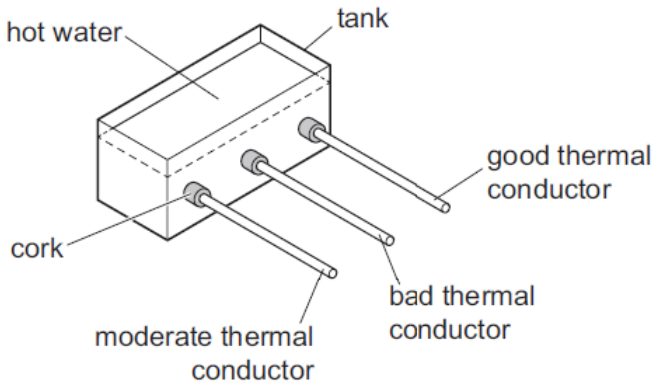
Thermal Processes – 2020 IGCSE 0625

1. March/2020/Paper_12/No.19

Rods of the same shape and size are inserted through corks into a tank of hot water. Each rod is covered with a layer of solid wax that has a low melting point. After a period of time, some wax melts.



On which rod will the wax melt first?

A all at the same time

B good thermal conductor

C bad thermal conductor

D moderate thermal conductor

2. March/2020/Paper_12/No.20

A boy jumps into an indoor swimming pool. He notices that the water appears to get colder as he goes deeper underwater. This is due to convection.

Which statement is correct?

A Cold water is more dense than warm water so it sinks to the bottom of the pool.

B Warm water is more dense than cold water so it rises to the surface of the pool.

C The molecules in cold water have more kinetic energy than the molecules in warm water so they move to the bottom of the pool faster.

D The molecules in warm water are closer together than the molecules in cold water so they rise to the surface of the pool.

3. March/2020/Paper_22/No.20

Metals are good thermal conductors.

Insulators are poor thermal conductors.

Which description of the mechanism of thermal conductivity is correct?

A In insulators, conduction takes place by electron transfer and molecular vibrations.

B In insulators, conduction takes place by electron transfer only.

C In metals, conduction takes place by electron transfer and molecular vibrations.

D In metals, conduction takes place by electron transfer only.

4. March/2020/Paper_22/No.21

A teacher shows his class a polystyrene cup. The cup is made from thick plastic with lots of tiny air bubbles in it.

He asks the class why the cup is so good at keeping a hot drink warm. Three suggestions are made.

1 It contains air which is a poor thermal conductor.

2 The air is trapped in tiny bubbles so very little convection is possible.

3 The plastic is a poor thermal conductor.

Which suggestions are correct?

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

5. March/2020/Paper_22/No.22

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6. March/2020/Paper_42/No.5

(a) Complete the sentences with words that describe the main process of thermal energy transfer in each case.

A man goes for a walk on a cold day. He touches a metal gate, which removes thermal energy from his hands by ..... . He holds the sides of a cup containing a hot drink. His hands gain thermal energy by ..... . Some farm workers have lit a fire. The man warms his hands by the side of the fire. His hands gain thermal energy by ..... . [3]

(b) Describe in terms of particles the transfer of thermal energy through the metal of the gate after transfer from the man's hands.

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..... [2]

(c) Fig. 5.1 shows a car on a sunny day in a hot country.

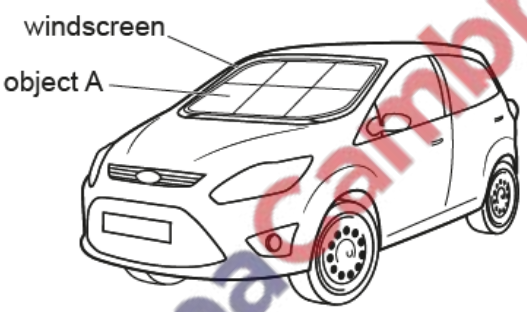


Fig. 5.1

The object labelled A is placed inside the windscreen. It is used by the owner of the car to reduce the temperature rise of the air in the car.

