Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS 9188/4

PAPER 4 Practical Test

NOVEMBER 2012 SESSION 2 hours 30 minutes

Candidates answer on the question paper.
Additional materials:
As listed in Instructions to Supervisors
Electronic calculator
Graph paper

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on any separate answer paper used.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
In Questions 1 and 2, 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. The working of the answers is to be handed in. Marks are mainly given for a clear record of the observations actually made, for their suitability and accuracy, and for the use made of them. **Routine** precautions and theory are **not** wanted in Questions 1 and 2. You should, however, record any **special** precautions you have taken so as to aid accuracy. At the end of the examination, fasten any separate answer paper used securely to the question paper.

INFORMATION FOR CANDIDATES

Questions 1 and 2 carry 18 marks each and question 3 carries 14 marks.
Squared paper and Mathematical tables are available.
Additional paper and graphs should be submitted **only** if it becomes **necessary** to do so.
You are advised to spend approximately one hour on each of Questions 1 and 2 and 30 minutes on Question 3
You are reminded of the need for good English and clear presentation in your answers.

FOR EXAMINER'S USE	
1	
2	
3	
TOTAL	

This question paper consists of 10 printed pages and 2 lined pages.

For Examiner's Use

1 In this experiment you will investigate the variation of terminal speed , V, of an air bubble (in an inclined burette filled with water) with the angle of inclination, θ.

(a) (i) Using a masking tape provided, fix the burette on a metre rule.

(ii) Set up the apparatus as shown in **Fig.1.1.**

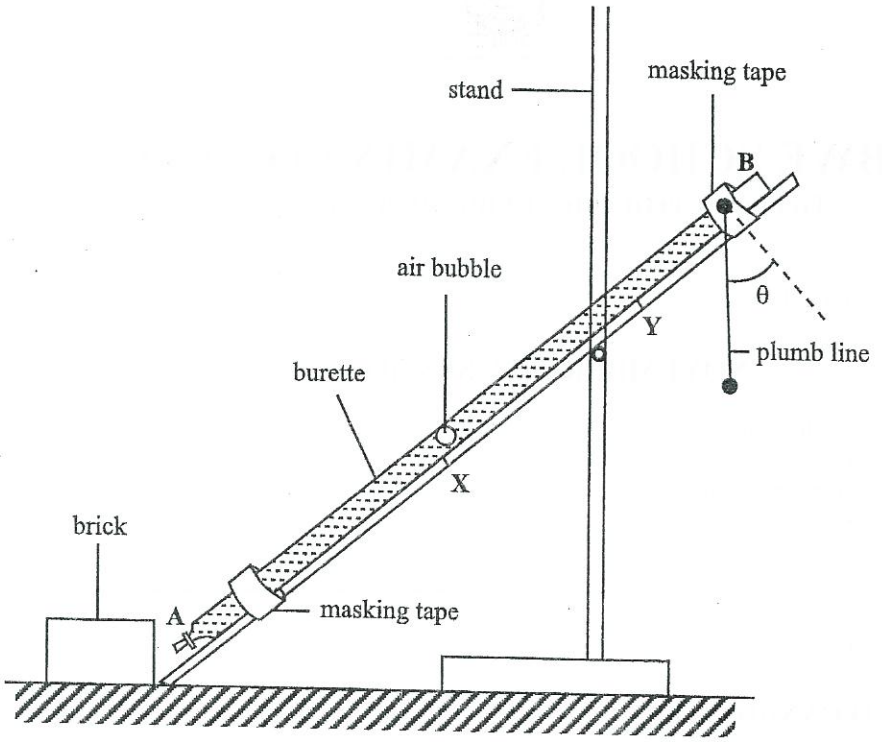


Fig.1.1.

(iii) Use a brick provided to support one end of the metre rule whilst the other end rests on a clamp.

(iv) Tie the plumbline at the upper end of the mounted burette such that $\theta = 40°$.

(v) Mark the points X and Y on the upper end of the mounted burette such that they are 40 cm apart.

