

e-Learning



- Index
- Language •
- General •
- Business
- Science •
- Mathematics And Applied Science •
- Home Economics •
- Civil And Mechanical

Physics Paper 3 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3

Menu

Question 3

General Comments

Weakness/Remedies

Candidate's Strength



In the set up above, a constantan wire of length, $l = 3 \ cm$ is connected to an ammeter, **A2**, whose current reading is **I**.

With the key close and the resistance box set at R Ω , the ammeters, A1and A2, show current reading I and Irespectively with the voltmeter showing a reading V.

The experiment was repeated for **four** other values of R with corresponding values of **Ili**and **V** recorded in **each** case.

The diagrams shown shown in **Fig. 3**(*a*) below shows the values of **Ri** offered in the circuit by the Rhetostat, Rh, while **Fig. 3**(*b*) and **Fig. 3**(*c*) shows the corresponding values of **li**and**li**readings from the ammeters, **A1** and **A2**, respectively, where = 1, 2, 3, 4 and 5.

The corresponding voltmeter readings **Vi**is shown in **Fig. 3**(*d*)where i = 1, 2, 3, 4 and 5 respectively.







Using the diagrams shown above, carry out the following instructions carefully.

- (i) Read and record R₁ where i = 1,2,3,4 and 5.
- $(ii) \qquad \mbox{Read and record the corresponding values I and I_i' respectively.}$

(iii) Evaluate
$$I_0 = \left(\frac{I + Ii'}{2}\right)$$
 in each case.

(iv) Measure and record **Vo**, also measured and record **V1** where i = 1,2,3,4 and 5 corresponding to the values of Ri already read and recorded and convert **Vo** and **V1** to real values, **V**, using the scale provided.

(v) Tabulate your readings

(vi) Plot a graph of **Io** on the vertical axis and **V** on the horizontal axis.

(vii) Determine the slope, **s**, of the graph.

(viii) Determine the intercept, **C**, on the horizontal axis.

(ix) State any **two** precautions necessary to ensure accurate results when performing this experiment.

(b) (i) State **three** factors that determine the choice of a wire as a conductor.

(ii) Write the expression to determine the resistivity, ρ , of a constantan wire of cross-sectional area, **A**, resistance, **R** and length, **L**.

Observation

(a) OBSERVATIONS [10]

- i. Value of $V_{0 raw}$ correctly measured and recorded to at least 1 d.p and within tolerance of ± 0.1 cm
- ii. Value of real V₀ correctly converted and recorded in volt.
- iii. Five values of Ri correctly read and recorded in Ω
- iv. Five values of I_i correctly read and recorded to at least 2 d.p and within tolerance of 0.05 A
- v. Five values of I'i correctly read and recorded to at least 2 d.p and within tolerance of
- vi. 0.05 A
- vii. Five values of $I_0 = \frac{I+I'}{2}$ correctly evaluated to at least 3 d.p.
- viii. Five values of $V_{i\,\text{Raw}}$ correctly measured and recorded to at least 1 d.p and within tolerance of \pm 0.1 cm

 $conv V_0 = 2.75 \pm 0.05V$

- ix. Five values of ViReal correctly converted and recorded in volt.
- x. Composite table showing at least Ri, Ii, Ii, Io, Vi Raw and Vi Real

Vo <u>Raw</u>	= 5.5± 0.1cm	

÷						
	Rį/Ω	$I_{i}/A \pm 0.03 A$	$I_i'/A \pm 0.03 A$	$I_0 = \frac{I+I'}{2}$	Vi Raw ± 0.1 cm	ConvVi/V
	1	0.60	0.20	0.400	1.6	0.80
	2	0.40	0.10	0.250	1.4	0.70
	3	0.35	0.05	0.200	1.2	0.60
	4	0.25	0.00	0.125	0.9	0.45
	5	0.20	0.00	0.10	0.5	0.25

<u>GRAPH</u>

- Both axes correctly distinguished
- Reasonable scales
- Five points correctlyplotted
- Line ofbestfit

SLOPE

- Largeright-angledtriangle
- ∆Iocorrectlydetermined
- ∆Vcorrectlydetermined
- $\frac{\Delta I_0}{\Delta V}$ correctly evaluated

INTERCEPT. c

Intercept, c, on the horizontal axis

PRECAUTIONS

- Ensure/ensured cleanterminals
- Ensure/ensured tightconnections
- Avoid/avoided/corrected zero error onammeter/voltmeter.
- Avoid/avoided parallax error onammeter/voltmeter
- Repeated readingsstated
-) (i) Factors that determine the choice of wire as aconductor
 - low resistivity
 - low temperature coefficient offesistivity.
 - free movement of electrons init
 - good thermalconductivity.
 - (ii) The expression to determine the resistivity, ρ, of a constantan wire of crosssectional area, A, resistance, R and length, L.

