01. 0625_w12_qp_13 Q: 16

A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

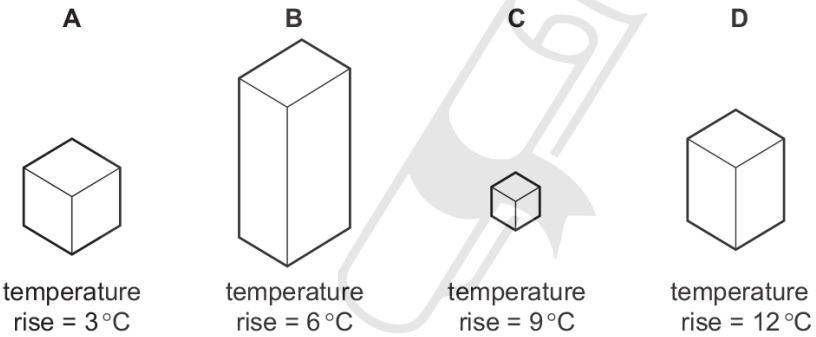
	lower fixed point	upper fixed point
A	freezing point of mercury	boiling point of mercury
B	freezing point of mercury	boiling point of water
C	freezing point of water	boiling point of mercury
D	freezing point of water	boiling point of water

---

02. 0625_w12_qp_13 Q: 18

Four blocks, made from different materials, are each heated so that they have the same increase in internal energy.

Which block has the smallest thermal capacity?



2.3 Thermal processes

03. 0625_m22_qp_22 Q: 20

Which statement describes thermal conduction in a metal by electrons?

A Atoms and electrons move freely throughout the metal.

B Atoms and electrons vibrate about their fixed positions only.

C Electrons move freely throughout the metal.

D Electrons remain attached to atoms.

---

04. 0625_m21_qp_22 Q: 18

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.

---

05. 0625_m21_qp_22 Q: 19

Which change will cause a decrease in the rate of radiation emitted by an object?

A changing the surface colour from white to black

B changing the surface texture from dull to shiny

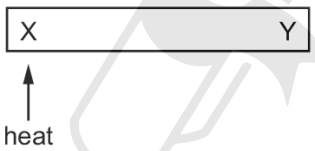
C increasing the surface temperature

D increasing the surface area

---

06. 0625_s21_qp_21 Q: 19

A metal rod is heated at end X.



Why does end Y of the metal rod become hot?

A Energy is transferred from end X of the rod to end Y by vibration of positive ions and by movement of electrons.

B Energy is transferred from end X of the rod to end Y by movement of positive ions only.

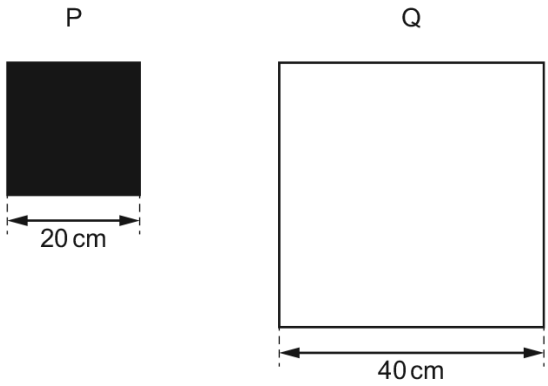
C Energy is transferred from end X of the rod to end Y by vibration of positive ions only.

D Energy is transferred from end X of the rod to end Y by movement of electrons only.

---

07. 0625_s21_qp_21 Q: 20

Two square sheets of metal, P and Q, are heated to the same temperature. The metal sheets are shown.



Sheet Q is emitting more radiation than sheet P.

Which statement explains this?

A Dull black surfaces are better conductors of radiation.

B Dull black surfaces are better emitters of radiation.

C The surface area of Q is larger than that of P.

D White surfaces are better absorbers of radiation.

---

08. 0625_s21_qp_22 Q: 19

A student sets up four cans. Each can contains the same mass of water at 90 °C.

The cans are identical except for the outside surfaces.

Which can will cool down the fastest?

A dull, black surface

B dull, white surface

C shiny, black surface

D shiny, white surface

---

09. 0625_s21_qp_22 Q: 20

Thermal energy is transferred by conduction in a metal bar.

Which statement is **not** correct?

A Fast vibrating ions leave the surface.

B Free moving electrons carry thermal energy through the bar.

C Ions vibrate and strike neighbouring ions to make them vibrate.

D Ions vibrate but do not change position.

---

10. 0625_s21_qp_23 Q: 19

Three students are planning an experiment to test thermal conduction in different materials.

The students each propose a hypothesis.

1 I think the copper rod will be a good thermal conductor because it is a metal.

2 I think the glass rod will be a good thermal conductor because it has free electrons which vibrate and transfer energy quickly.

3 I think the wooden rod will be a poor thermal conductor because it can only transfer energy along the rod by vibrating the lattice particles.

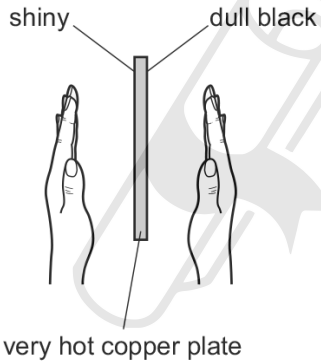
Which of their hypotheses are correct?

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

---

11. 0625_s21_qp_23 Q: 20

A copper plate is shiny on one side and is painted dull black on the other side. The plate is heated to a high temperature. A person places his hands at equal distances from either side of the plate, close to the plate, but not touching it.



Why does the hand near the dull black surface of the plate feel much hotter than the hand near the shiny surface?

A The dull black surface is a better emitter of radiation than the shiny surface.

B The dull black surface is a better conductor of radiation than the shiny surface.

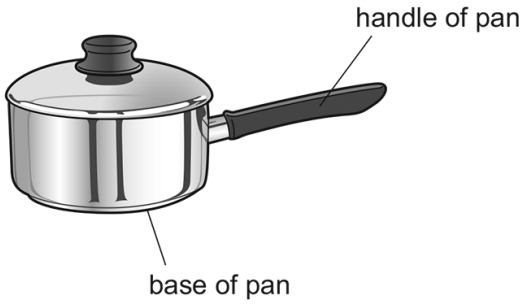
C The dull black surface is a better reflector of radiation than the shiny surface.

D The dull black surface is at a higher temperature than the shiny surface.

---

12. 0625_w21_qp_21 Q: 16

The diagram shows a pan used for cooking food.



Which row is correct for the materials used to make the base and the handle of the pan?

	base of pan	handle of pan
A	good thermal conductor	good thermal conductor
B	good thermal conductor	poor thermal conductor
C	poor thermal conductor	good thermal conductor
D	poor thermal conductor	poor thermal conductor

---

13. 0625_m20_qp_22 Q: 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.

---

14. 0625_m20_qp_22 Q: 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

---

15. 0625_m20_qp_22 Q: 22

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.

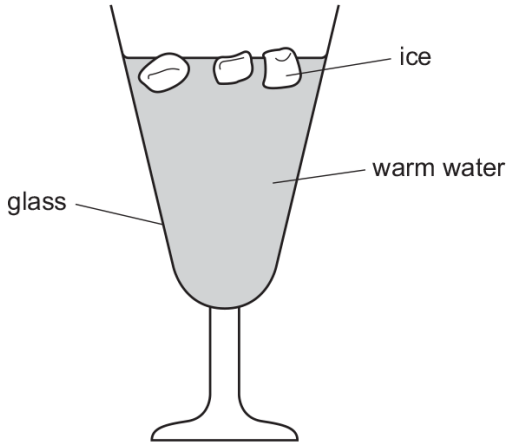
C The molecules in cold water have more kinetic energy than the molecules in warm water so they move to the bottom of the pool faster.