(b) (i) Tilt the system so that the bubble moves to end A. Return end A to its original position.

(ii) Measure and record the time taken, t, by the bubble to move the distance XY.

(iii) Change the angle of inclination and repeat steps **(b) (i)** and **(b) (ii)** such that $10° \leq \theta \leq 40°$ until you have six sets of readings.

(iv) In your table of results include values of V, V^2, $\sin^2\theta$.

For Examiner's Use

(c) It is suggested that V and θ are related by $V^2 = k\sin^2\theta + C$ where k and C are constants.

(i) Plot a graph of $V^2(y-\text{axis})$ and $\sin^2\theta\ (x-\text{axis})$

(ii) Comment on the validity of the relationship.

(iii) Determine the gradient and hence the values of k and C.

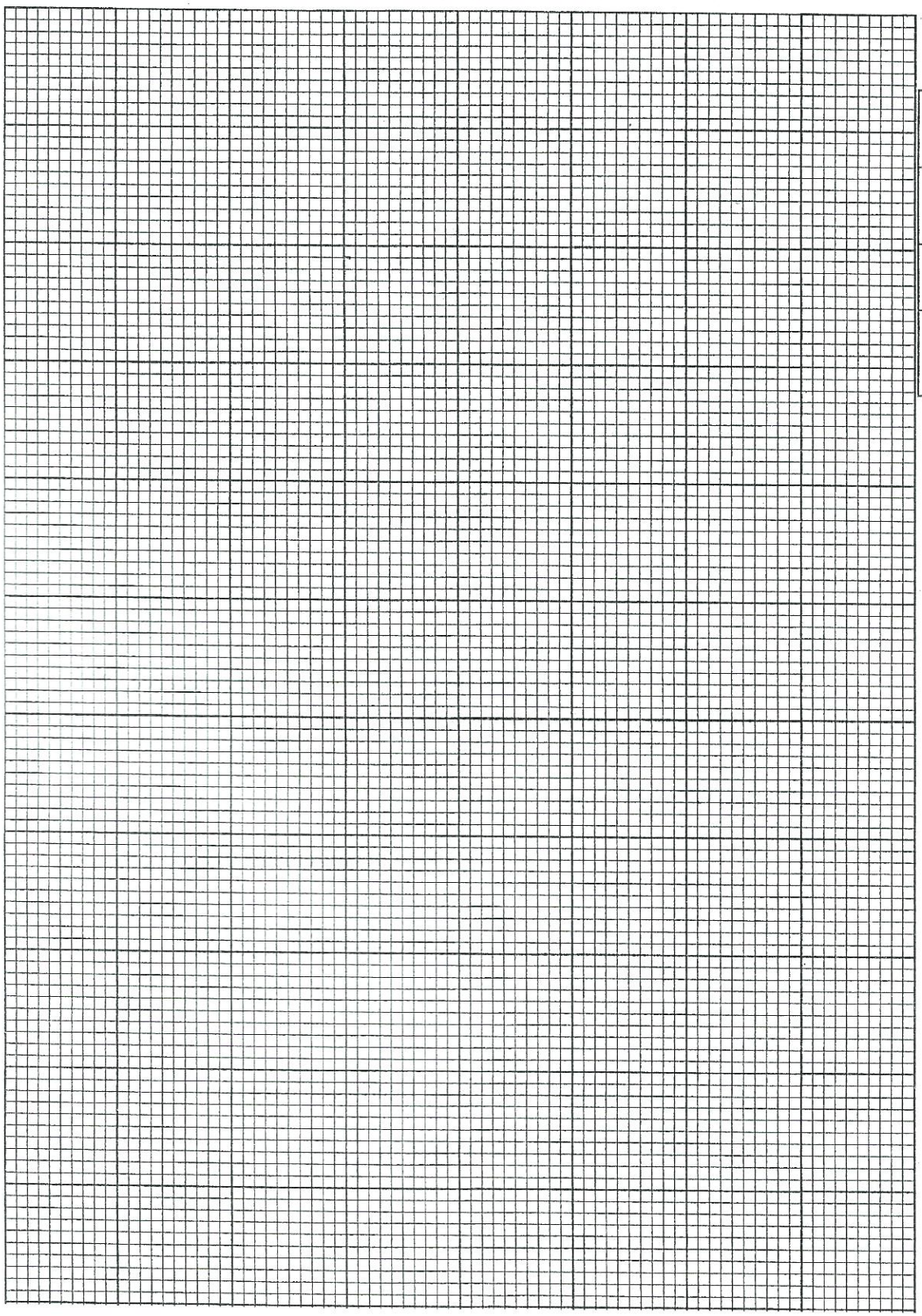
(iv) Use your graph to find the value of V when $\theta = 15°$.