 $= \frac{RA}{r} = \rho$

Prev

Next

Copyright © 2018. The West African Examinations Council. All rights reserved. Powered by Sidmach Technologies (Nigeria) Limited.







- Index
- Language •
- General •
- Business
- Science •
- Mathematics And Applied Science •
- Home Economics •
- Civil And Mechanical

Physics Paper 3 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3

Menu

Question 2

General Comments

Weakness/Remedies

Candidate's Strength

(a)



In the experiment, the external diameter, \mathbf{D} , of a boiling tube is measured with a pair of vernier calipers. A loaded boiling tube with a centimeter scale fixed it is made to float vertically in water as shown in the diagram above.

The depth of immersion, y0, of the zero mark of the scale is measured and recorded.

A mass, \mathbf{m} , is put in the boiling tube and the new depth of immersion, y, of the zero mark is measured and recorded. The experiment is repeated for **four** other increasing values of \mathbf{m} .

In each case, y is measured and recorded.

Fig. 2(a) shows the value D, on the Vernier caliper,

Fig. 2(b)shows the values, y0and y1 and

Fig. 2(c) shows the masses, mi where i = 1,2,3,4 and 5.



- (iii) Read and record the values, \mathbf{m}_{i} .
- (iv) Measure and record values, yoand y1.
- (v) Evaluate $hi = (y_0 y_1)$ in each case.
- (vi) Evaluate log mi.
- (vii) Evaluate log h_i.
- (viii) Tabulate the results.
- (ix) Plot a graph of log m on the certical axis and log h on the horizontal axis, starting both axes at the origin (0, 0).
- (x) Determine the slope, s, of the graph.
- (xi) Determine the intercept, C, on the vertical axis.
- (xii) State two precautions necessary to ensure accurate results when performing this experiment.

(b) (i) State the law of flotation.

(ii) A beaker contains a liquid of density 916 kg m-3, a block of metal of mass 5.0 kg is suspended from a spring balance and completely immersed in the liquid. Calculate the reading of the balance.
 [Density of metal = 9.86 x 103 kg m⁻³, g = 10 m s⁻²]

Observation

(a) OBSERVATIONS

Value of **D** correctly recorded to 2 d.p in cm.

- (i)
 - (ii) Value of **A correctly** evaluated to **at least** 2 d.p
 - (iii) Value of **yo correctly** measured and recorded to **at least** 1 d.p and within tolerance of \pm 0.1 cm
 - (iv)

Five values **mi correctly** measured and recorded in grammes

TABLE OF RESULTS

External diameter D = 2.50 cm Depth of immersion = 9.4 cm $A= 0.25 \times 3.14 \times [2.50]2 = 4.91 \text{ cm}2$

mi/g	yi± 0.1 cm	hi= (yi– yo)	log mi	log hi
2	9.9	0.5	0.301	-0.301
5	10.5	1.1	0.699	0.041
7	10.9	1.5	0.845	0.176
10	11.4	2.0	1.000	0.301
12	11.8	2.4	1.079	0.380

<u>GRAPH</u>

- 1. Both axes correctly distinguished
- 2. Reasonable scales
- 3. Five points correctlyplotted
- 4. Line ofbestfit

SLOPE

- Largeright-angledtriangle
- <u>\[]
 <u>\[]
 </u>Log mcorrectlydetermined

 </u>
- ∆Log hcorrectlydetermined

<u>INTERCEPT, c</u>

Intercept, c, on the vertical axis

Precaution

- 1. Avoid/avoided parallax error on the scale/vernier caliper/metrerule.
- 2. Avoid/avoided zero error on metrerule.
- 3. Repeated readingsstated.

(b) (i) <u>The law of flotation</u>

(ii) A floating body displaces its own weight of fluid in which it floats.

Or

A floating object experiences an upthrust which is equal to itsweight.