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

---

16. 0625_p20_qp_20 Q: 23

The diagram shows some ice being used to lower the temperature of some warm water.



What is the main process by which the water at the bottom of the glass becomes cool?

A condensation

B conduction

C convection

D radiation

---

17. 0625_s20_qp_21 Q: 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.

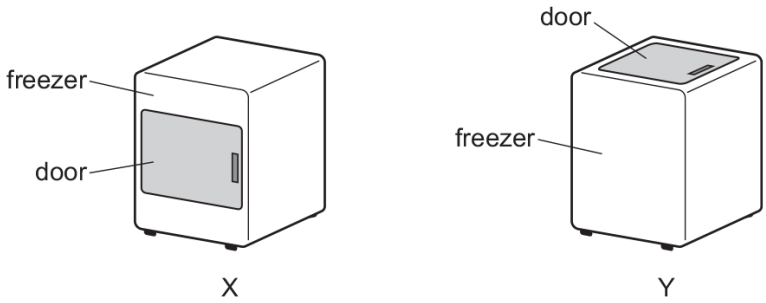
C Molecules in metals can move freely.

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

---

18. 0625_s20_qp_21 Q: 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.

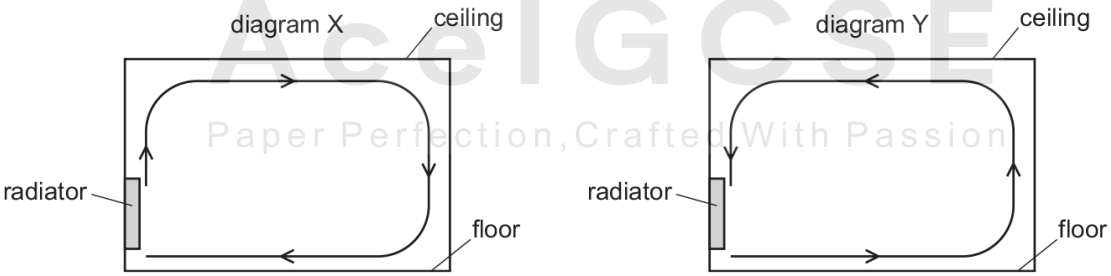
Which freezer gains the least amount of thermal energy in this time and why?

	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

---

19. 0625_s20_qp_22 Q: 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?

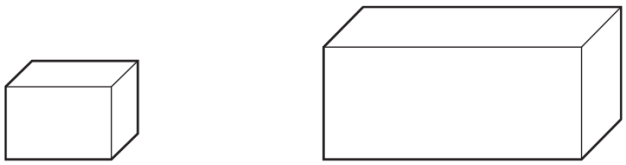
	diagram	reason
A	X	air density decreases when air is heated
B	X	air density increases when air is heated
C	Y	air density decreases when air is heated
D	Y	air density increases when air is heated

---

20. 0625_s20_qp_22 Q: 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.

---

21. 0625_s20_qp_23 Q: 18

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

A They contain free electrons.

B Their molecules are further apart.

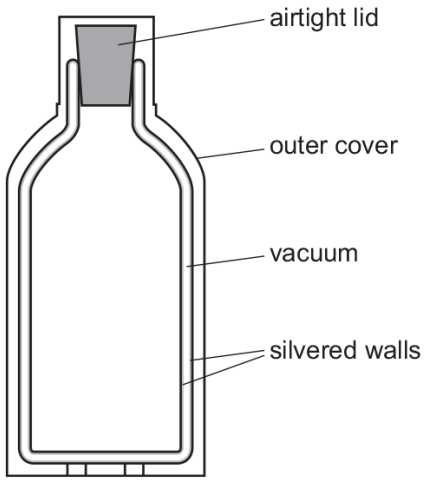
C Their molecules vibrate at a higher frequency.

D They have smoother surfaces.

---

22. 0625_s20_qp_23 Q: 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

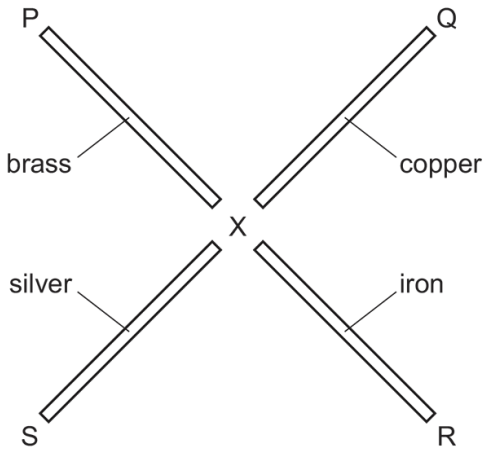
B conduction and convection only

C convection and radiation only

D conduction, convection and radiation

23. 0625_w20_qp_21 Q: 19

The diagram shows four rods. Each rod is made of a different metal.



Wax is used to attach small metal balls at the rod ends P, Q, R and S.

Each rod is the same size. They are heated uniformly by a Bunsen burner at point X.

As the rods warm up, the wax melts and the balls fall off.

Why does the ball on the silver rod fall first?

A Silver is the best conductor of heat.

B Silver is the worst conductor of heat.

C Silver is the best radiator of heat.

D Silver is the worst radiator of heat.

---

24. 0625_w20_qp_21 Q: 20

Four cups **A**, **B**, **C** and **D** contain hot coffee.

Which cup keeps the coffee warm the longest?

	the outside surface of the cup	the top of the cup
A	black	covered with a lid
B	black	no lid
C	white	covered with a lid
D	white	no lid

---

25. 0625_w20_qp_22 Q: 20

Four solid spheres made of the same metal are heated to the same temperature.

Which sphere initially loses thermal energy by radiation at the greatest rate?

A diameter of 10 cm with a dull surface

B diameter of 10 cm with a shiny surface

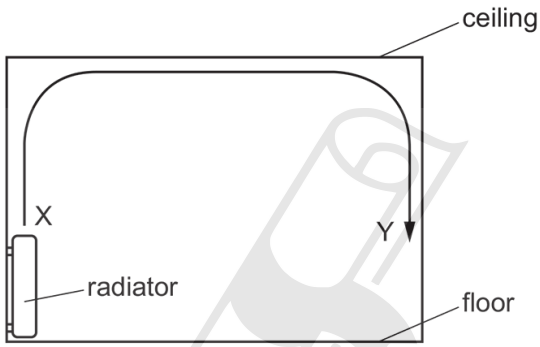
C diameter of 5 cm with a dull surface

D diameter of 5 cm with a shiny surface

---

26. 0625_w20_qp_23 Q: 19

The diagram shows the view of a room heated by a radiator. The arrowed line from X to Y is the path of the convection current in the air.



Which row about the air temperature and the air density at X and at Y is correct?

	air temperature	air density
A	higher at X	higher at X
B	higher at X	higher at Y
C	higher at Y	higher at Y
D	higher at Y	higher at X

---

27. 0625_w20_qp_23 Q: 20

A warm dark-coloured surface emits radiation. It is decided to increase the amount of radiation produced.

Three suggestions are made.

1 Make the surface hotter.

2 Colour the surface white.

3 Increase the area of the surface.

Which suggestions are correct?

