UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME										
CENTRE NUMBER							CANDIDATE NUMBER			

5205277896

PHYSICS **9702/35**

Advanced Practical Skills 1 **October/November 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
You will be allowed to work with the apparatus for a maximum of one hour for each question.
You are expected to record all your observations as soon as these observations are made, and to plan the presentation of the records so that it is not necessary to make a fair copy of them.
You may lose marks if you do not show your working or if you do not use appropriate units.

Additional answer paper and graph paper should be used only if it becomes necessary to do so.
You are reminded of the need for good English and clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **9** printed pages and **3** blank pages.

DC (NF/SW) 36706/4

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International Examinations

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You may not need to use all of the materials provided.

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1 In this experiment you will investigate how the depth to which a beaker is submerged in water depends on the mass added to the beaker.

(a) Measure and record the height *h* of the beaker as shown in Fig. 1.1.

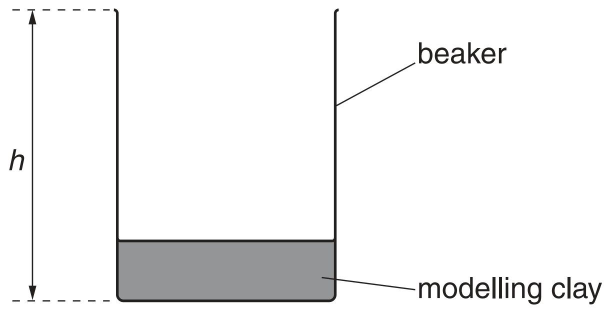

Fig. 1.1

h = ... cm [1]

(b) (i) Place the beaker from **(a)** inside the larger container, which contains water. The beaker will float in the water and may tilt to one side.

(ii) Measure and record the distance *d* between the **lowest** point of the bottom of the beaker and the water surface as shown in Fig. 1.2.

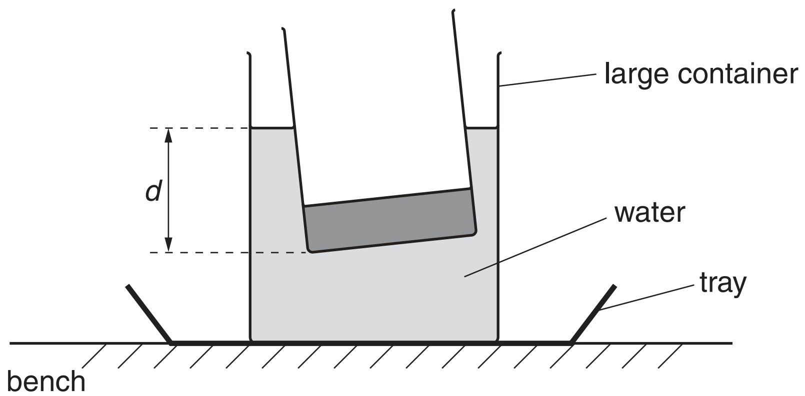

Fig. 1.2

This measurement should be taken from outside the large container.

d = ... [1]

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(c) Carefully place the 50 g mass on top of the modelling clay in the beaker.
For this added mass m of 50 g, measure and record the new distance d.

d = ...

(d) Change the added mass in the small beaker and measure d.
Repeat this until you have six sets of readings of m and d.

Include values of $\frac{m}{d}$ and $\frac{1}{d}$ in your table.

[10]

(e) **(i)** Plot a graph of $\frac{m}{d}$ on the y-axis against $\frac{1}{d}$ on the x-axis. [3]

(ii) Draw the straight line of best fit. [1]

(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...
[2]

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(f) It is suggested that the quantities m and d are related by the equation

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$$\frac{m}{d} = -\frac{A}{d} + B$$

where A and B are constants.

Use your answers in **(a)** and **(e)(iii)** to determine the least value of m that would be needed to completely submerge the beaker.
Give an appropriate unit.

m = ... [2]

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Please turn over for Question 2.

You may not need to use all of the materials provided.

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2 In this experiment you will investigate how the rate of heat energy transferred from a resistor depends on the voltage across it.

(a) (i) Pour water into the measuring cylinder to the 50 ml mark.

(ii) Pour the water from the measuring cylinder into the empty beaker.
Determine and record the mass *m* of water in the beaker.
(1 ml of water has a mass of 1 g.)

m = ... [1]

(iii) Estimate the percentage uncertainty in *m*.

percentage uncertainty = ... [1]

(b) (i) Set up the circuit shown in Fig. 2.1.

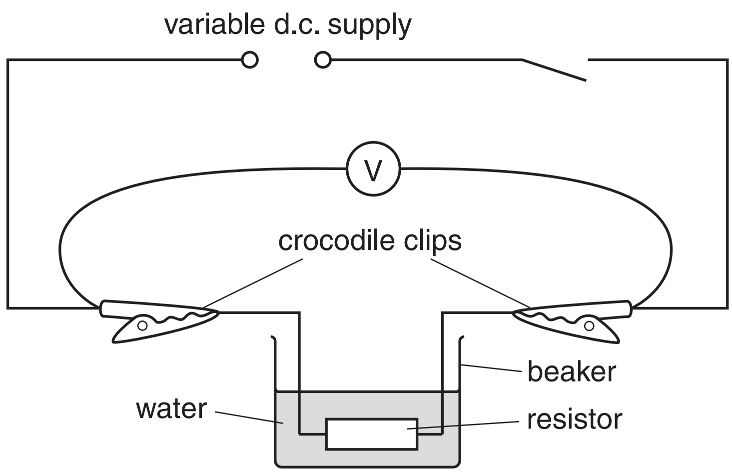

Fig. 2.1

(ii) Adjust the output of the power supply to approximately 4 V.

(iii) Close the switch. Measure and record the voltmeter reading *V*. Open the switch.

V = ... [1]

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(c) Measure and record the temperature θ_1 of the water in the beaker.

θ_1 = ... [1]

(d) **(i)** Close the switch and start the stopwatch.

(ii) After four minutes, measure and record the temperature θ_2 of the water.

θ_2 = ... [1]

(iii) Calculate and record the temperature rise $(\theta_2 - \theta_1)$.

$(\theta_2 - \theta_1)$ = ... [1]

(e) Repeat **(b)(iii)** for an output voltage in the range 7 V – 9 V.

V = ... [1]

(f) Repeat **(c)** and **(d)** for this new output voltage.

θ_1 = ...

θ_2 = ...

$(\theta_2 - \theta_1)$ = ...
[2]

(g) It is suggested that the relationship between V, θ_1 and θ_2 is

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$$V^2 = k(\theta_2 - \theta_1)$$

where k is a constant.

(i) Using your data calculate two values of k.

first value of k = ...

second value of k = ...
[1]

(ii) Justify the number of significant figures that you have given for your values of k.

....

....

.... [1]

(iii) Explain whether your results support the suggested relationship.

....

....

....

.... [1]

(h) **(i)** Describe four sources of uncertainty or limitations of the procedure for this experiment.

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1. ....

....

2. ....

....

3. ....

....

4. ....

....
[4]

(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. ....

....

2. ....

....

3. ....

....

4. ....

....
[4]

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