Weight of metal = $5.0 \times 10 = 50$ N Volume of metal = $\frac{5}{9.86 \times 10^3} = 5.04 \times 10^{-4}$ m³.

Upthrust on metal = $5.04 \times 10^{-4} \text{ m}^3 \times 916 \times 10 = 4.64 \text{ N}$

Reading on balance = Apparent weight = Actual weight of metal - upthrust on metal

Prev

Next

Copyright © 2018. The West African Examinations Council. All rights reserved. Powered by Sidmach Technologies (Nigeria) Limited.



e-Learning



- Index
- Language •
- General •
- Business
- Science •
- Mathematics And Applied Science •
- Home Economics
- Civil And Mechanical

Physics Paper 3 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3

Menu

Question 1

General Comments

Weakness/Remedies

Candidate's Strength



A wooden block of mass, m = 100g, was placed on a rough wooden surface board of length 70 *cm*, as shown in **Fig. 1(a)(i)** above.

The wooden block was placed at a distance, x, from the end of the rough wooden surface and the board was raised until it attained a vertical height, h, where the wooden block was just about to slide down the surface of the wooden as shown in **Fig. 1(a)(ii)** above.

The procedure was repeated for **four** other values of x_i and the corresponding vertical height, **hi**, was read where **i** = 1,2,3,4, and 5 respectively.

Fig 1(b) below shows the various values of xi while Fig. 1(c) shows the corresponding values of hi.



Using the diagram as a guide, carry out the following instructions.

(i) Read and record the values of xiand him **Fig. 1(b)** and **Fig. 1(c)** and in each case convert xito real values of Xi and hito real values, Hi, using the scales provided, where i = 1,2,3,4, and 5 respectively.

(ii) Evaluate in each case Xi-1 and Hi-1.

(iii) Tabulate your results.

(iv) Plot a graph of H-1on the vertical axis and X-1 on the horizontal axis starting both axes from the origin (0,0).

(v) Determine the slope, s, of the graph.

(vi) Evaluate k =

(vii) State any two precautions you would have taken if you were to perform the experiment above.

- (b) (i) Define *friction*.
- (ii) State **two** methods of reducing the effect of friction.

Observation

- i. Five values of xiraw correctly measured and recorded to at least1 d.p and within toleranceof± 0.1cm
- ii. Five values of Xicorrectlyconverted
- iii. Five values of hiraw correctly measured and recorded to at least1 d.p and within toleranceof± 0.1cm
- iv. Five values of Hicorrectlyconverted.
- v. Five values of Xi-1 correctly evaluated to at least3d.p
- vi. Five values of Hi-1 correctly evaluated to at least3d.p
- vii. Composite table showing at least x, h, X, H, X-1and H-1.

TABLE OF RESULTS

Xi Raw ± 0.1 cm	Conv. Xi	hi Raw ± 0.1 cm	Conv. Hi	Xi-1	Hi-1
1.0	10	1.9	5.7	0.100	0.175
2.0	20	3.8	11.4	0.050	0.088
3.0	30	5.8	17.4	0.033	0.057
4.0	40	7.7	23.1	0.025	0.043
5.0	50	9.8	29.4	0.020	0.034

<u>GRAPH</u>

i. Both axes correctly distinguished

ii. Reasonable scales

iii. Five points correctly plotted

iv. Line ofbestfit

SLOPE

- (i) Largeright-angledtriangle
- (ii) ∆H⁻¹
- (iii) ∆X⁻¹

 ΔH^{-1}

(iv) $\frac{\Delta X^{-1}}{\Delta X^{-1}}$

EVALUATION OF k

 $k = s^{-1}$

Precautions

- 1. Avoid/Avoided parallax error when taking metrerulemeasurements.
- 2. Note/Noted/correct/corrected zero error on metrerule.
- 3. Ensure/Ensured the board was gently raised.
- 4. Ensure/ensured that the tube does not touch the vessel.
- 5. Repeated readings (stated).

(b) (i) Friction.

Friction is the force that opposes motion between two surfaces in contact.

Methods of Reducing Friction

- 1. Polishing/smoothing the surfaces incontact.
- 2. Lubrication.
- 3. Using ballbearings.
- 4. Streamlining.
- 5. Reduce pressure/weight on the object.
- 6. Reduce contact between surfaces by electrostatic and magnetic levitation

Next

Copyright © 2018. The West African Examinations Council. All rights reserved. Powered by Sidmach Technologies (Nigeria) Limited.