Ring the most suitable material for the outer surface of object A. Explain your choice.

dull black **dull white** **shiny black** **shiny white**

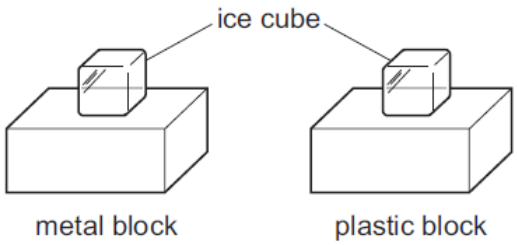
explanation .....

..... [2]

[Total: 7]

7. June/2020/Paper_11/No.19

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.

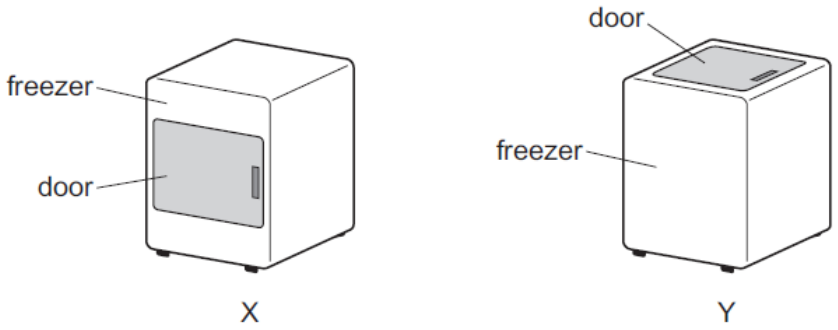
B The ice cube on the plastic block melts first because plastic is a good conductor of thermal energy.

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.

8. June/2020/Paper_11/No.20

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.



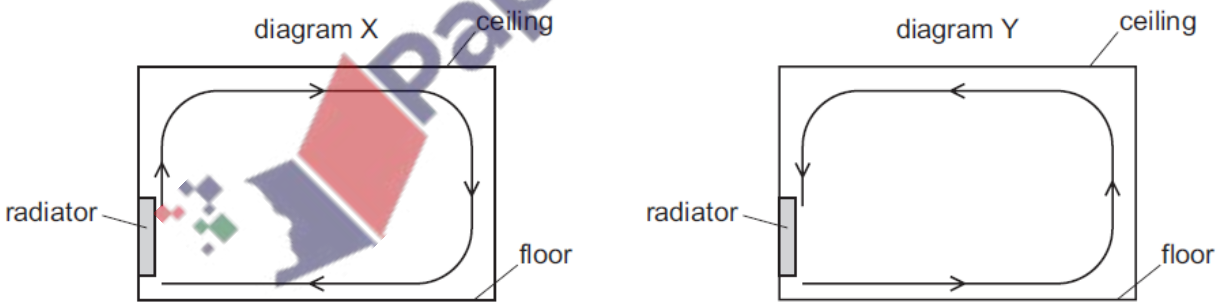
Both doors are the same size and are opened for the same amount of time.

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

9. June/2020/Paper_12/No.19

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

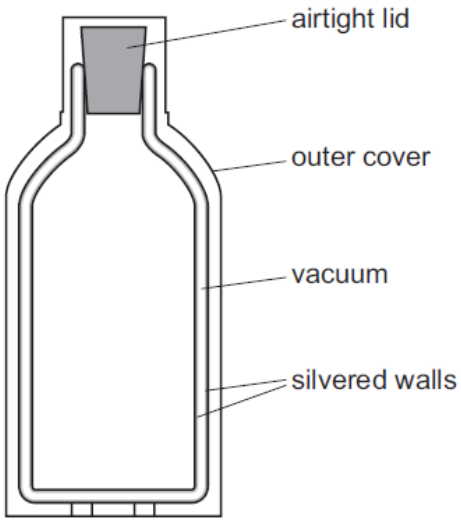


Which diagram and reason explain the heating of the room by convection?