Measurements and calculations

M

R

A



G

2 In this experiment you will determine the internal resistance, r, and the e.m.f, E, of a source.

For Examiner's Use

(a) (i) Set up the circuit as shown in **Fig. 2.1** with resistance, $R = 100\ \Omega$.

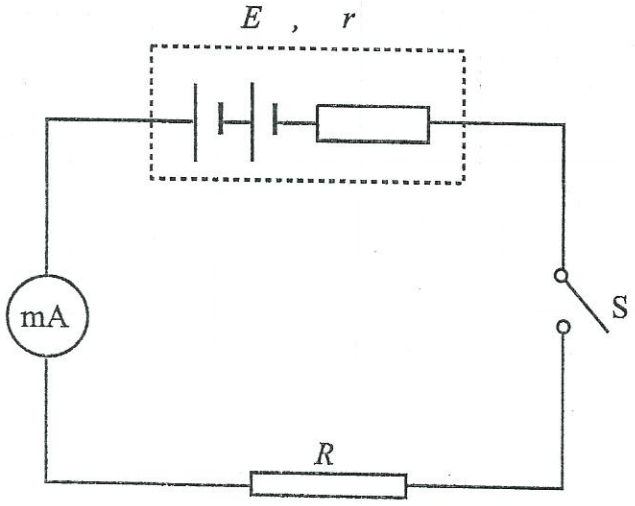


Fig 2.1

(ii) Close switch S and record values of current, I, and resistance, R. Include values of $\frac{1}{I}$ in your table of results.

(iii) Change R and repeat **(a) (ii).**

(iv) Repeat **(a) (iii)** to obtain six sets of measurements using the three resistors provided.

[For resistors in series, $R_T = R_1 + R_2 - - -$ and in parallel $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + - - -$.]

(v) Justify the number of significant figures you have used for $\frac{1}{I}$.

(b) The relationship between I and R is given by $\frac{1}{I} = \frac{R}{E} + \frac{r}{E}$.

Plot a graph of $\frac{1}{I}$ (y - axis) against R (x - axis).

For Examiner's Use

(c) Determine the

(i) gradient,

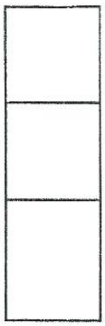
(ii) e.m.f, E, of the source,

(iii) intercept,

(iv) internal resistance, r, of the source.

