MENGO SENIOR SCHOOL
MID TERM 1 EXAMINATIONS 2003
PHYSICS DEPARTMENT
P510/2
TIME: 1:45 HOURS

INSTRUCTIONS:
Attempt all questions
Assume where necessary:
-Acceleration due to gravity g=9.81ms^{-2}

1(a)(i) Define the Celsius scale of Temperature on a thermocouple.

(ii) State two advantages of the thermocouple over the electrical resistance thermometer.

(iii) The resistance of a wire at the triple point of water is 2.00. Find the temperature at which the resistance is 2.53.

(b)(i) Define specific Latent Heat of Fusion.

(ii) A solid of mass 0.5kg and specific Heat Capacity 4.0 x 10^2J kg^{-1}k^{-1} and temperature 90^0 C is placed into a mixture of ice and 0.10kg of water contained in a vacuum flask. The final temperature of the mixture is found to be 10^0C. Calculate the mass of ice initially in the mixture.

(c)(i) A current of 2.50A passing through a heating coil immersed in 180g of paraffin of specific Heat capacity 2.00Jg^{-1}k^{-1} contained in a 100g calorimeter of specific Heat capacity 0.400Jg^{-1}k^{-1} raises the temperature from 5^0C below room temperature to 5^0C above room temperature in 100s. What should be the reading of a voltmeter connected across the heating coil?

(ii) Define Specific Heat Capacity and Heat Capacity of a substance. What is the relationship between the 2?

2(a)(i) State the desirable properties a material must have to be used as a thermometric substance.

(ii) Explain why scales of temperature based on different thermometric properties may not agree.

(b)(i) Draw a labeled diagram to show the structure of a simple constant volume gas thermometer.

(ii)Describe how a simple constant-volume gas thermometer can be used to establish a Celsius scale of temperature.

(iii) State the advantages and disadvantages of a mercury-in-glass thermometer and a constant-volume gas thermometer.

3(a) In an experiment to determine the Specific Heat Capacity of a liquid, it flows past an electric heating coil and in a steady the inlet and outlet temperature are 10.4^{0C} and $13.5^{0}C$ respectively. When the mass rate of flow of the liquid is $3.2 \times 10^{-3}kgs^{-1}$ the power supplied to the coil is 27.4W. The flow rate is then changed to $22X10^{-3}kgs^{-1}$ and in order to maintain the same inlet and outlet temperatures, the power supplied was adjusted to 19.3W.

(i) Explain why two sets of data are obtained and calculate the specific Heat Capacity of the liquid.
(ii) Why are the temperatures made the same in each part of the experiment?
(iii) What are the advantages of this method over the method of mixtures?
(iv) What is the rate of heat loss in the above experiment?

(b)(i) What is meant by a "cooling correction" in the method of mixtures?
(ii) Explain briefly, showing how it is catered for in the experiment above.

(c)(i) When a current of 2.0A is passed through a coil of constant resistance 15 immersed in 0.5kg of water at $0^{0}C$ in a vacuum flask, the temperature of the water rises to $8^{0}C$ in 5min. If instead the flask originally contained 0.25kg of ice and 0.25kg of water, what current must be passed through the coil if this mixture is to be heated to the same temperature in the same time?
SHC of water = $4.2 \times 10^{3}Jkg^{-1}k^{-1}$
SLHf of ice = $3.3 \times 10^{5}Jkg^{-1}$

END