



ATAR PHYSICS

UNIT 1: THERMAL PHYSICS

TOPIC TEST 2020

Student Name:

Teacher: JRM PCW JH SA
(Please circle)

Time allowed for this paper

Working time for paper: 50 minutes.

Instructions to candidates:

- You must include **all** working to be awarded full marks for a question.
- Marks may be deducted if diagrams are not drawn neatly with a ruler and to scale (if specified).
- Marks will be deducted for incorrect or absent units.
- **No** graphics calculators are permitted – scientific calculators only.

Mark:	/ 46
=	%

Question 1**(3 marks)**

Non physics people often use the word heat when they actually mean temperature or even internal energy (thermal energy) of the object. Explain the difference between these three concepts.

Question 2**(3 marks)**

Calculate the specific heat capacity of an alloy if it requires 3.20×10^4 J of energy to heat 1.20 kg of the alloy from 15.0 °C to 92.5 °C

Question 3**(3 marks)**

A small espresso coffee machine contains 0.500 kg of water at 20.0 °C. Calculate how much energy is required to change the water into steam at 100.0 °C

Question 4**(6 marks)**

Madhuri is shopping for a new LPG hot water system for her caravan. She knows she'll need one that can heat 65.0 kg of water from 20.0 °C to 65.0 °C. Given that LPG contains 25.0 MJ of energy per kilogram and the heater is 43.0% efficient, calculate how much LPG will be required to heat a full tank of water.

Question 5**(5 marks)**

Jason wants to add the exact amount of ice to his 250.0 g drink which has a specific heat capacity of $3.99 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$ so that it cools it from 36.0 °C to 7.00 °C. The ice comes from the freezer where it is kept at a temperature of -6.00 °C. Assuming his cup is fully insulated, calculate the mass of ice that must be added.

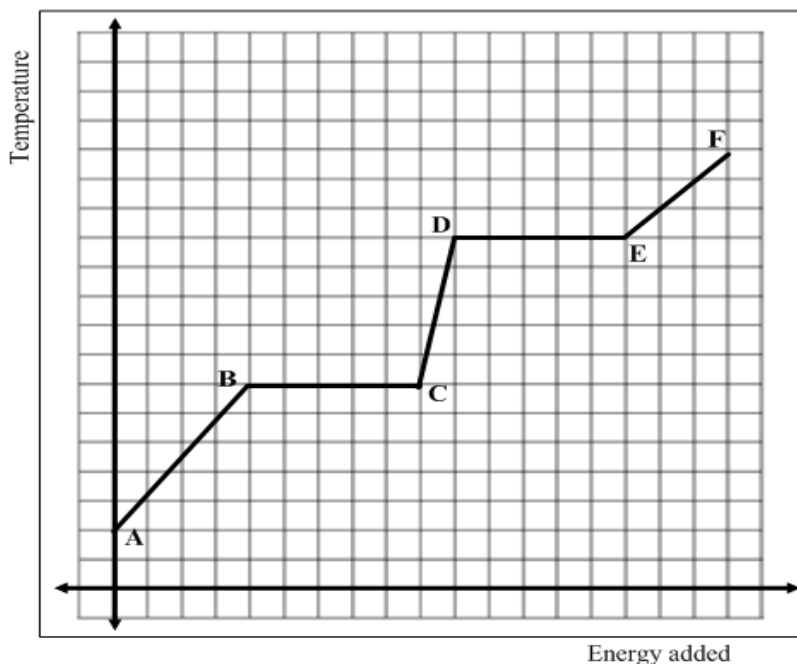
Question 6

(7 marks)

In an experiment a material is being heated at a constant rate producing the graph below.

- (a) Indicate on the graph where the material is present in both the liquid and gas phases at the same time.

(1 mark)



- (b) Describe using kinetic theory of matter what is occurring during the section of the graph mentioned in part (a).

(2 marks)

- (c) Explain how the specific heat of this material relates to the graph and compare the specific heat for each of the sections.

(4 marks)

Question 7

(4 marks)

Explain the following using your understanding of the Kinetic Particle model for matter.

(a) Water can evaporate even when it has not reached 100°C

(2 marks)

(b) When some of the sweat evaporates from a person's skin, the sweat that remains on our skin is cooler and thus acts to cool us down.

(2 marks)

Question 8

(3 marks)

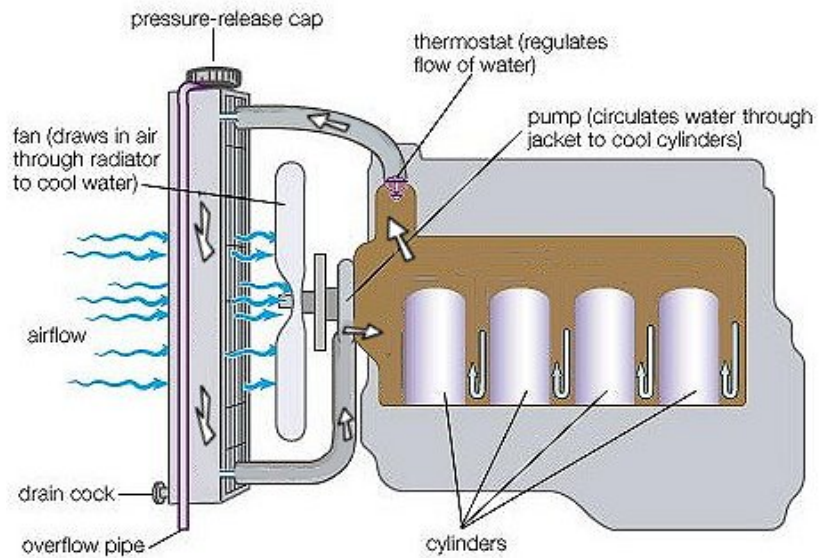
Using appropriate terminology, explain why a bathtub of water at 20 °C can melt much more ice than a pot full of boiling water even though it might be at 100°C.

(3 marks)

Question 9

(6 marks)

The diagram to the right shows the engine cooling system of a standard car. The radiator at the front is coloured black and filled with water which flows through the engine absorbing heat before cycling back.



(a) Explain why the radiator is black.

(2 marks)

(b) Explain why water is a good choice as a coolant.

(2 marks)

(c) Why does the radiator have a large number of fins in its construction?

(2 marks)
