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90939



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Level 1 Physics, 2016

90939 Demonstrate understanding of aspects of heat

2.00 p.m. Tuesday 15 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of heat.	Demonstrate in-depth understanding of aspects of heat.	Demonstrate comprehensive understanding of aspects of heat.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Make sure that you have Resource Sheet L1–PHYSR.

In your answers use clear numerical working, words and/or diagrams as required.

Numerical answers should be given with an appropriate SI unit.

Useful information for calculation questions is available in the Resource Booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

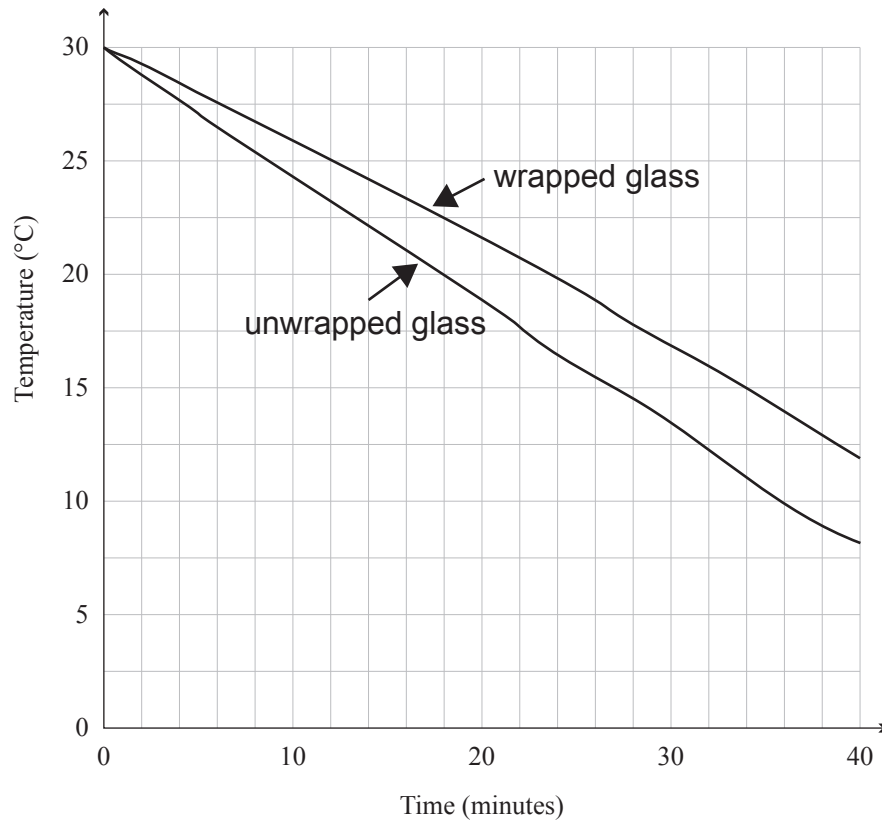
TOTAL

ASSESSOR'S USE ONLY

QUESTION ONE: COOLING YOUR DRINK

Bill and Ted want to find a fast way to cool down their drinking water in summer. Bill told Ted that if you wrap tissue paper around a drink and then put it in the freezer, it will cool down faster.

They decided to test this theory, so they got two identical glass bottles, and filled each glass bottle with 600 g of water. Bill and Ted then screwed on the caps and wrapped one with tissue paper. Both bottles were placed in the freezer and the results are shown in the graph below.



