Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
TOTAL	

General Certificate of Education
Advanced Level Examination
June 2011

Physics PHA6/B6/XPM2
(Specifications A and B)

Unit 6 Investigative and Practical Skills in A2 Physics
Route X Externally Marked Practical Assignment (EMPA)

Section A Part 2

For this paper you must have:
- a calculator
- a pencil
- a ruler.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for Section A Part 2 is 16.

Section A Part 2

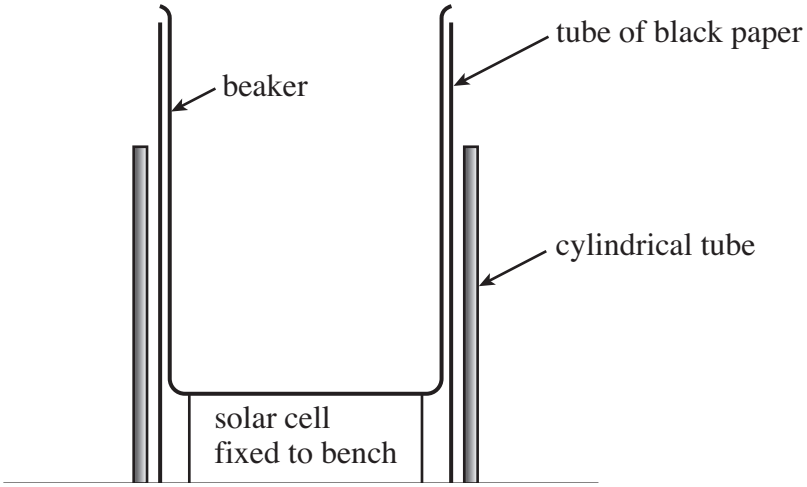
Follow the instructions given below.

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

No description of the experiment is required.

1 In this experiment you are to investigate the absorption of light as it passes through a solution of ink. The apparatus you will use is shown in **Figure 4**.

Figure 4



The solar cell and the cylindrical tube have been taped to the bench.
Do not remove the beaker or the tube of black paper from within the cylindrical tube.

Position the clamped lamp so that it is coaxial with the beaker.
Do not adjust the height of the lamp or the output voltage of the power supply.

The output voltage of the solar cell is shown on the digital voltmeter.
Do not change the range setting of the voltmeter.

Switch on the lamp and monitor the voltmeter reading over a short interval of time, eg 20 seconds, so that either the reading reaches a steady value or so you can determine the range, and hence the mean value, V_0, of the reading.

1 (a) Read and record V_0.

V_0 = ...

(1 mark)

1 (b) You are provided with approximately 500 ml of a solution of ink and two measuring cylinders of different capacity and resolution.
You are to record the voltmeter reading, V, as the volume of ink solution in the beaker, Q, is varied.

1 (b) (i) Transfer **between 90 ml and 100 ml** of the solution to the **larger** measuring cylinder.
Note the volume of the solution in this measuring cylinder before carefully pouring this into the beaker.
Record Q, the volume of the solution in the beaker.
Read and record the (mean) voltmeter reading, V.

1 (b) (ii) Transfer between **20 ml and 25 ml** of the solution to the **smaller** measuring cylinder.
Note the volume of the solution in the measuring cylinder before carefully pouring this into the beaker.
Record Q, the new volume of the solution in the beaker then read and record the corresponding (mean) voltmeter reading, V.
Increase Q in increments of between 20 ml and 25 ml, recording the voltmeter reading, V, at each stage, until Q is about 200 ml.

1 (b) (iii) Transfer between **40 ml and 70 ml** of the solution to the **larger** measuring cylinder.
Note the volume of the solution in this measuring cylinder before carefully pouring this into the beaker.
Record Q and V then continue, increasing Q in increments of between 40 ml and 70 ml, measuring the voltmeter reading, V, at each stage, until all the solution has been transferred to the beaker.

You should record all the data required to complete part (b) of this question on **page 4** of this booklet.
Note that you will not be expected to record repeat readings of the measurements made in part (b).

Question 1 continues on the next page

Measurements and observations.

(6 marks)

1 (c) Plot, on the grid on **page 5**, a graph with ln(V/mV) on the vertical axis and Q on the horizontal axis. You should draw a straight line of best fit through the plotted points. Record below the data you will plot on your graph.

(9 marks)

END OF SECTION A PART 2

16

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