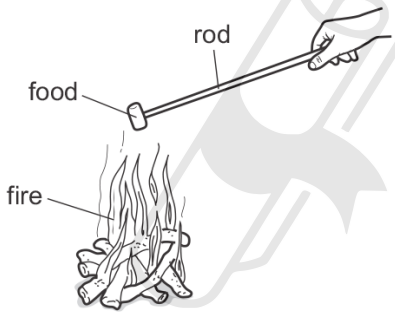
A 1 only **B** 1 and 2 only **C** 1 and 3 only **D** 1, 2 and 3

---

28. 0625_m19_qp_22 Q: 19

Four campers are warming their food on a fire.

They use different rods, each of the same dimensions, to hold their food near the fire.



Which material is the best choice to prevent their hands from getting too hot?

A aluminium

B copper

C steel

D wood

---

29. 0625_m19_qp_22 Q: 20

Two metal cans are identical, except that one has a shiny silver outer surface and the other has a dull black outer surface. They each have 300 g of water at 80 °C sealed inside them. They are both in a vacuum, in the darkness of outer space.

How does the temperature of the water in each one change?

A Neither one will cool down.

B The water in the black can cools more slowly than that in the shiny can.

C The water in the shiny can cools more slowly than that in the black can.

D They both cool down at the same rate.

---

30. 0625_s19_qp_21 Q: 17

In which does thermal conduction **not** occur?

A a gas

B a liquid

C a solid

D a vacuum

---

31. 0625_s19_qp_21 Q: 18

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.

---

32. 0625_s19_qp_21 Q: 19

Some hot water is sealed inside a metal can. The can is in a vacuum in outer space. The hot water slowly cools down.

How does the thermal energy escape into space?

A by conduction then convection

B by conduction then radiation

C by evaporation then convection

D by evaporation then radiation

---

33. 0625_s19_qp_22 Q: 17

The handle of a metal saucepan is made of plastic. As the saucepan heats up, the handle gets warmer.

Which statement explains this?

A Molecules of the plastic radiate their energy to other molecules.

B Molecules of the plastic vibrate more and pass on their energy to nearby molecules.

C The free electrons in the plastic transfer the thermal energy along the handle.

D The heated molecules very slowly move along the plastic handle.

---

34. 0625_s19_qp_22 Q: 19

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

---

35. 0625_s19_qp_23 Q: 17

Why does a metal rod conduct thermal energy much better than a similar-sized plastic rod?

A The molecules in the plastic are much closer together than the atoms in the metal.

B The molecules in the plastic are much larger than the atoms in the metal.

C The molecules in the plastic are much more tightly held together than the atoms in the metal.

D The molecular structure in the plastic contains no free electrons, but the metal has free electrons.

---

36. 0625_w19_qp_21 Q: 19

One end of a rod of copper is placed in hot water. Thermal energy travels along the rod to make the other end warmer.

What is the behaviour of the copper at an atomic level that accounts for most of the transfer of thermal energy from one end to the other?

A Atoms at the hot end gain kinetic energy and move towards the other end.

B Atoms at the hot end expand, colliding with other atoms and transferring energy.

C Free electrons at the hot end gain energy and move towards the other end, colliding with atoms along the rod.

D Free electrons at the hot end gain energy from the hot water and move directly to the other end.

---

37. 0625_w19_qp_21 Q: 20

A surface is made so that it is a good source of infrared radiation.

Which surface is **not** suitable?

A a surface that is painted matt black

B a surface that is painted white

C a surface that is heated to a high temperature

D a surface that has a large surface area

---

38. 0625_w19_qp_22 Q: 20

In a cold country, a bicycle has been left outside all night. The cyclist finds the plastic hand grips feel less cold to the touch than the steel handlebars.

Which row correctly describes the temperature and the property of the two materials?

	the temperature of the two materials	the property of the two materials
A	the temperature of the steel is much lower than that of the plastic	the plastic is a better thermal conductor than the steel
B	the temperature of the steel is much lower than that of the plastic	the steel is a better thermal conductor than the plastic
C	the steel and the plastic are both at the same temperature	the plastic is a better thermal conductor than the steel
D	the steel and the plastic are both at the same temperature	the steel is a better thermal conductor than the plastic

---

39. 0625_w19_qp_22 Q: 21

The diagram shows a tent made from a new material.

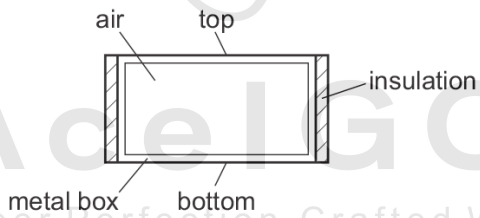
What type of material should the tent be made of to reflect the radiant energy from the Sun?

	material texture	material surface colour
A	dull	black
B	dull	white
C	shiny	black
D	shiny	white

---

40. 0625_w19_qp_23 Q: 19

A sealed metal box contains a fixed mass of air. The sides of the box are insulated.



A scientist investigates the thermal conductivity of air. She measures how quickly thermal energy passes between the top and bottom of the box.

Which row gives the correct procedure and conclusion?

	procedure	conclusion
A	heat bottom surface	air is a good thermal conductor
B	heat bottom surface	air is a poor thermal conductor
C	heat top surface	air is a good thermal conductor
D	heat top surface	air is a poor thermal conductor

---

41. 0625_w19_qp_23 Q: 20

In a cold country, the ground is covered in snow. There is a pile of black sand outdoors and its temperature is the same as that of the snow. A man sprinkles a thin layer of this sand over the snow.

Why does the black sand help to melt the snow during the day?

A Any thermal energy still left in the sand will melt the snow.

B The black sand is a good absorber of the infrared radiation from the Sun.

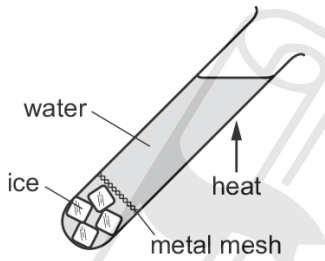
C The black sand is a good conductor of thermal energy.

D The black sand lowers the melting point of the snow.

---

42. 0625_m18_qp_22 Q: 20

A teacher demonstrates an experiment to a class. A boiling tube is filled with water and some ice cubes are trapped at the bottom of the tube. The teacher then heats the boiling tube in the position shown until the water at the top boils.



The ice does not melt.

What does this demonstrate?

A Water is a good conductor of thermal energy.

B Water is a good convector of thermal energy.

C Water is a poor conductor of thermal energy.

D Water is a poor convector of thermal energy.

---

43. 0625_m18_qp_22 Q: 21

A metal cup has a plastic lining. The cup is filled with hot water and held by a hand.

Which statement about the transfer of thermal energy from the water to the hand is correct?

A In the plastic, no energy is transferred directly between adjacent molecules.

B In the plastic, fast moving molecules interact with free electrons, making the electrons move very quickly.

C In the metal, energy is transferred only by electrons.

D In the metal, energy is transferred by electrons and by vibrations of the lattice.

---

44. 0625_s18_qp_21 Q: 18

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.

---

45. 0625_s18_qp_22 Q: 18

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

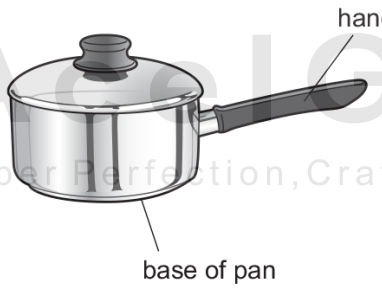
C shiny black

D shiny white

---

46. 0625_s18_qp_23 Q: 18

The diagram shows a pan used for cooking food.



