UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9564582109

PHYSICS **0625/63**

Paper 6 Alternative to Practical **October/November 2011**

1 hour

Candidates answer on the Question Paper.
No Additional Materials are required.

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 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 **all** questions.

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.

DC (SJF/CGW) 34207/4

UNIVERSITY *of* CAMBRIDGE
International Examinations

1 An IGCSE student is investigating the passage of light through a transparent block using optics pins.

The student's ray trace sheet is shown in Fig. 1.1.

The student places two pins P_1 and P_2 to mark the incident ray. He looks through the block and places two pins P_3 and P_4 to mark the emergent ray so that P_3, P_4 and the images of P_1 and P_2 appear to be exactly one behind the other. He draws the outline of the block. He removes the block and pins and draws in the incident ray and the emergent ray.

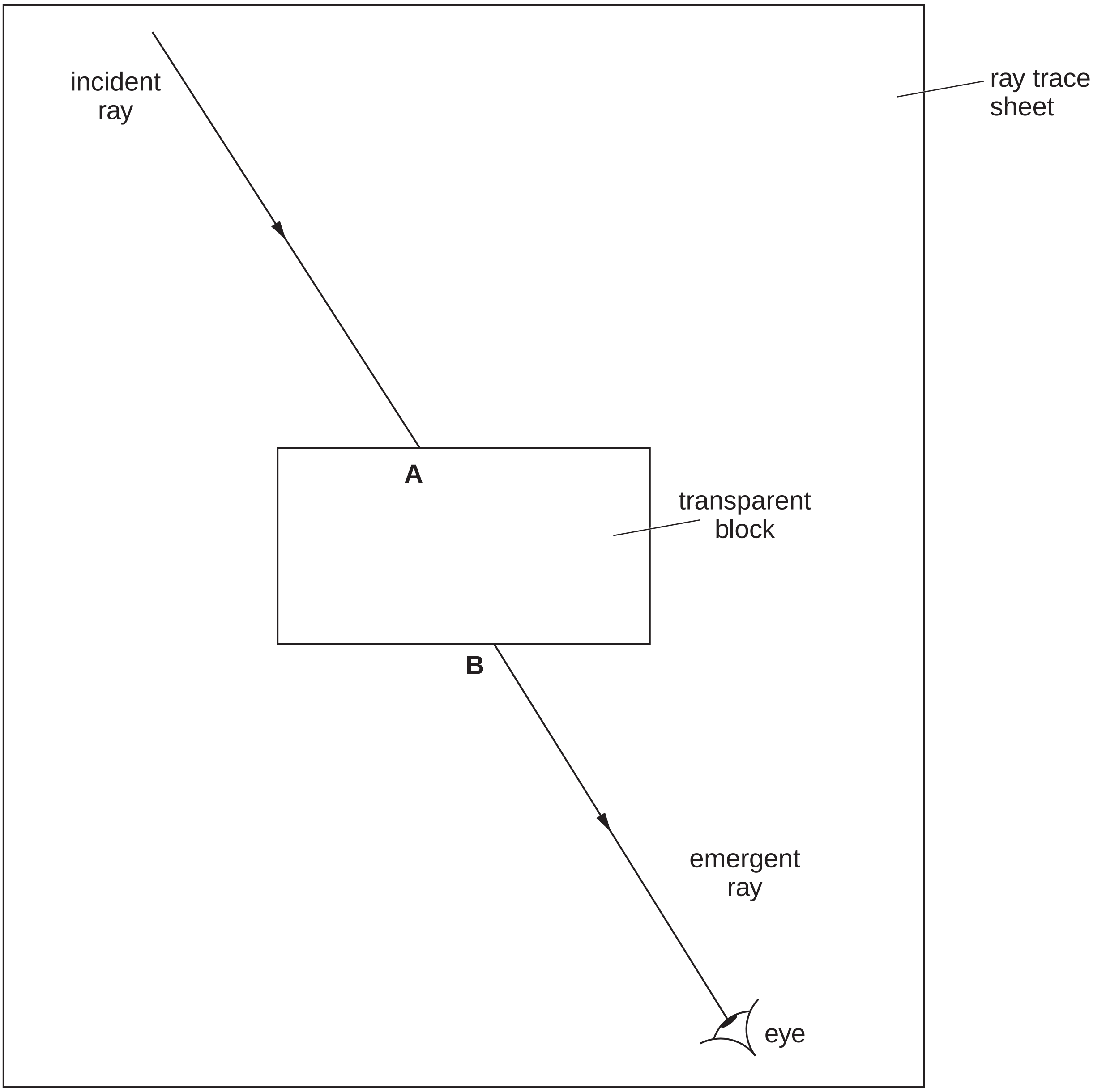

Fig. 1.1

(a) **(i)** On Fig. 1.1, mark suitable positions for the four pins. Label the pins P_1, P_2, P_3 and P_4.

(ii) Draw the normal at point **A**.

[2]

(b) (i) Draw in the line **AB**. Measure and record the angle of refraction *r* between the line **AB** and the normal.

r = ...

(ii) Measure and record the angle of incidence *i* between the incident ray and the normal.

i = ...
[2]

(c) The student does not have a set square or any other means to check that the pins are vertical. Suggest how he can ensure that his P_3 and P_4 positions are as accurate as possible.

....

....[1]

[Total: 5]

2 An IGCSE student is investigating the energy changes that occur when hot water and cold water are mixed.

The student is provided with a supply of hot water and a supply of cold water.

