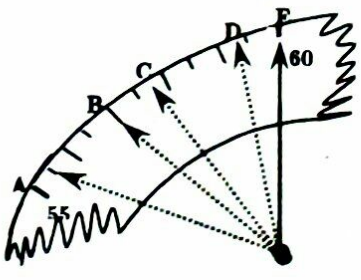
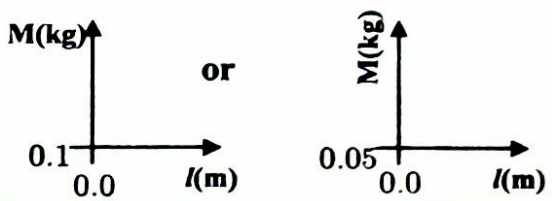
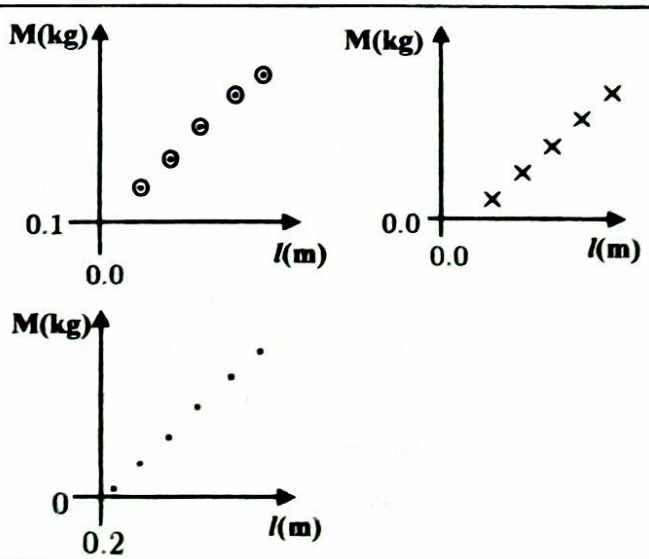
AREAS OF DIVERGENCE AND 2018 RESOLUTIONS

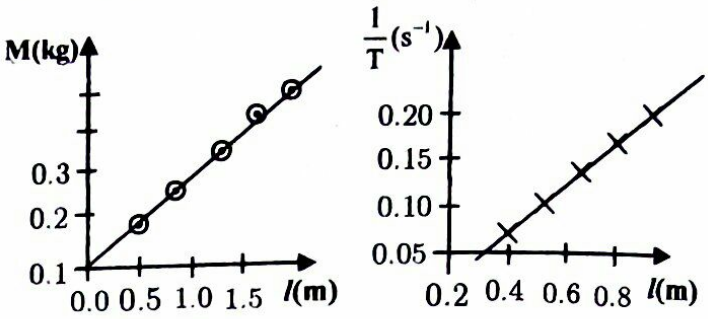
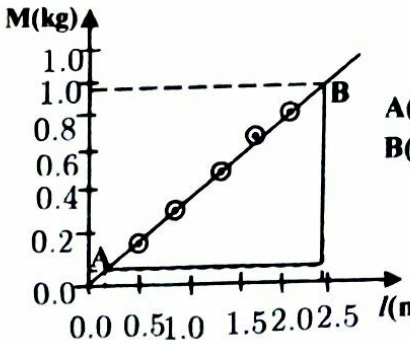
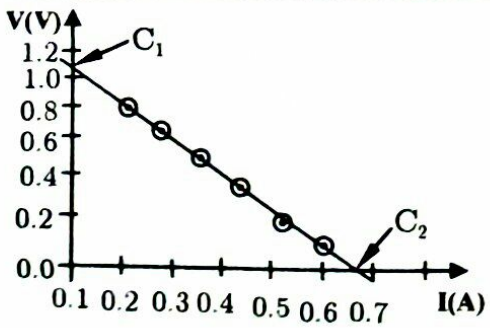
<table>
<tr><th>SUBJECT</th><th>RESOLUTION</th><th>NOTES/EXAMPLES</th></tr>
<tr><td>TABLE OF RESULTS
Notation for units in tables and labels of axes using forward slash(/)</td><td>Data should be PRESENTED in column form. Related values should be next to each other but candidates should not be penalized if related values are not next to each other.
Columns to be labelled, quantity and unit in bracket not forward slash.</td><td>
<table>
<tr><th>l(m)</th><th>l^3(m^3)</th><th>t(s)</th><th>T(s)</th><th>T^2(s^2)</th></tr>
<tr><td>0.900</td><td>0.7290</td><td>17.75</td><td>0.8875</td><td>0.7877</td></tr>
<tr><td>0.800</td><td>0.5120</td><td>15.25</td><td>0.7625</td><td>0.5814</td></tr>
<tr><td>0.700</td><td>0.3430</td><td>12.94</td><td>0.6470</td><td>0.4186</td></tr>
<tr><td>0.600</td><td>0.2160</td><td>10.62</td><td>0.5310</td><td>0.2820</td></tr>
<tr><td>0.500</td><td>0.1250</td><td>8.40</td><td>0.4200</td><td>0.1764</td></tr>
<tr><td>0.400</td><td>0.0640</td><td>6.50</td><td>0.3250</td><td>0.1056</td></tr>
</table>
</td></tr>
<tr><td>Use of bracket or forward slash(/)</td><td>Units should be in brackets not forward slash. Use of forward slash not to be accepted.</td><td>E.g. M(kg) NOT M/kg
l(m) NOT l/m</td></tr>
<tr><td>Use of pencil in calculation and recording data.</td><td>Pencil should not be used in calculations and recording of data in table.</td><td>The only areas where the use of a pencil is acceptable include:
-Plotting points on the graph i.e. when marking dots for points being plotted but the circle may be drawn using a pen.
-Drawing the best straight line (line of best fit) or smooth curve (if the graph is a curve).
-Drawing the axes of the graph and generally all drawings may be done using a pen.</td></tr>
<tr><td>Number of significant figures to which measured values are to be recorded</td><td>Least count /least possible scale values on the instrument being used to be considered.
Midpoint estimation of smallest division acceptable for all measuring instruments except for the metre rule.
This should be done where the readings are constant.</td><td>Example
 