	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

10. June/2020/Paper_13/No.19

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

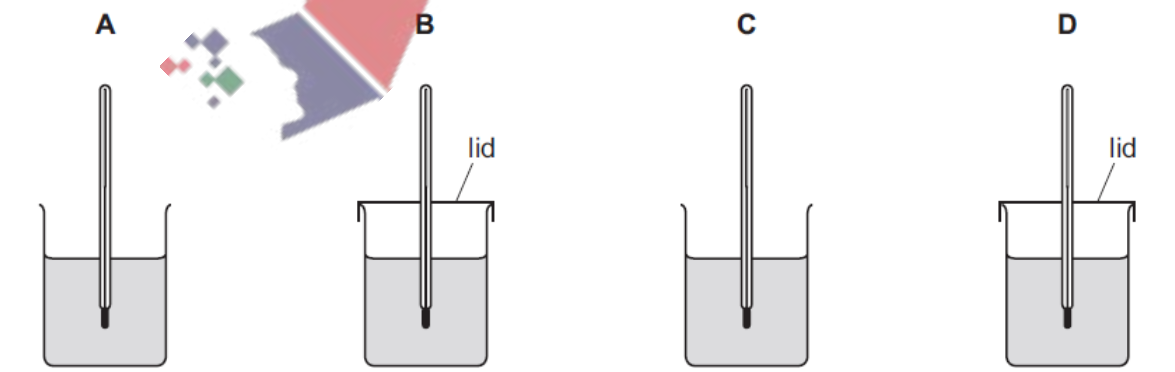
D conduction, convection and radiation

11. June/2020/Paper_13/No.20

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?



12. June/2020/Paper_21/No.18

Why are metals better thermal conductors than other solids?

A Metals contain free electrons which help transfer the energy.

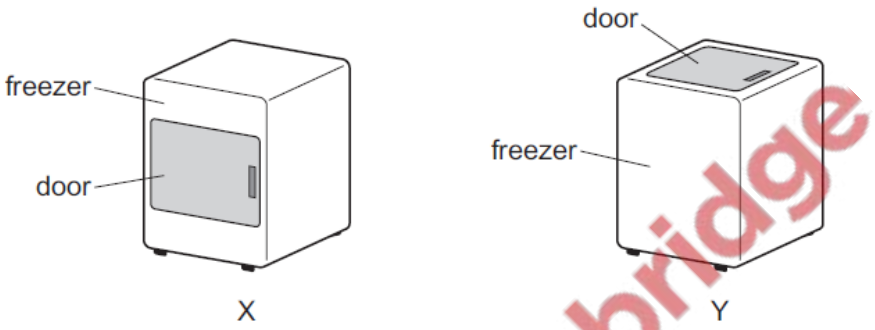
B Molecules in metals are in fixed positions.

C Molecules in metals can move freely.

D Molecules in metals vibrate faster than those in other solids.

13. June/2020/Paper_21/No.19

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?

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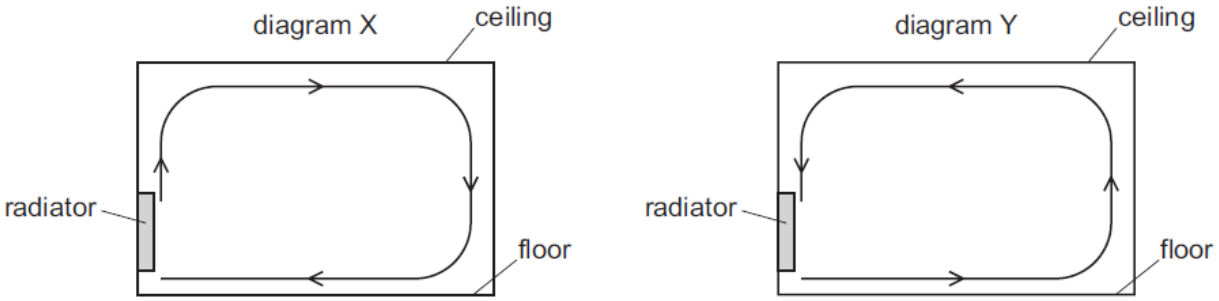
A	X	cold air falls
B	X	warm air falls
C	Y	cold air falls
D	Y	warm air falls

