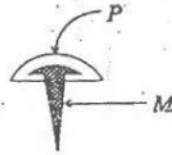


2002 A/L Structured Essay Question No (02)

2. You are provided with metal (M) nails studded with plastic (P) caps as shown in the figure, and asked to find the specific heat capacity (C_p) of the plastic using the method of mixtures without separating the plastic part. The plastic content of each nail is 30% of its total mass. Specific heat capacity (C_M) of the metal is a known quantity.



- (a) If the nails at 100°C , a calorimeter, and water are provided what other apparatus would you require to carry out this experiment? (Assume that the plastic can be heated to 100°C without affecting its properties.)

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- (b) Write down the list of measurements that you would take in this experiment. Make sure list them in the order you take the measurements. (Select the appropriate symbols given)

(i) (m_1)

(ii) (m_2)

(iii) (θ_1)

(iv) (θ_2)

(v) (m_3)

- (c) Write down an expression relating C_p , C_M , C_w (specific heat capacity of water) and the quantities measured in (b). Assume that the calorimeter and the metal part of nails are made of the metal.

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(d) State a main experimental error that can affect the result of the experiment in addition to error associated with the above measurements.

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(e) Suggest a suitable measure to minimize the error that you have stated under (d).

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(f) Would you expect to obtain a more accurate value for C_p if a relatively large quantity of nails and a small quantity of water are used in this experiment? (Yes or No)
Give reasons for your answer.

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(g) Give a valid reason as to why the value obtained for C_p in this experiment is more accurate than the value that would have been obtained had a large lump of plastic been used instead of nails.

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