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UGANDA NATIONAL EXAMINATIONS BOARD
OCTOBER - NOVEMBER, 2019

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UACE 2020

PS10/3 PHYSICS (PRACTICAL)

Random No.					
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MARKING GUIDE

Qn 1

Marks

A₁ d measured at least three times. = $\frac{1}{2}$ A₂ Value of d = 0.0650 - 0.0740, ^{sdp} or 4dp [accept sdpif the school reports that the candidate used
a digital vernier callipers]; unit: m [correct symbols] = $\frac{1}{2} + \frac{1}{2}$ A₃ Value of d = 0.20 - 0.50, 1dp or 2dp;Unit: N [correct symbols] or newton not Newtons = $1 + \frac{1}{2}$ A₄ Value of h = 0.035 - 0.050, 3dp;unit: m [correct symbols] or metres = $1 + \frac{1}{2}$ A₅ Value of W = 1.40 - 1.60, 1dp or 2dpUnit: N [correct symbols] = $1 + \frac{1}{2}$ A₆ Correctly calculated valueof $\beta_1 = 600 - 900$, 0dp

[provided correct substitution in

$$\beta_1 = \frac{4(W-\alpha)}{\pi g h d^2}, g = 9.81 \text{ m s}^{-2}$$

Unit: ~~N s⁻⁴ or K g m⁻³~~ [correct symbols] = $1 + \frac{1}{2}$
~~N m⁻⁴ s²~~ $7 \frac{1}{2}$ ~~X~~ NB Pencil work, zero marks.

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marks

No1 contd

B₁ Columnar table labelled: M, t, T, T²
 [correct symbols] @ $\frac{1}{2}$

= 2

B₂ Indication of units using brackets;

(kg), (s), (s), (s²) [correct symbols] @ $\frac{1}{2}$

= 2

B₃ Values of t:

SC: 6 - 35, 0dp, increasing, differences between consecutive values 1-3

SC: 6.0 - 35.0, 1dp, increasing, differences between consecutive values 0.5 - 3.0

SW: 6.00 - 35.00, 2dp, increasing, differences between consecutive values 0.50 - 3.00

* [if all the five differences are constant, mark only the first three values] @ $1\frac{1}{2}$

= 9

B₄ Correctly calculated values of T:

SC (0dp): Largest t ≥ 20 , 1dp; 10 \leq largest t < 20 , 2dp;

Largest t < 10 , 1dp.

SC (1dp): Largest t ≥ 20.0 , 2dp; 10.0 \leq largest t < 20.0 , 3dp;

Largest t < 10.0 , 2dp

SW (2dp): Largest t ≥ 20.00 , 3dp; 10.00 \leq largest t < 20.00 , 4dp;

Largest t < 10.00 , 3dp @ $\frac{1}{2}$

= 3

B₅ Correctly calculated values of T²:

SC (0dp): Largest t ≥ 20 , 1dp; 10 \leq largest t < 20 , 2dp;

Largest t < 10 , 1dp.

SC (1dp): Largest t ≥ 20.0 , 2dp; 10.0 \leq largest t < 20.0 , 3dp;
 Largest t < 10.0 , 2dp.

SW (2dp): Largest t ≥ 20.00 , 3dp; 10.00 \leq largest t < 20.00 , 4dp;
 Largest t < 10.00 , 3dp @ $\frac{1}{2}$

= 3

NB Pencil work, zero marks

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- Note contd*
- C1** Title: A graph of T^2 against M [accept versus or variation, not v/s, no units, correct symbols] = $\frac{1}{2}$
- C2** Perpendicular axes drawn, with arrows, correctly labelled [i.e. vertical axis: $T^2(s^2)$, horizontal axis: M(kg)] [correct symbols] @ $\frac{1}{2} = 1$
- C3** VA: Uniform scale covers $\frac{1}{2}$ or more, starting value indicated, axis marked at least three times.
HA: Starting value ~~zero~~, axis marked at least three times. @ $\frac{1}{2}$ = 1
- C4** Correctly plotted points using: X, \otimes , +, \oplus , . or \odot [not *] with error limit of a half a small square. Accept shaded dots within this error margin. For multiple scales consider first uniform scale only. If axes are not labelled don't check, for reversed axes, no mark. @ $\frac{1}{2} = 3$
- C5** Line of best fit drawn provided at least four points are correctly plotted. = $\frac{1}{2}$
- C6** Indication for slope S covers $\frac{1}{2}$ a page on at least one of the sides. = $\frac{1}{2}$
- C7** Correctly calculated slope $S = 0.600 - 2.10$, 2dp or 3dp if $S \leq 1.00$, 1dp or 2dp if $S \geq 1.00$ [provided coordinates are correctly read, not table values]; unit: $s^2 kg^{-1}$ [correct symbols] = $1 + \frac{1}{2}$
- C8** Correctly read intercept $C = 0.050 - 0.300$, 2dp or 3dp [provided HA starts from zero]; unit: s^2 [correct symbols] = $1 + \frac{1}{2}$
- C9** Correctly calculated value of $\beta_2 = 600 - 900$, 0dp [provided correct SI units substitution
in $\beta_2 = \frac{1}{V} \left(\frac{C}{S} - \frac{\alpha}{g} \right)$, $g = 9.81 m s^{-2}$];
Unit: $N s^2 m^{-4}$ or $kg m^{-3}$ [correct symbols] = $1 + \frac{1}{2}$