SECONDS
At C, reading = 57.75 seconds
At D, reading = 59.25 seconds
It's advisable to estimate the mid-point reading only when the readings are constant.</td></tr>
</table>

Significant figures(S.F) or Decimal place (d.p) in calculated values	**Division and multiplication with float(*constant value with infinite S.F & d.p*) –S.F of measured value to be used.**	**Example** **24** *(float)* **× 1.42***(3 s.f)* **= 34.1***(3 s.f)* A zero as a result of rounding off is significant if it's after a decimal point e.g. Rounding off 4.2897 to 3d.p gives 4.290. This zero is significant. A float like 1000 can be written to have a precise number of significant figures. e.g. 1000 to 2 s.f = 1.0×10^3 1000 to 3 s.f = 1.00×10^3 1000 to 2 s.f = 1.000×10^3
	Division and multiplication with another measured value- S.F of the value with least number of S.F is to be used.	**0.67** *(2s.f)* **× 2.65***(3 s.f)* **= 1.8***(2 s.f)* $\frac{10.44_{(4s.f)}}{5.25_{(3s.f)}} = 1.99_{(3s.f)}$
	Addition and subtraction of decimals- the d.p of the least accurate value is to be used.	**0.937***(3 d.p)* **+ 1.20***(2 d.p)* **=2.14***(2 d.p)* **7.95***(2d.p)* **- 1.350***(3 d.p)* **=6.60***(2 d.p)*
	Zero is a significant figure if it represents the accuracy of an instrument.	*E.g. if l=20.0 cm, trailing zeros here are significant. 20.0 has 3 s.f.* *if angle i = 60°. The trailing zero is significant. 60 has precisely 2 s.f.* *Note that if the values of a given variable are whole numbers, they have a precise number of d,p and s.f and are not float values e.g. when required to vary mass m starting with* ***M*** *= 100g and then repeating procedure for* ***M****= 200, 300, 400, 500 and 600g, the values of* ***M*** *in this case are not float values. They all have precisely 0d.p and 3s.f.*
Log and trigonometric ratios(sin, cos & tan)	**To be recorded to 3d.p**	**e.g. sin20° = 0.342** **cos28° = 0.883** **tan44° = 0.966** **log 15 = 1.176**
S.F was determined by first entry value in the column	**-Largest value in the column to determine S.F of the processed values and fix the number of d.p in the column.** **-Incase of aproduct or quotient of**	

