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90939



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Level 1 Physics, 2013

90939 Demonstrate understanding of aspects of heat

2.00 pm Monday 25 November 2013
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.

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 2–8 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

You are advised to spend 60 minutes answering the questions in this booklet.

You may use the following data for any question:

Specific heat capacity of water	= $4200 \text{ J kg}^{-1} \text{ K}^{-1}$
Latent heat of fusion of ice	= $3.3 \times 10^5 \text{ J kg}^{-1}$
Latent heat of vaporisation of water	= $2.3 \times 10^6 \text{ J kg}^{-1}$

QUESTION ONE: HEAT TRANSFER

(a) There are three different heat transfer methods.

Name each heat transfer method and name the medium (solid/liquid/gas) for each method that would allow for maximum heat transfer to occur.

1. _____

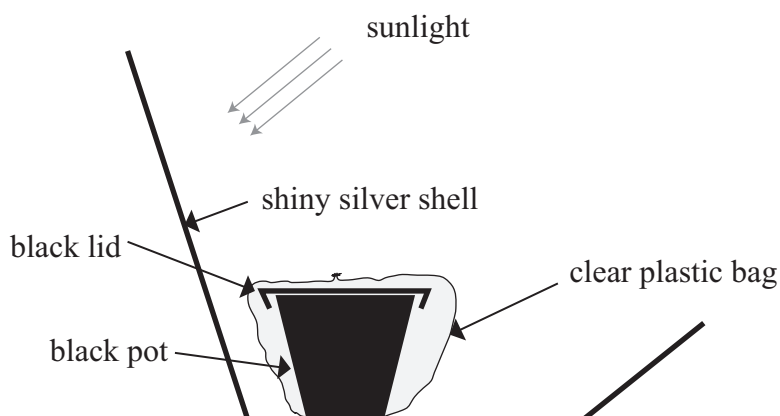
2. _____

3. _____

The picture shows a solar cooker being used to heat food. It consists of an L-shaped shell with a silver interior wall. There is a platform in the middle for a cooking pot. A black cooking pot with a lid will be placed inside a closed clear plastic bag.



The diagram below shows a side view of the cooker.



The main features of the cooker are:

- the shiny interior wall of the cooker
- the black surface of the pot
- the L-shaped reflector shell.

(b) Explain how these features help heat the food efficiently.

(c) Explain why the lid on the pot helps to cook the food more quickly.

(d) The closed clear plastic bag traps a layer of air around the pot.

Explain how enclosing the cooker inside the **clear** plastic bag aids faster cooking.

QUESTION TWO: HEATING WATER IN A SOLAR COOKER

- (a) State what is meant by the term **temperature**.

- (b) 100 g of water at 23°C is poured into the solar cooker's pot and left in the sun without the lid for 20 minutes.

Two minutes later, the temperature of the water is 42°C.

Calculate the amount of **heat energy** gained by the water.

heat energy _____

- (c) After 20 minutes of heating, the water boils at 100°C. When the pot was removed from the cooker, the mass of the water in the pot was only 87 g.

Explain, in terms of particle motion, what has happened to the water during the 20 minutes.

Your answer should show an understanding of the terms **heat energy** and **temperature**.

QUESTION THREE: CAMPING

- (a) When Sonya sits in a camp chair, she notices that the metal frame feels colder than the fabric of the chair, even though the metal and fabric are at the same temperature.

Explain this difference.

- (b) Sonya lights a camp fire. She knows that wood must reach a temperature of 350°C to burn. She finds that it is easier to get small twigs to burn than large logs.

Use the terms **heat capacity** and **heat energy** to explain why it is easier to heat the small twigs to 350°C to start the fire than the large logs.

- (c) After being near the fire for a while, Sonya begins to sweat.

Explain how sweat helps to cool her body.

- (d) The next morning, Sonya melts some ice using a gas cooker. The power available from the cooker is 0.15 kW.

Calculate the time for 100 g of ice at 0°C to melt into water at 0°C .

time _____

