THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2A **PHYSICS 2A**

ACTUAL PRACTICAL A

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2014**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. The aim of this experiment is to determine the unknown mass B using the law of moments.

(a) The center of gravity G of the meter rule is found by balancing it on a knife edge without any load.

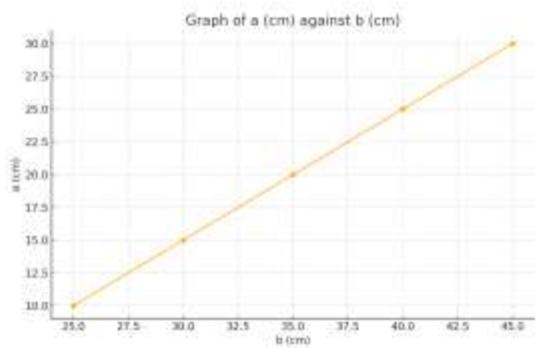
(b–d) For each setup, place the 20 g mass (weight A) on the left at given positions (a), and adjust position of weight B on the right until the ruler balances. Measure distances a and b.

Assume the meter rule is balanced at 50 cm and weight A is placed at:

a (cm)	b (cm)
10	25.0
15	30.0
20	35.0
25	40.0
30	45.0

(e) Diagram should show the meter rule balanced on a knife edge at G, with weight A on the left at distance a from G, and weight B on the right at distance b from G.

(g) Plot a graph of a against b



(h) The graph is a straight line since moments are balanced: A × a = B × b

(i) Slope = Δa / Δb = (30 − 10) / (45 − 25) = 20 / 20 = 1

(j) From A × a = B × b → a/b = B/20 → B = 20 × (a/b) = 20 × slope
Thus, B = 20 × 1 = 20 g

(k) Principle: Law of Moments — When a system is in equilibrium, the sum of clockwise moments equals the sum of anticlockwise moments.

(l) Aim: To determine the unknown mass B using the principle of moments.

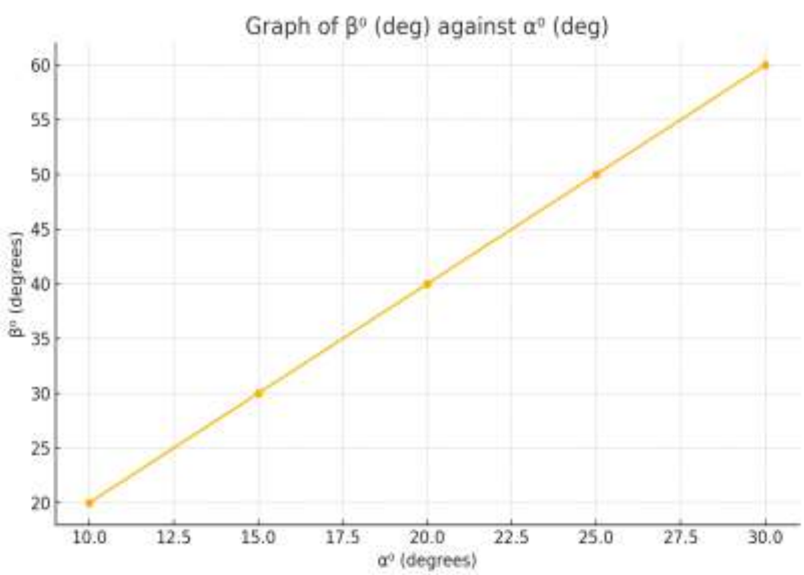
2. The aim is to study the relationship between the angle of incidence α^o and the corresponding angle of rotation β^o using plane mirror rotation.

(a–c) Pins are used to trace images of reflection before and after rotating a mirror through angle α. The angle between the two reflected rays is β^o.

(d–e) Assume the following results:

α^o (deg)	β^o (deg)
10	20
15	30
20	40
25	50
30	60

(f) Plot a graph of β^o against α^o



(g) Slope = $\Delta\beta^o / \Delta\alpha^o = (60 - 20) / (30 - 10) = 40 / 20 = 2$

(h) Reciprocal of slope = $1 / 2 = 0.5$

(i) This means $\beta = 2\alpha$. So the mirror rotation angle is doubled in reflection.

(j) Relationship is linear: $\beta = 2\alpha$