I(A)	$\frac{1}{I}(A^{-1})$	$x(m)$	$y(m)$	$xy(m^2)$	$\frac{x}{y}$	$\frac{xl}{y}(m)$
0.40	2.5 (2 s.f)	0.05	0.261	0.01	0.19	0.10
0.36	2.8	0.10	0.310	0.03	0.32	0.16
0.32	3.1 (1d.p)	0.15	0.380	0.06 (2d.p)	0.39 (2 d.p)	0.20 (2 d.p)
0.28	3.6	0.20	0.450	0.09	0.44	0.22
0.24	4.2	0.25	0.532	0.13	0.47	0.23
0.20	5.0	**0.30**	**0.620**	**0.19** (2 s.f)	**0.48** (2 s.f)	**0.24** (2 s.f)

	values in two columns, multiplication and division rules apply to the largest product or quotient and this fixes the number of decimal places in the column.	**In the column of $\frac{1}{I}$, using largest value in I i.e.** $0.40(2s.f)$, **we have** $\frac{1(float)}{0.40(2s.f)} = 2.5(2s.f \text{ and } 1d.p)$. **Thus all values of** $\frac{1}{I}$ should be recorded to 1 d.p. **In the column of** xy, ***Largest product*** $= 0.30_{(2\ s.f)} \times 0.620_{(3\ s.f)} = 0.19_{(2\ s.f \text{ and } 2\ d.p)}$. **Since the largest product when written to 2** ***s.f gives 2 d.p, then all values*** *in the column of xy must be recorded to* **2** ***d.p.*** **Largest quotient** $= \frac{0.30_{(2s.f)}}{0.620_{(3s.f)}} = 0.48_{(2s.f \text{ and } 2d.p)}$. **Since largest quotient when written to 2** ***s.f*** ***gives 2 d.p, then all values*** *in the column of* $\frac{x}{y}$ *must be recorded to* **2** ***d.p.*** **In the column of** $\frac{xl}{y}$, **largest value** $= \frac{0.30_{(2s.f)} \times 0.500_{(3s.f)}}{0.620_{(3s.f)}} = 0.24_{(2s.f \text{ and } 2d.p)}$. Since the largest value when written to $2s.f$ gives 2 d.p, then all values in the column of $\frac{xl}{y}$ should be written to $(2d.p)$.
GRAPHS ***Title*** ***Axes*** ***Units***	**The use of "against", "versus" and "variation with" in stating the title of the graph should be accepted.** **No unit in title** **Labels that are vertical or horizontal to be accepted** **Units should be in brackets**	**A graph of M against** l **or** **A graph of M versus** l **or** **The variation of M with** l 
PLOTTING	**The use of a cross (×), a dot (.) or a circle with a dot at the centre (⊙) with error limit of a small square should be accepted. Shaded dots within this error margin are to be accepted too. Use of pencil or pen be accepted in plotting.**	

SCALES	- The scales used must be those that can be easily read without the use of calculators. - Scales must be multiples or submultiples of 1, 2, 2.5 and 5. - The values must be spread to cover about half a page and	Starting values on must be a multiple of the scale used. 
Slope	-Right angled triangle covering ½ a page on at least one of the sides drawn. -Points used for the slope (*where coordinates are read*) must lie on the line of best fit. - when calculating the slope, use coordinates read from the graph not table values. -calculation of the slope to be based on the values from the graph and then applying the rules for addition, subtraction, multiplication and division.	 A(0.2, 1.40) B(2.4, 0.98) Slope from A to B, $S = \frac{\Delta M}{\Delta l}$ (2d.p) (2d.p) $S = \frac{(1.40 - 0.98)}{(2.4 - 0.2)}$ (1d.p) (1d.p) $= \frac{0.42}{2.2}$ (2 s.f) (2 s.f) $S = 0.19\ kg\ m^{-1}$ Numerator; (2d.p)-(2d.p) = (2d.p) Denominator:(1d.p)-(1d.p) = (1d.p) Intermediate step : $\frac{(2s.f)}{(2s.f)} = (2s.f)$ Thus the slope should be written to 2 *s.f.*
Intercept	Intercept to be read directly from the graph basing on the scales of the axis. The scale considered is what one small square represents. If 1 small square has 1 d.p, then the intercept on that axis must also be written to 1d.p and if scale has 2d.p, the intercept must also be written to 2d.p.	 From the graph; Vertical intercept, $C_1 = 1.08V$ Horizontal intercept, $C_2 = 0.67A$

Wrong values in the table obtained experimentally	Graphing to be awarded credit. Plotting skills to be awarded.	Values which are wrong in the table are to be marked wrong in the table but if plotted correctly, marks are to be awarded for correct plotting.
Suspected values(values that were not got experimentally), over rounded values for ease in plotting, calculated or outright fabricated values	To miss marks for plotted points but the rest of the work to be marked	In this case, the marks will be awarded for : - title - labeling axes - units