14. June/2020/Paper_22/No.18

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



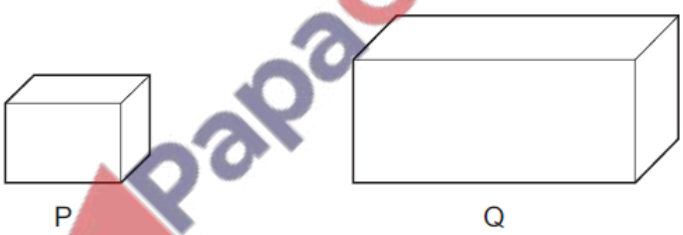
Which diagram and reason explain the heating of the room by convection?

	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

15. June/2020/Paper_22/No.19

Two copper containers P and Q are filled with hot water.

The diagrams are both drawn to the same scale.



Container P emits more infrared radiation from its surfaces than container Q.

What is a possible reason for this?

A The surfaces of P are painted white and the surfaces of Q are painted black.

B The surfaces of P are shiny and the surfaces of Q are dull.

C The surfaces of P have a smaller area than the surfaces of Q.

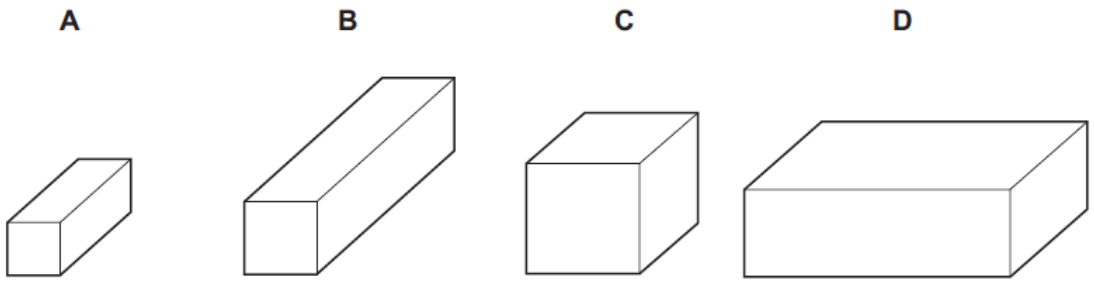
D The water in P is hotter than the water in Q.

16. June/2020/Paper_23/No.17

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?



17. June/2020/Paper_23/No.18

Why are metals better conductors of thermal energy than non-metals?

A They contain free electrons.

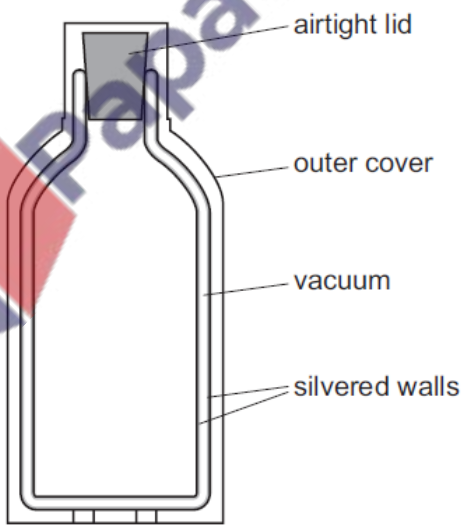
B Their molecules are further apart.

C Their molecules vibrate at a higher frequency.

D They have smoother surfaces.

18. June/2020/Paper_23/No.19

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



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19. June/2020/Paper_31/No.6(c)

(c) A student is testing how different surfaces absorb radiant heat.

The student puts two metal plates in holders and places them on either side of a radiant heater as shown in Fig. 6.2. One plate has a shiny metal side facing towards the heater and the other plate has a dull black side facing towards the heater.

A metal disc is attached to each plate using wax.