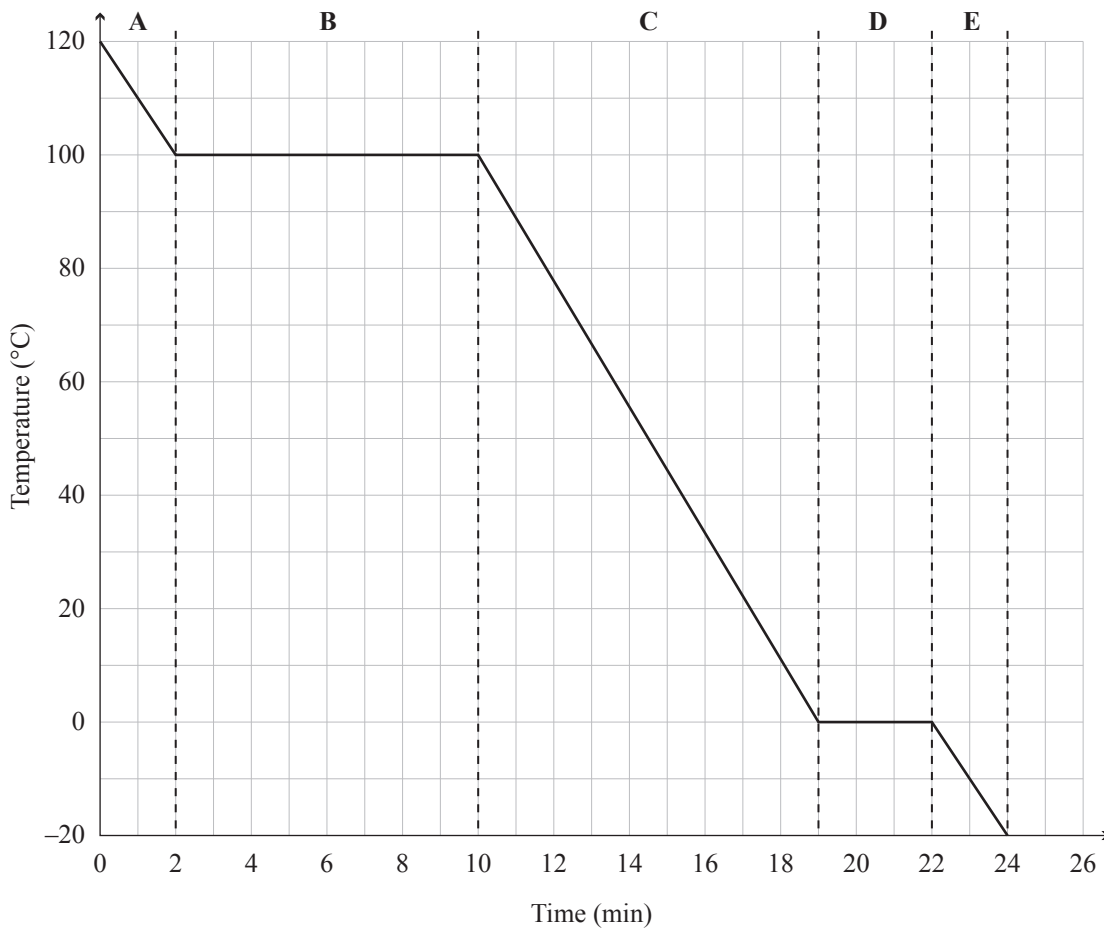
- (a) From the graph it can be seen that both bottles lost heat energy. State where the heat energy was lost to.

- (d) Bill suggested to Ted that they could try a different freezer that had a power rating of **0.4 kW**.

Explain how doubling the power rating of the freezer would affect the time taken for the 600 g of water at 0°C to freeze into ice at 0°C .

QUESTION TWO: COLD DRINK

Bill and Ted want to learn more about how to cool down their drinks. They look at a graph of cooling water to help them understand the process of cooling.



- (a) Use the graph above to give the names of the:
- (i) phases (states of matter) of sections A, C and E

Section A: _____ Section C: _____ Section E: _____

- (ii) processes occurring during sections B and D.

Section B: _____ Section D: _____

- (b) (i) Give the definition of latent heat.

- (ii) The graph on the previous page shows that the temperature is constant in Section D.

Explain, in terms of particle motion, what has happened to the water during Section D.

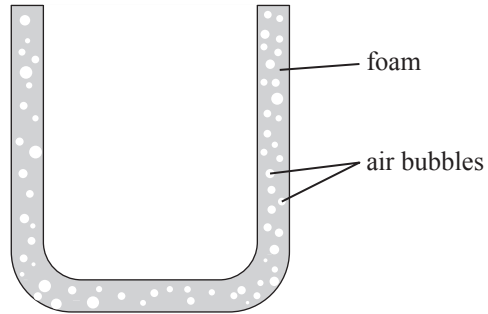
- (c) Instead of using the freezer to cool down their drinks, Ted decides to put ice into their water to cool it down.

Using the concept of latent heat, explain how the ice can cool their drinks.



QUESTION THREE: STAY COOL

Now that Bill and Ted have cooled their water, they want to keep it cool. They have decided to invest in a bottle holder called a Koozie. A Koozie is usually made from foam rubber that will fit over a bottle. Foam rubber is a material that has been created to have air pockets inside it.



- (a) Describe how the foam material of the Koozie helps to keep the drink cool.

- (b) Bill and Ted find that their drinking water is still warming up.

State and explain any modification that could be done to the Koozie to help reduce the rate of heat energy transfer.

- (c) Bill noticed that water had **condensed** on the outside of the water bottle.

Calculate the mass of the water that condensed if 12 000 J of energy was released during the condensation process.

Give your answer in **grams**.

Mass: _____

- (d) In their research they found that in some countries people tend to drink hot drinks to try to increase their sweating to therefore lower their body temperature.

- (i) Explain how drinking a hot drink could lower a person's body temperature.

There is more space for your answer on the following page.

- (ii) Explain why drinking a hot drink in high humidity would be less effective at lowering the body temperature of a person than drinking a hot drink in low humidity.