Which row is correct for the materials used to make the base and the handle of the pan?

	base of pan	handle of pan
A	good thermal conductor	good thermal conductor
B	good thermal conductor	poor thermal conductor
C	poor thermal conductor	good thermal conductor
D	poor thermal conductor	poor thermal conductor

---

47. 0625_w18_qp_21 Q: 19

On a cold day, a shiny metal rod feels colder to the touch than a black plastic rod.

Which statement explains this observation?

A The metal rod is a better absorber of infra-red radiation than the plastic rod.

B The metal rod is a better thermal conductor than the plastic rod.

C The metal rod is a worse absorber of infra-red radiation than the plastic rod.

D The metal rod is a worse thermal conductor than the plastic rod.

---

48. 0625_w18_qp_21 Q: 20

One end of a copper bar is heated to a high temperature.

Which mechanism is responsible for the transfer of thermal energy to the other end of the copper bar?

A the lattice vibrations of copper ions only

B the lattice vibrations of copper ions and the movement of high energy electrons along the bar

C the movement of high energy copper ions along the bar

D the movement of high energy electrons along the bar only

---

49. 0625_w18_qp_22 Q: 19

Which statement about convection is **not** correct?

A It enables water in a pan on a cooker to get evenly heated.

B It happens in liquids and gases.

C It means that heat rises.

D It occurs because the density of a fluid decreases when it is heated.

---

50. 0625_w18_qp_22 Q: 20

A lamp has a metal filament that glows when heated by an electric current.

The middle of the filament is at a very high temperature. The ends of the filament, which are connected to the base of the lamp, are cooler.

Which statement is correct?

A Some thermal energy is conducted to the base of the lamp.

B The filament radiates energy equally at all points along its length.

C The lamp transfers all of the electrical energy it receives into light energy.

D When the voltage across the filament is halved, the power output is halved.

---

51. 0625_w18_qp_23 Q: 19

One end of a shiny metal rod is heated and the other end quickly gets hot.

Which statement describes why the other end quickly gets hot?

A Metals are good thermal conductors.

B Metals are poor thermal conductors.

C Shiny surfaces are good emitters of infra-red radiation.

D Shiny surfaces are poor emitters of infra-red radiation.

---

52. 0625_w18_qp_23 Q: 20

Four different surfaces are at the same high temperature.

Which surface will emit thermal radiation at the slowest rate?

	colour of surface	texture of surface	surface area / cm^2
A	black	dull	10
B	black	dull	100
C	white	shiny	10
D	white	shiny	100

---

53. 0625_m17_qp_22 Q: 17

In which type of substance are free electrons involved in the transfer of thermal energy?

A all liquids

B all solids

C metals only

D plastics only

---

54. 0625_m17_qp_22 Q: 18

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?

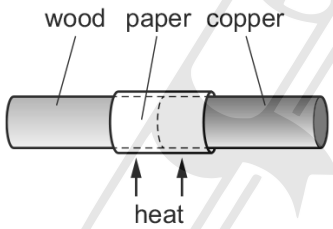
	surface	surface area
A	dull	large
B	dull	small
C	shiny	large
D	shiny	small

---

55. 0625_s17_qp_23 Q: 18

A copper bar and a wooden bar are joined. A piece of paper is wrapped tightly around the join.

The bar is heated strongly at the centre for a short time, and the paper goes brown on one side only.



Which side goes brown, and what does this show about wood and copper?

	brown side	wood	copper
A	copper	conductor	insulator
B	copper	insulator	conductor
C	wood	conductor	insulator
D	wood	insulator	conductor

---

56. 0625_w17_qp_21 Q: 19

Which statement about convection currents is correct?

A Convection currents occur because, when cooled, liquids contract and become more dense.

B Convection currents occur because, when warmed, liquids expand and become more dense.

C Convection currents only occur in liquids.

D Convection currents only occur in solids and liquids.

---

57. 0625_w17_qp_22 Q: 19

Why does a balloon filled with hot air rise?

A Cold air is less dense than hot air.

B Cold air is more dense than hot air.

C Heat rises.

D The density of the balloon is greater than the density of the surrounding gas.

---

58. 0625_w17_qp_23 Q: 19

Why is the heating coil of a domestic immersion heater placed at the bottom of the tank?

A Cold water is less dense than hot water and therefore sinks.

B Cold water is more dense than hot water and therefore rises.

C Hot water is less dense than cold water and therefore rises.

D Hot water is more dense than cold water and therefore sinks.

---

59. 0625_m16_qp_22 Q: 19

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.

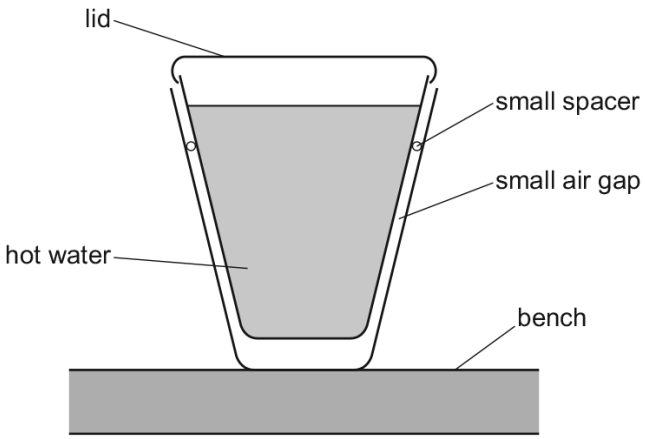
D Molecules of copper move from the hotter end to the cooler end.

---

60. 0625_m16_qp_22 Q: 20

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.

---

61. 0625_s16_qp_21 Q: 18

Two otherwise identical cars, one black and one white, are at the same initial temperature. The cars are left in bright sunshine and their temperatures increase. During the night their temperatures decrease.

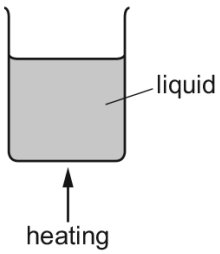
Which car shows the greater rate of temperature increase and which car shows the greater rate of temperature decrease?

	greater rate of temperature increase	greater rate of temperature decrease
A	black	black
B	black	white
C	white	black
D	white	white

---

62. 0625_s16_qp_21 Q: 19

A liquid is heated in a beaker.



The density of the liquid changes as its temperature increases. This causes energy to be transferred throughout the liquid.

How does the density change and what is this energy transfer process?

	density	energy transfer process
A	decreases	conduction
B	decreases	convection
C	increases	conduction
D	increases	convection

---

63. 0625_s16_qp_22 Q: 18

Which processes occur in a metal to cause thermal conduction?

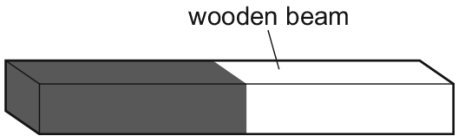
	electron transfer	proton transfer	lattice vibration
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = process occurs
✗ = process does not occur

---

64. 0625_s16_qp_22 Q: 19

A wooden beam is painted part black and part white. The beam absorbs infra-red radiation from the Sun during the day, and loses infra-red radiation to the surroundings at night.