The temperature of the cold water $\theta_c = 23\,°C$.

(a) The temperature of the hot water is shown in Fig. 2.1.

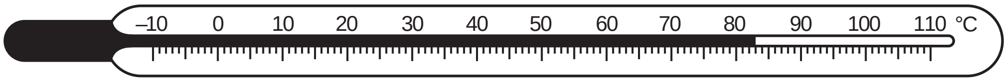

Fig. 2.1

Record the temperature θ_h of this hot water.

θ_h = ... [1]

(b) The student pours $50\,cm^3$ of the hot water into $50\,cm^3$ of the cold water. He briefly stirs the mixture and then records the temperature θ_m of the mixture, $\theta_m = 49\,°C$.

(i) Calculate the gain in thermal energy E_c of the cold water using the equation

$$E_c = k(\theta_m - \theta_c),$$

where $k = 210\,J/°C$.

E_c = ...

(ii) Calculate the loss in thermal energy E_h of the hot water using the equation

$$E_h = k(\theta_h - \theta_m),$$

where $k = 210\,J/°C$.

E_h = ...
[2]

(c) The student suggests that all the thermal energy lost by the hot water is gained by the cold. Thus E_c and E_h should be equal.

(i) State whether the experimental results support this suggestion. Justify your statement by reference to the results.

statement ....

justification ....

....

....[1]

(ii) Suggest a practical reason in this experiment why E_c might be different from E_h.

....

....[1]

(d) Another student is asked to suggest quantities that should be kept constant if this experiment is repeated in order to check the readings. Table 2.1 shows the suggestions.

Place a tick (✓) in the second column of the table next to each correctly suggested quantity.

Table 2.1

suggested quantities	
avoid parallax (line of sight) errors when taking readings	
number of stirs	
room temperature	
starting temperature of hot water	
use a digital thermometer	
use only two or three significant figures for the final answers	

[2]

[Total: 7]

3 The IGCSE class is investigating the resistance of a wire.

The circuit is shown in Fig. 3.1.

