Do not write in this margin

Candidate's Name P510/3
Signature ..... UACE 2023
Subject ..... Paper code ...../.....

Random No.							
Personal Number							

Qn1

A1 Value of L_0 = 2·0 − 6·0, 1dp in cm OR
0·020 − 0·060, 3dp in m; unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

A2 Value of G = 48·0 − 52·0, 1dp in cm OR
0·480 − 0·520, 3dp in m unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

A3 Value of L = 5·3 − 11·9, 1dp in cm OR
0·053 − 0·119, 3dp in m unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

A4 Correctly calculated value of e
e = 0·033 − 0·059, 3dp in m unit: m [correct symbols] $\frac{1}{2}+\frac{1}{2}$

A5 Value of L_1 = 30·5 − 34·5, 1dp in cm OR
0·305 − 0·345, 3dp in m; unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

05

NB pencil work zero marks

B1 Columnar table labelled: M, L_2, $\frac{L_1}{L_2}$, y [correct symbols] @ $\frac{1}{2}$ = 2

B2 Indication of units using brackets:
(kg), (cm), —, (m) [correct symbols] @ $\frac{1}{2}$ = 2

B3 Values of L_2 = 40·0 − 6·0; 1dp in cm, decreasing,
1st difference 8·0 − 14·0, rest 4·0 − 6·0 OR
L_2 = 0·400 − 0·060, 3dp in m, decreasing
1st difference 0·080 − 0·140 rest 0·010 − 0·060 @ 1 = 6

B4 Correctly calculated value of $\frac{L_1}{L_2}$
2dp if the smallest value of $L_2 \geq 10·0$, 1dp if
the smallest value of $L_2 < 10·0$, 1-2: $\frac{1}{2}$, 3-4: 1, 5-6: 2 = 2

B5 Correctly calculated values of y, 2dp
[$y = e\frac{L_1}{L_2}$] 1-2: $\frac{1}{2}$, 3-4: 1, 5-6: 2 = 2

14

Variation of y with M

2

Candidate's Name .....

Signature ..... Random No.

Subject ..... Paper code ...../..... Personal Number

C1 Title: A graph of y 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: y (m), horizontal axis M (kg) [correct symbols] @ $\frac{1}{2}$ $\frac{1}{2}$

C3 VA: Uniform scale covers half or more, starting values indicated, axis marked atleast 3 times.
HA: ~~starting~~ value zero, ~~axis~~ scale uniform, axis marked ~~atleast three times~~ @ $\frac{1}{2}$ = 1

C4 Correctly ~~calculated~~ plotted points using: X, ⊗, ⊕, · or ⊙ [not *] with error limit of ½ a small square. ~~only if axes~~ Accept shaded dots with in 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 the best fit drawn provided atleast four points are correctly plotted.

C6 Indication for slope s covers half a page or more, on atleast one of the sides
[if right angled triangle must touch line of best fit]

C7 Correctly calculated slope s = 0.200 − 0.490 2dp or (3dp) [provided coodinates are correctly read, not of a plotted point]; unit: mkg^{-1} [correct symbols] = $1+\frac{1}{2}$

C8 Correctly calculated value of β = 20−50, 0dp or (1dp) 1dp [provided correct subst. in $\beta = \frac{g}{s}$]; unit: kgs^{-1} or Nm^{-1} [correct symbols] = $1+\frac{1}{2}$

C9 Correctly read intercept c = 0.010 − 0.040 2dp or (3dp) [provided HA starts from zero] unit: m [correct symbols] = $\frac{1}{2}+\frac{1}{2}$

$G = 24.5$ cm mark ✓

$y = e^{\frac{L_1}{L_2}}$

$\frac{L_1}{L_2}$ | $e^{\frac{L_1}{L_2}}$ | x | value

Do not write in this margin

Candidate's Name .....

Signature .....

Subject P510/3 Paper code ...../.....

Random No.

Personal Number

UCE

Do not write in this margin

C_{10} Correctly calculated value of $\alpha_1 = -0.030 - 0.154$, 2dp or 3dp [provided correct S.I units substitution in $\alpha_1 = \frac{c\beta}{g} - 0.050$] unit: kg [correct symbols] $1+\frac{1}{2}$

NB1 for C_7 to C_{10} pencil work, zero marks

12

D_1 Value of $G_1 = 23.5 - 26.5$, 1dp in cm OR $0.235 - 0.265$, 3dp in m unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

D_2 Value of $y_1 = 12.0 - 240$, 1dp in cm or $0.120 - 0.240$ 3dp in m; unit: cm [correct symbols] $1+\frac{1}{2}$

D_3 Value of $y_2 = 26.5 - 50.0$, 1dp in cm or $0.265 - 0500$ in m unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