Which part of the beam heats up more quickly during the day, and which part cools down more quickly at night?

	part heating up more quickly	part cooling down more quickly
A	black	black
B	black	white
C	white	black
D	white	white

---

65. 0625_s16_qp_23 Q: 18

Which row shows the surface that is the better absorber and the surface that is the better emitter of infra-red radiation?

	better absorber	better emitter
A	black surface	black surface
B	black surface	white surface
C	white surface	black surface
D	white surface	white surface

---

66. 0625_s16_qp_23 Q: 19

A student suggests some uses for containers made from good thermal conductors and for containers made from poor thermal conductors.

In which row are both suggested uses correct?

	good thermal conductor	poor thermal conductor
A	keeping a cold liquid at a low temperature	transferring thermal energy quickly from a hot liquid
B	keeping a hot liquid at a high temperature	keeping a cold liquid at a low temperature
C	transferring thermal energy quickly from a hot liquid	transferring thermal energy quickly to a cold liquid
D	transferring thermal energy quickly to a cold liquid	keeping a hot liquid at a high temperature

---

67. 0625_w16_qp_21 Q: 19

The thermal transfer of energy through a copper rod involves electrons.
A second process is also involved.

What is this method of thermal energy transfer, and what is the second process?

	method	second process
A	conduction	density change
B	conduction	lattice vibration
C	convection	density change
D	convection	lattice vibration

---

68. 0625_w16_qp_21 Q: 20

The diagrams show four spherical objects at the same temperature. Two of the objects are small and two are large. Two of the objects are white and two are black.

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

---

69. 0625_w16_qp_22 Q: 18

On a very cold day, a boy puts one hand on the metal handlebars of his bicycle. He puts the other hand on the rubber hand grip.

The metal feels colder than the rubber hand grip, although they are both at the same temperature.

Why is this?

A The metal has a higher melting point than the rubber.

B The metal has a lower thermal capacity than the rubber.

C The metal is a better thermal conductor than the rubber.

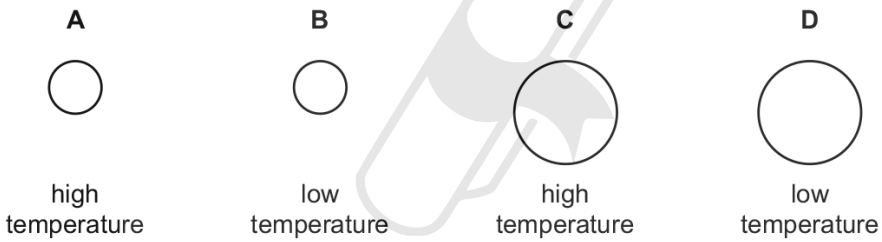
D The metal radiates more infra-red radiation than the rubber.

---

70. 0625_w16_qp_22 Q: 19

The diagrams show four spherical objects of the same colour and same type of surface. Two of the objects are small and two are large. Two of the objects are at the same high temperature and two are at the same low temperature.

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

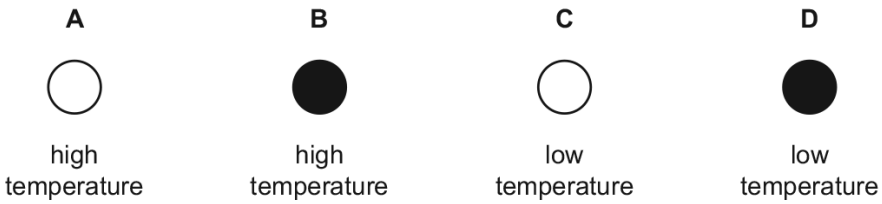


---

71. 0625_w16_qp_23 Q: 19

The diagrams show four spherical objects of the same size. Two of the objects are white and two are black. Two of the objects are at the same high temperature and two are at the same low temperature.

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



---

72. 0625_m15_qp_12 Q: 16

What is the name of the process of heat transfer using electromagnetic waves?

A conduction

B convection

C evaporation

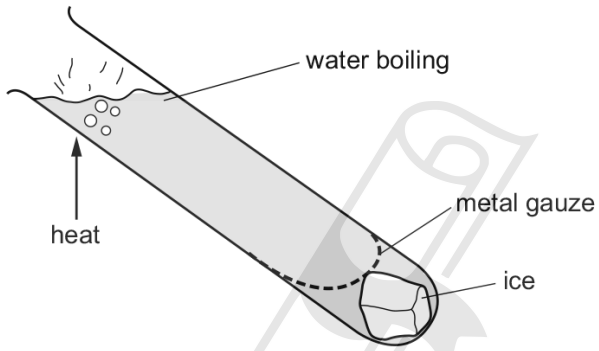
D radiation

---

73. 0625_m15_qp_12 Q: 17

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.

---

74. 0625_s15_qp_11 Q: 16

Thermal energy travels through space from the Sun to the Earth. Space is a vacuum.

How is thermal energy transferred from the Sun to the Earth?

A by conduction only

B by convection only

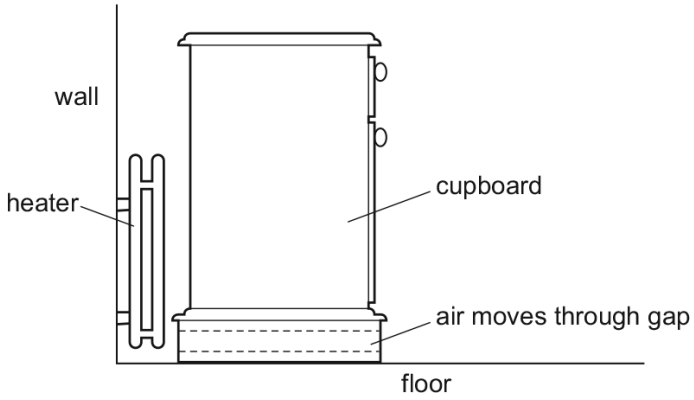
C by radiation only

D by convection and radiation

---

75. 0625_s15_qp_11 Q: 17

A cupboard is placed in front of a heater. Air can move through a gap under the cupboard.

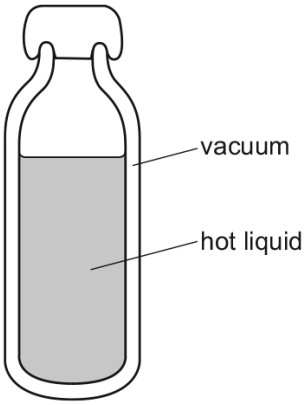


Which row describes the temperature, and the direction of movement, of the air in the gap?

	air temperature	air direction
A	cool	away from the heater
B	cool	towards the heater
C	warm	away from the heater
D	warm	towards the heater

76. 0625_s15_qp_12 Q: 16

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



How does thermal energy pass through the vacuum?

A conduction only

B convection only

C radiation

D conduction and convection

---

77. 0625_s15_qp_13 Q: 16

One method of heat transfer involves the energy travelling at a much greater speed than in other methods.

What is the name of this method?

A conduction

B convection

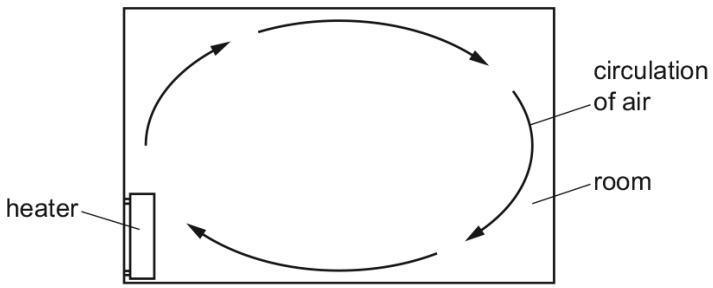
C evaporation

D radiation

---

78. 0625_w15_qp_11 Q: 16

The air in a room is heated by a heater. The diagram shows the circulation of the air in the room.