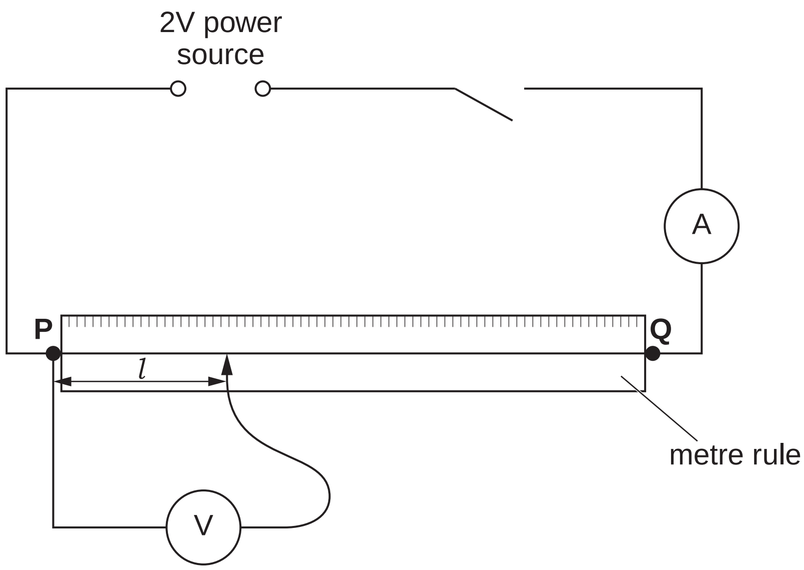

Fig. 3.1

(a) A student measures and records in Table 3.1 the current I in the circuit and the potential difference V across a length l = 0.250 m of wire **PQ**.

She repeats the procedure using l values of 0.500 m and 0.750 m.

(i) Complete the heading for each column of the table.

(ii) Calculate the resistance R of each length l of the wire using the equation $R = \frac{V}{I}$.

Record the values of R in the table.

Table 3.1

l /	V /	I /	R /
0.250	0.54	0.32	
0.500	1.10	0.32	
0.750	1.61	0.32	

[4]

(b) Use numbers from the table to suggest and justify a relationship between the length l of the wire and its resistance R. Show your working.

relationship ....

....

justification ....

....

....[3]

(c) Use the results to predict the resistance of a 1.50 m length of the same wire. Show your working.

prediction .... [2]

(d) Another student proposes that the accuracy of the experiment would be improved by using a 12 V power source.

Suggest two effects that this might have on the experiment.

1. ....

....

2. ....

....[2]

[Total: 11]

4 The IGCSE class is investigating the formation of images by a lens.

Fig 4.1 shows the apparatus.

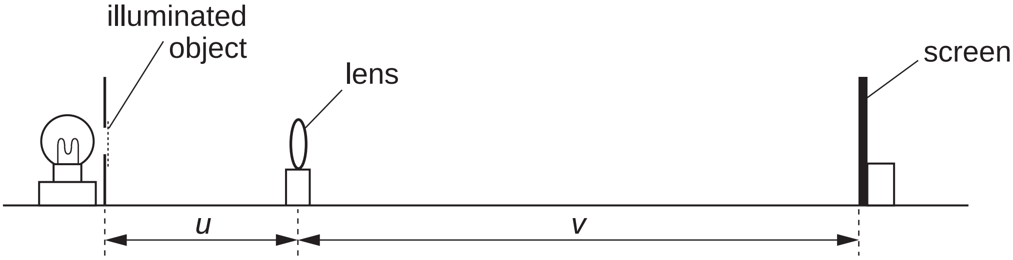

Fig. 4.1

A student places the screen about 1.0 m from the illuminated object. He places the lens between the object and the screen at a distance u = 0.200 m from the object. He adjusts the position of the screen until a clearly focused image is formed on the screen. He records the distance v between the centre of the lens and the screen. He repeats the procedure using different values of u. The readings are shown in Table 4.1.

Table 4.1

u / m	v / m	$\frac{1}{u} / \frac{1}{\mathrm{m}}$	$\frac{1}{v} / \frac{1}{\mathrm{m}}$
0.200	0.596	5.00	1.68
0.300	0.304	3.33	3.29
0.400	0.244	2.50	4.10
0.500	0.214	2.00	4.67
0.600	0.198	1.67	5.05

(a) State and briefly explain one precaution you would take in order to obtain reliable measurements in this experiment.

precaution ....

....

explanation ....

....

....[1]

(b) Plot the graph of $\frac{1}{v}\Big/\frac{1}{\text{m}}$ (y-axis) against $\frac{1}{u}\Big/\frac{1}{\text{m}}$ (x-axis). Both axes must start at 0 and extend to 7.0.

[4]

(c) **(i)** Use the graph to find the intercept on the y-axis.

intercept on the y-axis = ...

(ii) Use the graph to find the intercept on the x-axis.

intercept on the x-axis = ...
[2]

[Total: 7]

5 The IGCSE class is determining the density of modelling clay by two methods.

(a) Method 1

A student moulds a piece of modelling clay into a cube shape as shown in Fig. 5.1.