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Marks

C₁₀

Correctly calculated value of $\beta = 600 - 900$, o.d.p.,

[provided correct substitution in $2\beta = \beta_1 + \beta_2$];

unit: $N s^{-4} m^{-4}$ or $Kg m^{-3}$ [correct symbols]

1 + $\frac{1}{2}$

C₁₁

Importance of step (n) :

= $\underline{\underline{+1\frac{1}{2}}}$

to:

- (i) get the average value of β_1 and β_2 .
- (ii) get a more accurate value of β .
- (iii) minimize errors

Any one, 1 mark

= 1

$13\frac{1}{2}$

NB: C₁ to C₁₁ pencil work, zero marks

Total marks = 40

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Qn 2

Marks

A₁ Value of $\alpha = 36 - 45$, Odp; unit: $^{\circ}$ [correct symbols] $= \frac{1}{2} + \frac{1}{2}$

A₂ Value of $\beta = 34 - 43$, Odp; unit: $^{\circ}$ [correct symbols] $= \frac{1}{2} + \frac{1}{2}$

A₃ Correctly calculated value of $\lambda = 1.40 - 1.60$, $(2dp)$
 [provided correct substitution in $\lambda = \frac{\sin(\alpha+\beta)}{\sin\alpha}$];
 no unit [correct symbol]

NB (i) Pencil work, 3 zero marks.
 (ii) For values of α and β , used tracing paper must be available.

B₁ Columnar table Labelled: $\beta, \alpha, \phi, \theta, y, h, \cos\phi, \sin\theta,$
 $\frac{\cos\phi}{\sin\theta}, \frac{h}{\sin\theta}, \cos\theta, y \cos\phi$ [correct symbols]
 $12-9: 2, 8-5, 1\frac{1}{2}, 4-1: \frac{1}{2}$

 $= 2$

B₂ Indication of Units using brackets:
 $(^{\circ}), (^{\circ}), (^{\circ}), (^{\circ}), (cm), (cm), -, -, -, (m), -, (cm)$ [correct symbols]
 $12-9: 2, 8-5: 1\frac{1}{2}, 4-1: \frac{1}{2}$

 $= 2$

B₃ Values of $\alpha = 60 - 15$, Odp, decreasing,
 differences between consecutive values 3-11,
 [if all the five differences are constant, mark only
 the first three values] @ $\frac{1}{2}$

 $= 3$

B₄ Values of $\phi = 70 - 42$, Odp, decreasing,
 differences between consecutive values 2-6
 [if all the five differences are constant, mark only
 the first three values] @ $\frac{1}{2}$

 $= 3$

B₅ Values of $\theta = 62 - 104$, Odp, increasing,
 differences between consecutive values 3-11
 [if all the five differences are constant, mark only
 the first three values] @ $\frac{1}{2}$

 $= 3$

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No 2 contd

Marks

B6 Values of $y = 1.0 - 3.2$, 1dp, increasing,differences between consecutive values $0.1 - 0.6$ [if all the five differences are constant, mark only
the first three values] @ $\frac{1}{2}$

= 3

B7 Values of $h = 2.0 - 5.8$, 1dp, increasing,differences between consecutive values $0.1 - 1.0$,
[if all the five differences are constant, mark onlythe first three values] @ $\frac{1}{2}$

= 3

B8 Correctly read values of $\cos\alpha$, 3dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$ B9 Correctly calculated values of $y \cos\alpha$, 1dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$ B10 Correctly read values of $\cos\phi$, 3dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$ B11 Correctly read values of $\sin\theta$, 3dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$ B12 Correctly calculated values of $\frac{\cos\phi}{\sin\theta}$, 3dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$ B13 Correctly calculated values of $h \frac{\cos\phi}{\sin\theta}$, 1dp6-5: $1\frac{1}{2}$, 4-3: 1, 2-1: $\frac{1}{2}$...= $1\frac{1}{2}$

NB (i) Pencil work, zero marks

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(ii) For B₃ to B₇ used

tracing paper must be available.