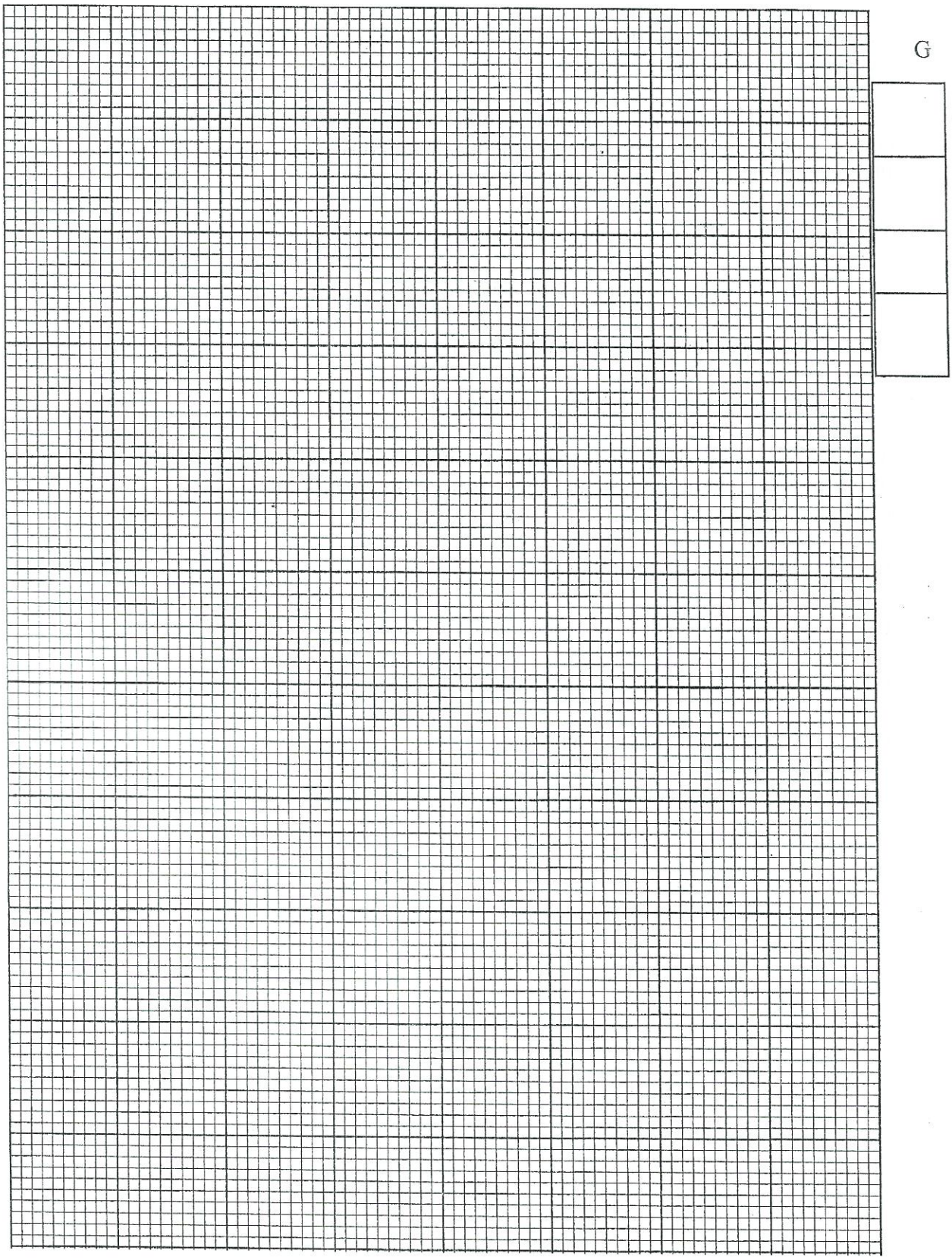
Measurements and calculations

M



R

A



G

3 The most expanding knowledge on domestic devices concerns the interaction between light and electricity.

For Examiner's Use

Researches have led to the development of a semi-conducting light sensitive device, a photodiode. When light falls on the photodiode, photo-current flows. Photodiodes are usually used as disc-shaped photo-detectors.

The magnitude of the photo-current depends on the

1. light intensity, I, falling on the exposed surface area, A,

2. exposed surface area, A, of the disc, and the

3. electromagnetic component irradiated to it.

You are required to design an experiment to investigate how the magnitude of the photocurrent depends on the above factors. In your discussion, pay particular attention to :

(a) the procedure to be followed

(b) control of variables

(c) how the measurements are executed

(d) the precautions to be observed

(e) improvements for better observations

For Examiner's Use

For Examiner's Use