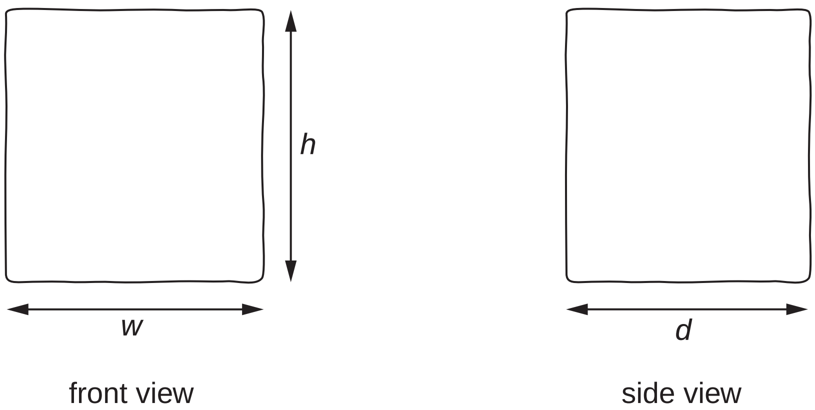

Fig. 5.1

(i) On Fig 5.1, measure the height h, width w and depth d of the cube-shaped piece of modelling clay.

h = ... cm

w = ... cm

d = ... cm

(ii) Calculate the volume V of the modelling clay using the equation $V = hwd$.

V = ...

(iii) Calculate the density ρ of the modelling clay using the equation $\rho = \frac{m}{V}$, where the mass of the modelling clay m = 103 g.

ρ = ... [3]

(b) Method 2

The student cuts the piece of modelling clay into two pieces. One piece is approximately twice the size of the other piece. The mass m_s of the smaller piece is 34.5 g.

Fig. 5.2a shows a measuring cylinder containing water. Fig. 5.2b shows the same measuring cylinder after the smaller piece of modelling clay has been lowered into it.

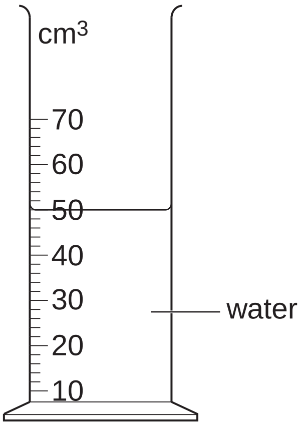

Fig. 5.2a

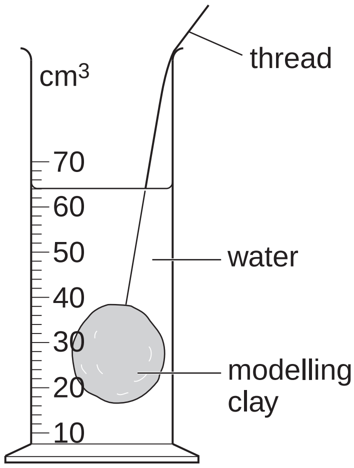

Fig. 5.2b

(i) Record the volume of water V_1 in the measuring cylinder, as shown in Fig. 5.2a.

V_1 = ... [1]

(ii) Record the new volume V_2 in the measuring cylinder, as shown in Fig. 5.2b.

V_2 = ... [1]

(iii) Describe briefly one precaution you would take to read the measuring cylinder correctly.

....

....

....[1]

(iv) Calculate the volume V_s of the modelling clay using the equation $V_s = (V_2 - V_1)$.

V_s = ...

(v) Calculate the density ρ of the modelling clay using the equation $\rho = \frac{m_s}{V_s}$, where m_s = 34.5 g.

ρ = ... [1]

(c) (i) Assuming that the experiment has been carried out with care, suggest two reasons why the two values obtained for the density of the modelling clay in **(a)** and **(b)** may not be the same.

1. ....

....

2. ....

....[2]

(ii) State which of the two methods for determining density (method 1 or method 2) you judge to be less accurate. Give a reason for your judgement.

method ....

reason ....

....[1]

[Total: 10]