Which statement about the air that is heated is correct?

A The air contracts and becomes less dense.

B The air contracts and becomes more dense.

C The air expands and becomes less dense.

D The air expands and becomes more dense.

---

79. 0625_w15_qp_11 Q: 17

Four rods are made from different metals P, Q, R and S. The rods have equal lengths and equal diameters. The rods are heated at one end, in the same way.

The table shows the time taken for the temperature at the other end of each rod to rise by 1.0 °C.

Which metal is the best conductor of thermal energy (heat)?

metal	time taken / s
P	35
Q	30
R	45
S	40

A metal P **B** metal Q **C** metal R **D** metal S

---

80. 0625_w15_qp_12 Q: 16

In a refrigerator, the cooling unit can be fitted either at the top or at the bottom. In an oven, the heater can be fitted either at the top or at the bottom.

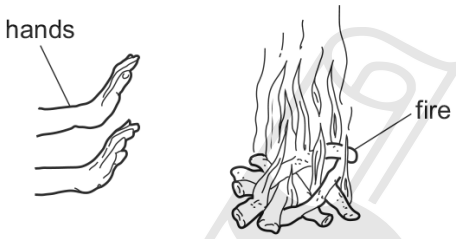
Which row shows the best position for the cooling unit and the best position for the heater?

	cooling unit	heater
A	bottom	bottom
B	bottom	top
C	top	bottom
D	top	top

---

81. 0625_w15_qp_12 Q: 17

A girl is outdoors. She warms her hands by holding them near a fire, as shown.



How does the heat from the fire reach her hands?

A conduction only

B convection and conduction

C convection and radiation

D radiation only

---

82. 0625_w15_qp_13 Q: 16

A heating engineer fits a heater to the ceiling of an office so that workers in the office are kept warm.

How does thermal energy reach the workers below the heater?

A conduction and convection

B convection and radiation

C convection only

D radiation only

---

83. 0625_w15_qp_13 Q: 17

Which row shows how heating changes the density of air, and the name of the method of energy transfer caused by this density change?

	density	method of energy transfer
A	decreases	conduction
B	decreases	convection
C	increases	conduction
D	increases	convection

---

84. 0625_s14_qp_11 Q: 16

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.

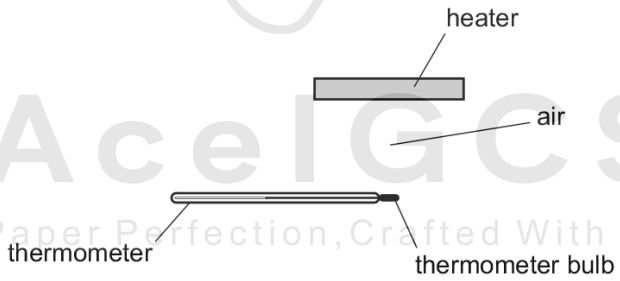
C Convection occurs in liquids because hot liquid is more dense than cold liquid.

D The radiation that transfers thermal energy is a type of electromagnetic radiation.

---

85. 0625_s14_qp_11 Q: 17

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



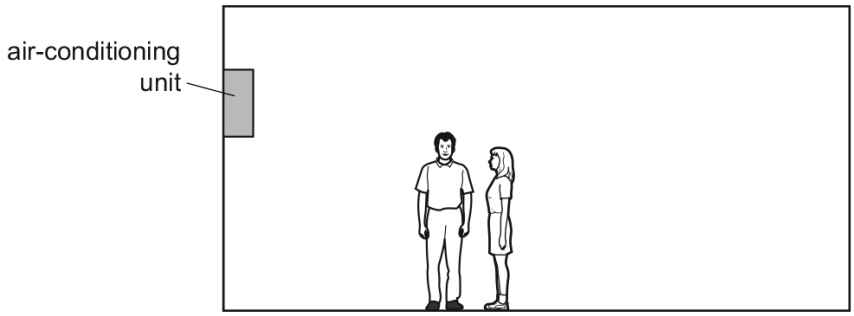
Which row shows how the heat energy from the heater reaches the thermometer bulb?

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

---

86. 0625_s14_qp_12 Q: 17

The diagram shows an air-conditioning unit on the wall of a room. The unit draws in warm air from the room and releases cold air into the room.



What happens to the cold air and why?

	cold air	why?
A	falls	it is less dense than warm air
B	falls	it is more dense than warm air
C	rises	it is less dense than warm air
D	rises	it is more dense than warm air

---

87. 0625_s14_qp_12 Q: 18

Which statement about thermal radiation is correct?

A It can only occur in a vacuum.

B It involves movement of electrons through a material.

C It involves movement of atoms.

D It is infra-red radiation.

---

88. 0625_s14_qp_13 Q: 13

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.

---

89. 0625_w14_qp_11 Q: 17

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.

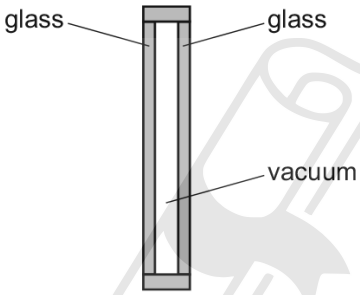
C The density of the air increases and the air falls.

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

---

90. 0625_w14_qp_11 Q: 18

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

---

91. 0625_w14_qp_13 Q: 17

Two methods by which thermal energy can be transferred are conduction and radiation.

Which statement is correct?

A Conduction involves density changes in fluids.

B Conduction only occurs in solids.

C Radiation cannot occur in a vacuum.

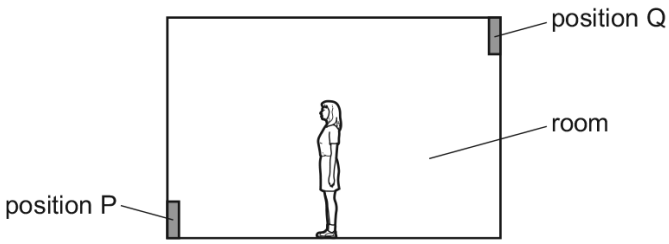
D Radiation involves electromagnetic waves.

---

92. 0625_w14_qp_13 Q: 18

A heater is to be fitted in a room to warm the air throughout the room.

The diagram shows two possible positions to fit the heater, P and Q.



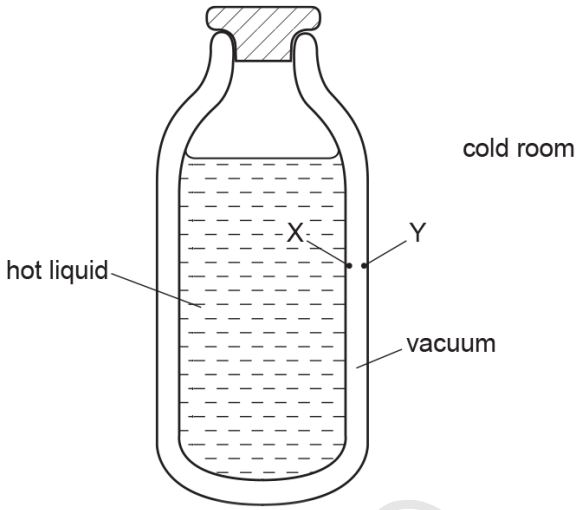
Which position is better and why?

	position	why?
A	P	warmer air is less dense and rises
B	P	warmer air is more dense and rises
C	Q	warmer air is less dense and falls
D	Q	warmer air is more dense and falls

93. 0625_s13_qp_11 Q: 17

The diagram shows the cross-section of a vacuum flask containing a hot liquid in a cold room.

