two minutes.

Which container has the highest temperature?



- Scan the QR code for the answers to this assignment.

http://www.nygh.sg/lower_secondary_science/sec_two_science/sec_two_physics/multiple_choice_thermal_answers.pdf