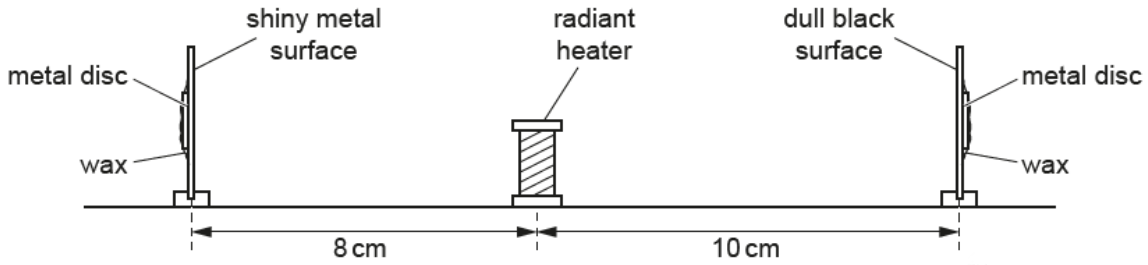

Fig. 6.2

(i) The student turns on the radiant heater and starts a stop-clock. The wax on the plate with a dull black side melts and the metal disc falls off the plate 53 seconds after the stop-clock is started.

The metal disc on the plate with a shiny metal side remains attached for another 32 seconds after the metal disc on the first plate falls.

Explain why the metal disc on the plate with a dull black side falls before the metal disc on the plate with a shiny metal side.

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..... [2]

(ii) Another student observes the experiment shown in Fig. 6.2 and says that the comparison of the two plates is not fair.

Suggest why the experiment is **not** fair.

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..... [2]

20. June/2020/Paper_32/No.6

Fig. 6.1 shows a hot liquid in a vacuum flask. The vacuum flask keeps the temperature of the liquid in the flask constant for a long time.

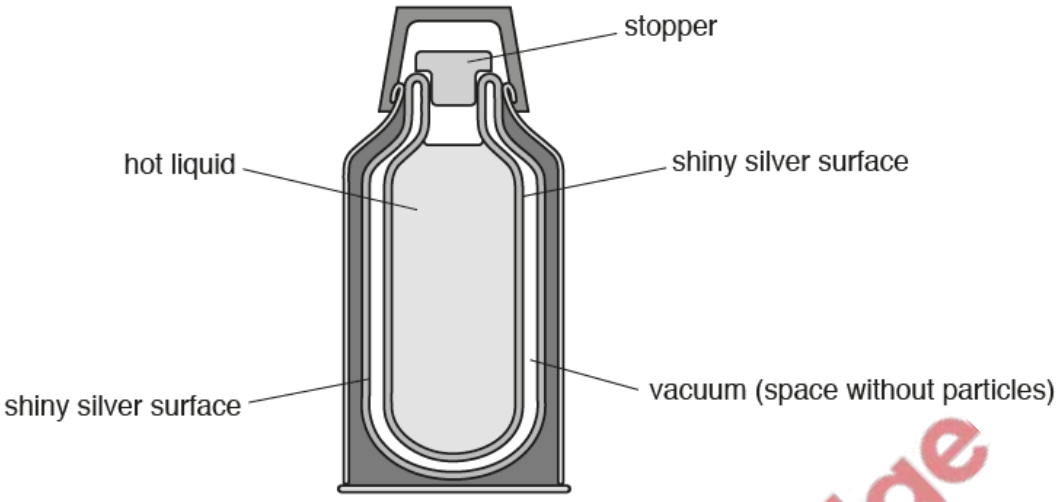

Fig. 6.1

(a) Describe how each feature helps to keep the liquid hot for longer.

(i) shiny silver surface

.....

..... [2]

(ii) the vacuum between the silvered surfaces

.....

.....

..... [3]

(b) **(i)** Suggest a material for the stopper that will help to keep the liquid hot for longer.

material ..... [1]

(ii) Give a reason for your answer.

reason .....

..... [1]

[Total: 7]