X and Y are points on the inside surfaces of the walls of the flask.



How is thermal energy transferred between X and Y?

A by conduction and convection

B by conduction only

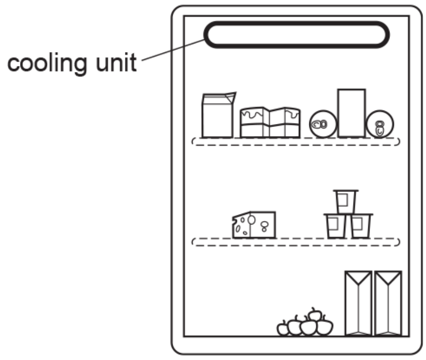
C by radiation and convection

D by radiation only

94. 0625_s13_qp_11 Q: 18

The diagram shows a refrigerator.

The cooling unit is placed at the top. The cooling unit cools the air near it.



What happens to the density of the air as it cools, and how does it move?

	density of the air	movement of the air
A	decreases	moves down
B	decreases	stays at the top
C	increases	moves down
D	increases	stays at the top

---

95. 0625_s13_qp_12 Q: 17

Which statement about the transfer of thermal energy is correct?

A Convection can occur in air, but only when the air is trapped.

B Convection can only occur in a gas.

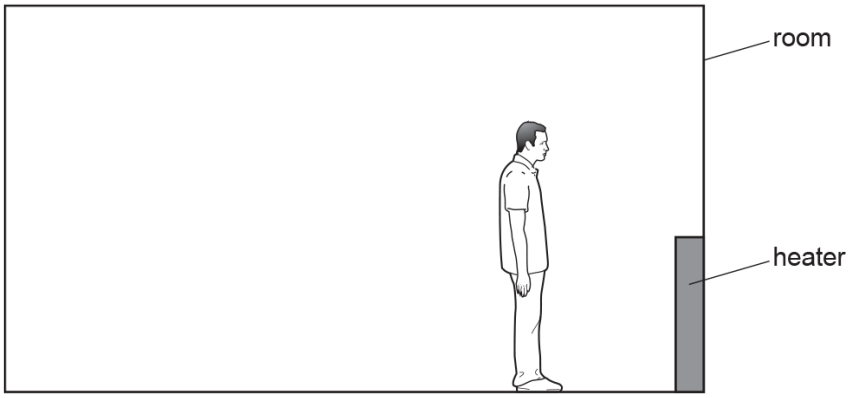
C Radiation cannot occur in air.

D Radiation can occur in a vacuum, but convection cannot.

---

96. 0625_w13_qp_11 Q: 17

A man goes into a cold room and switches on a heater. The man then stands one metre away from the heater. He feels warmer almost immediately.



How is thermal energy transferred from the heater to the man so quickly?

A by conduction, convection and radiation

B by conduction only

C by convection only

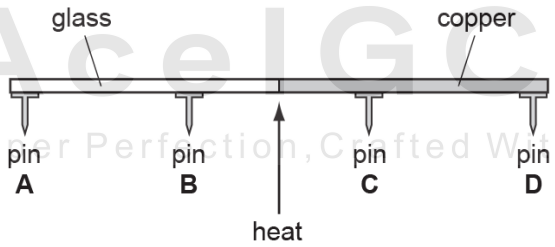
D by radiation only

---

97. 0625_w13_qp_11 Q: 18

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?



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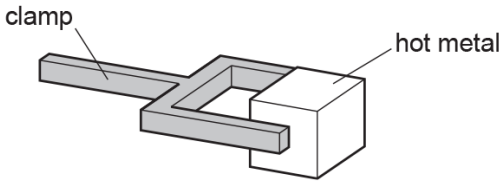
98. 0625_w13_qp_13 Q: 17

A piece of hot metal is held by a clamp in a cold room. The air next to the metal becomes hot.

The density of the air changes and the air moves.



Which row shows the density change of the air and the direction in which the air moves?

	density of air	movement of air
A	decreases	downwards
B	decreases	upwards
C	increases	downwards
D	increases	upwards

---

99. 0625_s12_qp_11 Q: 18

Why does convection take place in a liquid when it is heated?

A Liquids expand when they are heated.

B Liquids start to bubble when they get close to boiling point.

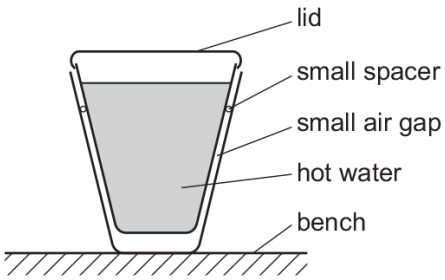
C Molecules in the liquid expand when they are heated.

D Molecules near to the surface of the liquid escape into the air.

---

100. 0625_s12_qp_11 Q: 19

Two plastic cups are placed one inside the other. Hot water is poured into the inner cup and a lid is put on top, as shown.



Which statement is correct?

A Heat loss by radiation is prevented by the small air gap.

B No heat passes through the sides of either cup.

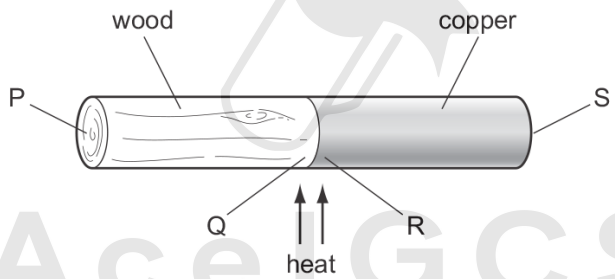
C The bench is heated by convection from the bottom of the outer cup.

D The lid is used to reduce heat loss by convection.

---

101. 0625_s12_qp_12 Q: 18

A rod is made of copper and wood joined together.



The rod is heated at the join in the centre for about a minute.

At which labelled point will the temperature be lowest, and at which point will it be highest?

	lowest temperature	highest temperature
A	P	Q
B	P	R
C	S	P
D	S	R

---

102. 0625_w12_qp_11 Q: 19

After a sheep has its wool cut off, it is harder for it to stay warm when the air temperature falls.

How does the wool help the sheep to stay warm?

A Air can circulate between the wool fibres and heat up the skin by convection.

B Air trapped by the wool fibres reduces heat losses from the skin by convection.

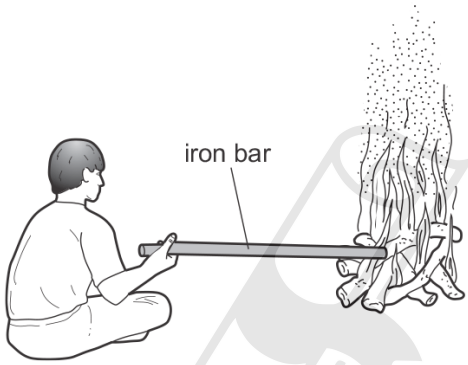
C The wool fibres are curly so it takes longer for heat to be conducted away from the skin.

D The wool fibres conduct heat to the skin from the air outside.

---

103. 0625_w12_qp_11 Q: 20

A boy sits near a campfire. He pokes the fire with an iron bar. His hand becomes hot.



In which ways does thermal energy (heat) from the fire reach his hand?

A conduction and convection only

B conduction and radiation only

C convection and radiation only

D conduction, convection and radiation

---

104. 0625_w12_qp_12 Q: 19

After a sheep has its wool cut off, it is harder for it to stay warm when the air temperature falls.