(iii) Accept split columns.

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No 2 contd

- C₁** Title: A graph of $y \cos \alpha$ against $h \frac{\cos \theta}{\sin \theta}$
 [accept versus or variation, not v/s, no units,
 correct symbols] = $\frac{1}{2}$
- C₂** Perpendicular axes drawn, with arrows, correctly
 labelled i.e vertical axis: $y \cos \alpha$ (cm), horizontal
 axis: $h \frac{\cos \theta}{\sin \theta}$ (cm) [correct symbols] @ $\frac{1}{2}$ = 1
- C₃** Uniform scales cover $\frac{1}{2}$ or more, starting
 values indicated, each axis marked at least three times @ $\frac{1}{2}$ = 1
- C₄** Correctly plotted points using: x, *, +, ⊕, • or ○ [not *]
 with error limit of a half a small square. Accept
 shaded dots within this error margin. For multiple scales
 consider first uniform scale only. If axes are not
 labelled, don't check, for reversed axes no mark. @ $\frac{1}{2}$ = 3
- C₅** Line of best fit drawn provided at least four points
 are correctly plotted. = $\frac{1}{2}$
- C₆** Indication for slope S covers $\frac{1}{2}$ a page on at least
 one of the sides. = $\frac{1}{2}$
- C₇** Correctly calculated slope $S = 0.700 - 0.800$, 2dp or 3dp
 provided coordinates are correctly read, not table
 values; no unit [correct symbols] = $\frac{1}{2} + \frac{1}{2}$
- C₈** Correctly calculated value of $\lambda_2 = 1.40 - 1.60$, 1dp or 2dp.
 Provided correct substitution in $S = \frac{1}{2} \lambda_2$; no unit [correct
 symbols] = $\frac{1}{2} + \frac{1}{2}$
- C₉** Correctly calculated value of $\lambda = 1.40 - 1.60$, 1dp or 2dp.
 provided correct substitution in $\lambda = \frac{1}{2}(\lambda_1 + \lambda_2)$; no unit [correct
 symbols] = $\frac{1}{2}$ no unit
- NB: C₇ to C₉, pencil work, zero marks = 9
- Total marks = 40

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Qn 3

- A₁ d_2 measured at least three times $\frac{1}{2}$
- A₂ Value of $d_2 = 0.32 - 0.39$, 2dp / in mm or $0.00032 - 0.00039$, 5dp / in m [Accept $0.350 - 0.370$, 3dp in mm or $0.000320 - 0.000390$, 6dp in m if the school reports that the candidates used a digital micrometer screw gauge]; unit: mm [correct symbols] $\frac{1}{2} + \frac{1}{2} = 1\frac{1}{2}$
- B₁ NB Pencil work, zero marks Columnar tables) Labelled: x , $\frac{1}{x}$, $\frac{1}{x^2}$ (for wire w_2), $\frac{l}{x}$, $\frac{l}{x^2}$ (for wire w_1), $\frac{1}{l}$ (for wire w_1), $\frac{l}{l}$ (for wire w_2) [Accept single table or separate tables, correct symbols] $\frac{1}{2} \times 2 = 2$
- B₂ Indication of Units using brackets: (m) , (m') , (m) , (m') , (m) , (m') [correct symbols] $\frac{1}{2} \times 2 = 3$
- B₃ Values of l (for wire w_2) = $0.250 - 0.900$, 3dp, increasing, differences between consecutive values $0.003 - 0.070$, if all the five differences are constant, mark only the first three values] $\frac{1}{2} \times 1 = 1$
- B₄ Correctly calculated values of $\frac{1}{l}$ (for wire w_2), 2dp $6-5:2, 4-3:1\frac{1}{2}, 2-1:\frac{1}{2} = 2$
- B₅ Values of l (for wire w_1) = $0.250 - 0.900$, 3dp, increasing, differences between consecutive values $0.003 - 0.070$, if all the five differences are constant, mark only the first three values] $\frac{1}{2} \times 1 = 1$
- B₆ Correctly calculated values of $\frac{1}{l}$ (for wire w_1), 2dp $6-5:2, 4-3:1\frac{1}{2}, 2-1:\frac{1}{2} = 2$
- B₇ Correctly calculated values of $\frac{1}{l}$ [5.00, 3.33, 2.50, 2.00, 1.67, 1.43] 2dp $6-5:2, 4-3:1\frac{1}{2}, 2-1:\frac{1}{2} = 2$
- NB Pencil work, zero marks 24