D_4 Correctly calculated value of $x_1 = 2.5 - 14.5$, 1dp in cm or $x_1 = 0.025 - 0.145$, 3dp in m [$x_1 = G_1 - y_1$, correct symbols] $\frac{1}{2}+\frac{1}{2}$

D_5 Correctly calculated value of $x_2 = 3.0 - 26.5$, 1dp in cm or $x_2 = 0.030 - 0.265$, 3dp in m [$x_2 = y_2 - G_1$, correct symbols] $\frac{1}{2}+\frac{1}{2}$

D_6 Correctly calculated value of $\alpha_2 = 0.032 - 0.077$ 2dp or 3dp [Provided correct subst. in $\alpha_2 = \frac{0.150x_1 - 0.050x_2}{x_2}$]

unit: kg [correct symbols] $1+\frac{1}{2}$

D_7 Correctly calculated value of $\alpha = 0.001 - 0.116$ 3dp [provided correct substitution in $\alpha = \frac{1}{2}(\alpha_1 + \alpha_2)$; unit kg [correct symbols]

9

NB Award zero for pencil work

Total marks = 40

Candidate's Name .....

Signature .....

Subject ..... Paper code ...../.....

Random No.

Personal Number

Do not write in this margin

UCE

Question 2:

A1 Value of $\phi = 27 - 35$, 0dp; unit: ° [correct symbol] $\frac{1}{2}+\frac{1}{2}$

A2 Value of $\theta = 47 - 53$, 0dp, unit: ° [correct symbol] $\frac{1}{2}+\frac{1}{2}$

A3 Value of $d = 5.4 - 6.6$, 1dp; unit: cm [correct symbols] $\frac{1}{2}+\frac{1}{2}$

A4 Correctly calculated value of $\gamma_1 = 0.62 - 0.71$, 2dp [provided correct subst. in $\gamma_1 = \frac{y\sin\phi}{d\cos\theta}$], no unit $4\frac{1}{2}$

NB(i) Pencil work award zero

(ii) for values in A1, A2 and A3, used tracing paper must be available.

B1 Columnar table labelled: i, L, x, $\sin i$, $\sin^2 i$, $\frac{1}{\sin^2 i}$, $\left(\frac{L}{x}\right)$, $\left(\frac{L}{x}\right)^2$

1-2: $\frac{1}{2}$, 3-4: 1, 5-6: 2, 7-8: 3 [correct symbols] =3

B2 indication of units using brackets:

(°), (cm), (cm), –, –, –, –, –, [correct symbols]

1-2; $\frac{1}{2}$, 3-4; 1, 5-6: 2, 7-8: 3 =3

B3 Values of $L = 8.0 - 6.0$, 1dp, decreasing, differences between consecutive values 0.1 – 0.3 [if all the five differences are constant, mark only the first three values] @1 = 6 =6

B4 Values of $x = 4.0 - 1.3$, 1dp decreasing, differences between consecutive values 0.1 – 0.7 [if all the five differences are constant, mark only the first three values] @1 =6

B5 Correctly calculated values of $\sin i$, 3dp

[0.707, 0.643, 0.574, 0.500, 0.423, 0.342]

1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$ $1\frac{1}{2}$

~~B6 Correctly calculated values of $\sin^2 i$, 3dp~~

~~[2.00, 2.42, 3.04, 4.00, 5.99, 8.55]~~

Candidate's Name .....
Signature ..... Random No.
Subject ..... Paper code ...../..... Personal Number

B6 Correctly calculated values of $\sin^2 i$, 3dp
[0·500, 0·413, 0·329, 0·250, 0·179, 0·117] $= 1\frac{1}{2}$
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$

B7 Correctly calculated values of $\frac{1}{\sin^2 i}$, 2dp
[2·00, 2·42, 3·04, 4·00, 5·59, 8·55] $= 1\frac{1}{2}$
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$

B8 Correctly calculated values of $\left(\frac{l}{x}\right)$, 1dp $= 1\frac{1}{2}$
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$

B9 Correctly calculated values of $\left(\frac{l}{x}\right)^2$, 0dp $= 1\frac{1}{2}$
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$

$25\frac{1}{2}$

NB (i) Pencil work award zero
(ii) For B3 & B4, used tracing paper must be available

Do not write in this margin

Candidate's Name .....

Signature .....

Subject ..... Paper code ...../.....

Random No.