How does the wool help the sheep to stay warm?

A Air can circulate between the wool fibres and heat up the skin by convection.

B Air trapped by the wool fibres reduces heat losses from the skin by convection.

C The wool fibres are curly so it takes longer for heat to be conducted away from the skin.

D The wool fibres conduct heat to the skin from the air outside.

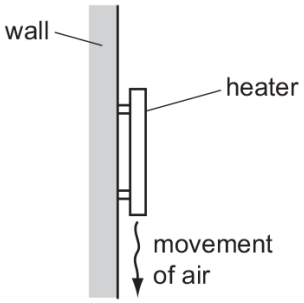
---

105. 0625_w12_qp_13 Q: 19

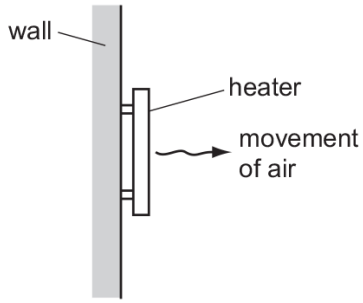
A convector heater is fixed to a wall.

Which diagram shows how warm air near the heater moves because of convection in the air?

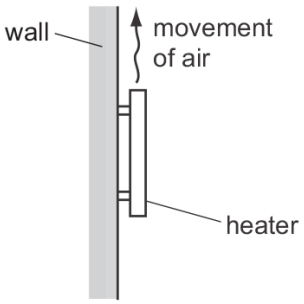
A



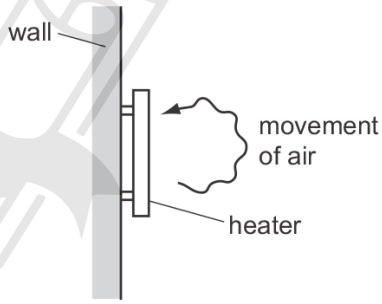
B



C



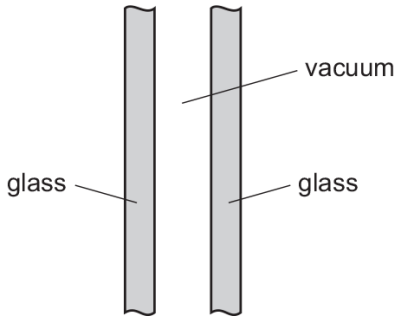
D



106. 0625_w12_qp_13 Q: 20

A double-glazed window consists of two panes of glass with a vacuum between them.

The vacuum reduces the amount of thermal energy transferred through the window.



Which row shows how much thermal energy is transferred through the vacuum by conduction, by convection and by radiation?

	conduction	convection	radiation
A	none	none	some
B	none	some	some
C	some	none	none
D	some	some	none

SN	Paper	Q. No.	Answer
939	0625_w12_qp_13	16	D
940	0625_w12_qp_13	18	D
941	0625_m22_qp_22	20	C
942	0625_m21_qp_22	18	B
943	0625_m21_qp_22	19	B
944	0625_s21_qp_21	19	A
945	0625_s21_qp_21	20	C
946	0625_s21_qp_22	19	A
947	0625_s21_qp_22	20	A
948	0625_s21_qp_23	19	B
949	0625_s21_qp_23	20	A
950	0625_w21_qp_21	16	B
951	0625_m20_qp_22	20	C
952	0625_m20_qp_22	21	D
953	0625_m20_qp_22	22	A
954	0625_p20_qp_20	23	C
955	0625_s20_qp_21	18	A
956	0625_s20_qp_21	19	C
957	0625_s20_qp_22	18	A
958	0625_s20_qp_22	19	D
959	0625_s20_qp_23	18	A
960	0625_s20_qp_23	19	B
961	0625_w20_qp_21	19	A
962	0625_w20_qp_21	20	C
963	0625_w20_qp_22	20	A
964	0625_w20_qp_23	19	B
965	0625_w20_qp_23	20	C
966	0625_m19_qp_22	19	D
967	0625_m19_qp_22	20	C
968	0625_s19_qp_21	17	C
969	0625_s19_qp_21	18	C
970	0625_s19_qp_21	19	D
971	0625_s19_qp_22	17	B
972	0625_s19_qp_22	19	D
973	0625_s19_qp_23	17	D
974	0625_w19_qp_21	19	C
975	0625_w19_qp_21	20	B
976	0625_w19_qp_22	20	D
977	0625_w19_qp_22	21	D
978	0625_w19_qp_23	19	D
979	0625_w19_qp_23	20	B
980	0625_m18_qp_22	20	C
981	0625_m18_qp_22	21	D
982	0625_s18_qp_21	18	B
983	0625_s18_qp_22	18	D
984	0625_s18_qp_23	18	B
985	0625_w18_qp_21	19	B
986	0625_w18_qp_21	20	B
987	0625_w18_qp_22	19	C

SN	Paper	Q. No.	Answer
988	0625_w18_qp_22	20	A
989	0625_w18_qp_23	19	A
990	0625_w18_qp_23	20	C
991	0625_m17_qp_22	17	C
992	0625_m17_qp_22	18	A
993	0625_s17_qp_23	18	D
994	0625_w17_qp_21	19	A
995	0625_w17_qp_22	19	B
996	0625_w17_qp_23	19	C
997	0625_m16_qp_22	19	B
998	0625_m16_qp_22	20	B
999	0625_s16_qp_21	18	A
1000	0625_s16_qp_21	19	B
1001	0625_s16_qp_22	18	C
1002	0625_s16_qp_22	19	A
1003	0625_s16_qp_23	18	A
1004	0625_s16_qp_23	19	D
1005	0625_w16_qp_21	19	B
1006	0625_w16_qp_21	20	D
1007	0625_w16_qp_22	18	C
1008	0625_w16_qp_22	19	C
1009	0625_w16_qp_23	19	B
1010	0625_m15_qp_12	16	D
1011	0625_m15_qp_12	17	D
1012	0625_s15_qp_11	16	C
1013	0625_s15_qp_11	17	B
1014	0625_s15_qp_12	16	C
1015	0625_s15_qp_13	16	D
1016	0625_w15_qp_11	16	C
1017	0625_w15_qp_11	17	B
1018	0625_w15_qp_12	16	C
1019	0625_w15_qp_12	17	D
1020	0625_w15_qp_13	16	D
1021	0625_w15_qp_13	17	B
1022	0625_s14_qp_11	16	D
1023	0625_s14_qp_11	17	D
1024	0625_s14_qp_12	17	B
1025	0625_s14_qp_12	18	D
1026	0625_s14_qp_13	13	D
1027	0625_w14_qp_11	17	B
1028	0625_w14_qp_11	18	A
1029	0625_w14_qp_13	17	D
1030	0625_w14_qp_13	18	A
1031	0625_s13_qp_11	17	D
1032	0625_s13_qp_11	18	C
1033	0625_s13_qp_12	17	D
1034	0625_w13_qp_11	17	D
1035	0625_w13_qp_11	18	C
1036	0625_w13_qp_13	17	B

SN	Paper	Q. No.	Answer
1037	0625_s12_qp_11	18	A
1038	0625_s12_qp_11	19	D
1039	0625_s12_qp_12	18	A
1040	0625_w12_qp_11	19	B
1041	0625_w12_qp_11	20	B
1042	0625_w12_qp_12	19	B
1043	0625_w12_qp_13	19	C
1044	0625_w12_qp_13	20	A