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Subject No3 contd

Marks

- C₁** Title: A graph of $\frac{1}{x}$ against t for wire W_2 , OR Graphs of $\frac{1}{x}$ against t for both wires OR A graph of $\frac{1}{x}$ against t for wire W_1 , OR A graph of $\frac{1}{x}$ against t for wire W_2 . A graph of $\frac{1}{x}$ against t for wire W_1 , OR Graphs of $\frac{1}{x}$ against t OR Graphs of $\frac{1}{x}$ against t for wire W_2 and wire W_1
 Accept versus or variation not V/S, no units, correct symbols
A graph of $\frac{1}{x}$ against t and A graph of $\frac{1}{x}$ against t = $\frac{1}{2}$
- C₂** Perpendicular axes drawn with arrows, correctly labelled i.e vertical axis: $\frac{1}{x}(\text{m}^{\text{s}})$, horizontal axis: $\frac{1}{t}(\text{m}^{-\text{s}})$
 [correct symbols] @ $\frac{1}{2}$ = 1
- C₃** Scales uniform, starting values indicated, each axis marked at least three times @ $\frac{1}{2}$ = 1
- C₄** $\frac{1}{x}$ against $\frac{1}{t}$ for wire W_2 :
 Correctly plotted points using: X, \otimes , +, \oplus , . or \odot
 [not *] with error limit of a half a small square.
 Accept shaded dots within this error margin.
 For multiple scales, consider first uniform scale only -
 If axes are not labelled, don't check, for reversed axes no mark. @ $\frac{1}{2}$ = 3
- C₅** $\frac{1}{x}$ against $\frac{1}{t}$ for wire W_1 [provided on the same axes with graph of wire W_2]
 Correctly plotted points using: X, \otimes , +, \oplus , . or \odot
 [not *] with error limit of a half a small square.
 Accept shaded dots within this error margin.
 For multiple scales, consider first uniform scale only -
 If axes are not labelled, don't check, for reversed axes no mark. @ $\frac{1}{2}$ = 3

No 3 contd

- C₆ $\frac{1}{x}$ against t (for wire W₂)
Line of best fit drawn provided at least four points are correctly plotted. = $\frac{1}{2}$
- C₇ $\frac{1}{x}$ against t (for wire W₁)
Line of best fit drawn provided at least four points are correctly plotted. = $\frac{1}{2}$
- C₈ $\frac{1}{x}$ against t (for wire W₂)
Indication for slope S₂ covers $\frac{1}{2}$ a page on at least one of the sides. = $\frac{1}{2}$
- C₉ $\frac{1}{x}$ against t (for wire W₁)
Indication for slope S₁ covers $\frac{1}{2}$ a page on at least one of the sides. = $\frac{1}{2}$
- C₁₀ Correctly calculated slope S₂ = $3.00 - 16.0$, 1dp or 2dp if S₂ < 10.0, 0dp, or 1dp if S₂ ≥ 10.0
provided coordinates are correctly read, not table values]; no unit [correct symbol] = 1 + $\frac{1}{2}$
- C₁₁ Correctly calculated slope S₁ = $1.00 - 15.0$, 1dp or 2dp if S₁ < 10.0, 0dp or 1dp if S₁ ≥ 10.0
provided coordinates are correctly read, not table values]; no unit [correct symbol] = 1 + $\frac{1}{2}$
- C₁₂ Correctly calculated value of $\alpha = 0.410 - 0.480$, 2dp or 3dp, unit: mm OR $\alpha = 0.000410 - 0.000480$, 5dp or 6dp
[provided correct substitution in $\alpha = d_2 \sqrt{\frac{S_2}{S_1}}$]; unit:m [correct symbol] = $\frac{1}{2} + \frac{1}{2}$

NB: C₁₀ to C₁₂, pencil work zero marks14 $\frac{1}{2}$

Total marks = 40