Personal Number

Do not write in this margin

C1 Title: A graph of $\frac{1}{\sin^2 i}$ against $\left(\frac{L}{x}\right)^2$
[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: $\frac{1}{\sin^2 i}$, horizontal axis: $\left(\frac{L}{x}\right)^2$ [correct symols] @$\frac{1}{2}$ = 1

C3 Uniform scales cover half or more starting values indicated,
axes marked atleast three times @ $\frac{1}{2}$ = 1

C4 Correctly plotted points using; x, ⊗, ⊕, ⊙, · [not *]
with error limit of a half a small square. Accept
shaded dots within this error limit. 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 atleast four points
are correctly plotted = $\frac{1}{2}$

C6 Indication for slope s covers half a page or more
on atleast one of the sides.
[if right angled triangle must touch line of best fit] $\frac{1}{2}$

C7 Correctly calculated slope s = 0·380 − 0·550
2dp or 3dp [provided coordinates are correctly read, not
of a plotted point]
no unit [correct symbols] $1+\frac{1}{2}$

C8 Correctly calculated value of γ_2 = 0·620 − 0·710, 2dp
or 3dp [provided correct subst. in $\gamma_2 = \sqrt{s}$]
no unit [Correct Symbols] $\frac{1}{2}+\frac{1}{2}$

C9 Assessing the accuracy of ~~two~~ methods:
• The values obtained in ~~method I~~ both methods are
close/near to 0·667 ~~than the one in method~~ therefore both methods are accurate

Do not write in this margin

Candidate's Name .....

Signature .....

Random No.

Subject ..... Paper code ...../.....

Personal Number

UCE

Do not write in this margin

- The value obtained in method I is more close/near to 0.667 than the one in method II Therefore method I is more accurate than method II.
- The value obtained in method II is more close to 0.667 than the one in method I Therefore method II is more accurate than method I
- The values obtained in both methods are equal to 0.667 Therefore both methods are accurate.

Any 1 1

NB For C_7 to C_9 award zero for pencil work

10

Total Marks = 40.

• Equal signs must have continuity

Do not write in this margin

Candidate's Name ..... Irene

Signature .....

Subject ..... Paper code ...../.....

Random No.

Personal Number

Question 3.

A1 Value of V_1 = 0·30 – 1·00, 1dp or 2dp
unit: V [Correct Symbols] 1+½

A2 Value of V_2 = 0·10 – 0·80, 1dp or 2dp,
$V_2 < V_1$, unit: V [Correct Symbol] 1+½

A3 Correctly calculated value of
f_1 = 4·0 – 10·0, 0dp or 1dp [provided correct
Subst. in $f_1 = \frac{1}{I_1 I_1 (x_2 - x_2)} \cdot [(V_1 I_2 - V_2 I_1) - 1.4(I_2 - I_1)]$ 1½+½
unit: $VA^{-1}m^{-1}$ or Ωm^{-1} [Correct Symbols] 05
NB pencil work award zero.

B1 Columnar table labelled: x, y, V, I, $\frac{V}{y}$, Ix, $\frac{Ix}{y}$,
[Correct Symbols] 1; ½, 2-4; 2, 5-7: 3 =3

B2 Indication of units using brackets:
(m), (m), (V), (A), (VA^{-1}), (Am) or (mA), (A) [Correct Symbols]
1; ½, 2-4; 2, 5-7: 3 =3

B3 Values of V = 0·50 – 1·50, 2dp, increasing,
differences btn Consecutive values 0·01 – 0·20
[Accept not more than two pairs of constant values
if all 5 differences are constant for all increasing
values, mark only the first three values] OR
0·5 – 1·5, 1dp, increasing, differences between Consecutive
values 0·1 – 0·2 [Accept not more than two pairs
of Constant values. If all the five differences are constant
for all increasing values, mark only the first 3 values]
@ 1 =6

dft pairs

B4 Values of I = 0·70 – 0·10, 2dp, decreasing,
differences between Consecutive values 0·02 – 0·16
[if all the five differences are constant, mark only

Candidate's Name .....

Signature ..... Random No.

Subject ..... Paper code ...../..... Personal Number

the first three values] @1 = 6

B5 Values of y = 0.300 – 0.900, 3dp Increasing, differences between consecutive values 0.010 – 0.060 [If all the five differences are constant, mark only the first three values] @1 = 6

B6 Correctly calculated values of $\frac{V}{y}$, 1dp or 2dp
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$ = $1\frac{1}{2}$

B7 Correctly calculated values of Ix, 2dp
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$ = $1\frac{1}{2}$

B8 Correctly calculated values of $\frac{Ix}{y}$, 2dp or 1dp
1-2: $\frac{1}{2}$, 3-4: 1, 5-6: $1\frac{1}{2}$ = $1\frac{1}{2}$

$28\frac{1}{2}$

NB Pencil work award zero.

C1 Title

C2 perpendicular axes = 1

C3 uniform scales = 1

C4 plotting = 3

C5 Why step (m) is important it helps to;
- get a more accurate value of P
- minimise errors
- compare values of P_1 & P_2
- get average / mean of P_1 & P_2
- get value of P which very close = 1

$6\frac{1}{2}$