Physics ATAR - Year 11

Thermal Physics Validation Test 2017

Mark:	/ 48
=	%

Name:

Time Allowed: 50 Minutes

Notes to Students:

1. You must include **all** working to be awarded full marks for a question.
2. Marks will be deducted for incorrect or absent units and answers stated to an incorrect number of significant figures.
3. **No** graphics calculators are permitted – scientific calculators only.

ADDITIONAL FORMULAE AND DATA

- Triple Point of Water   = 0.01°C   = 273.16 K

$$\frac{T_\theta}{100} = \frac{X_\theta - X_0}{X_{100} - X_0}$$

Question 1 **(2 marks)**

The absolute scale of temperature is defined in terms of the pressure of a fixed volume of an ideal gas. State the fixed points of the Kelvin scale.

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Question 2 **(3 marks)**

A pan of water is heated from 25.0°C to 80.0°C. Calculate the change in temperature in the Kelvin scale.

Question 3 **(3 marks)**

The length of the mercury column in an uncalibrated 'liquid-in-glass' thermometer is 12.0 mm in ice water and 237 mm in boiling water. When placed in a liquid with an unknown temperature it is 57.0 mm long. Calculate the value of the unknown temperature.

Question 4   **(3 marks)**

Calculate the amount of energy absorbed by a 2.80 kg brick, sitting in the sun, if its temperature rises from 18.0°C to 28.0°C. (c_{brick} = 7.50 x 10^2 J kg^{-1} K^{-1}).

Question 5   **(4 marks)**

A certain quantity of energy is supplied to both a kilogram of water (c = 4180 J kg^{-1} K^{-1}). And to a kilogram of iron (c = 470 J kg^{-1} K^{-1}). State which undergoes the greater change in temperature and explain your reasoning.

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Question 6   **(3marks)**

If 4.20 kJ of energy are required to vaporise 5.00 g of ethanol, calculate the specific latent heat of vaporization of ethanol.

Question 7   **(8 marks)**

A large bucket of water at 80.0 °C sits next to a small cup of water at 80.0 °C.

(a)   Choose which has more internal energy (Circle your chosen answer)

                                                                                        (1 mark)

     (i)   The bucket

     (ii)   The cup

     (iii)   They both have the same amount of internal energy

(b)   Explain why you chose your answer to (a).

                                                                                        (3 marks)

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(c)   Choose which has the fastest moving molecules (Circle your chosen answer)

(1 mark)

      (i)   The bucket

      (ii)   The cup

      (iii)   They both have the same mean speed of particles

(d)   Explain why you chose your answer to (c).

(3 marks)

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Question 8   (8 marks)

A 500 W copper kettle of mass 0.500 kg contains 2.00 kg of water at 20.0°C.
(c_{Cu} = 390 Jkg^{-1}K^{-1})

(a)   Calculate the amount of energy required to bring the water (and the copper) to its boiling point.

(4 marks)

(b)   Calculate the time, in minutes, required to bring the water to boil

(4 marks)

Question 9   **(3 marks)**

Explain why is there no increase in temperature when the water undergoes the change from the liquid to the gaseous phase.

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Question 10   **(5 marks)**

Suppose you pour a mass of water initially at 20.0°C into a 0.500 kg aluminium pan fresh off the stove with a temperature of 145°C. Assuming that the pan is on an insulated pad and that a negligible amount of water boils off, if the final temperature of the mixture is 50.0 °C, calculate the mass of the water. (c_{Al} = 900 Jkg^{-1}K^{-1})

Question 11   (6 marks)

A calorimeter that has a mass of 1.00 kg and a specific heat capacity of 8.40×10^2 J kg^{-1} K^{-1} is cooled to 0.00°C and 1.40 kg of water at 0.00°C is placed in it. 2.00 kg of water at 90.0°C is then poured into the calorimeter. Calculate the resulting temperature of the mixture.

END OF TEST