For Examiner's Use

Answer **all** the questions in the spaces provided.

1 **(a)** In an experiment to determine the thickness of a typical $1 coin, a student used a half meter rule to determine the thickness of one $1 coin and the thickness T of N such coins, as shown in Fig. 1.1.

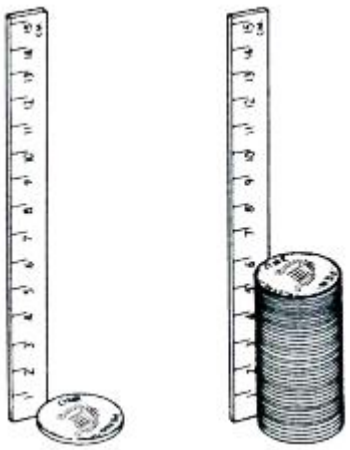

Fig. 1.1

The thickness of a typical $1 coin is then taken to be $\frac{T}{N}$.

(i) In finding the thickness of a $1 coin, explain how dividing T by N reduces random error as compared to measuring the thickness of only 1 coin.

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…….. [2]

(ii) Suggest a method to further improve the accuracy in determining the thickness of the coin. Explain your answer.

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…….. [1]

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(b) The ideal gas law states that $pV = nRT$

where p is the pressure of the gas,
V is the volume of the gas,
n is the number of moles and
T is the thermodynamic temperature.

In an experiment, the student was attempting to calculate the value of p for a sample of 2.00 millimoles of gas trapped in a sphere.

Assuming ideal gas conditions, if the diameter of the sphere is (50.0 ± 0.1) mm and the temperature of the gas is (36.7 ± 0.1) °C, determine the value of p with its associated uncertainty.

p = (…….. ± ……..) Pa [3]

[Total: 6]

[Turn over