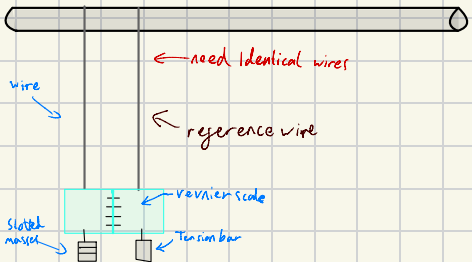
Young modules (E)

$$E = \frac{\sigma\ (\text{stress})}{\varepsilon\ (\text{strain})} = \frac{(F/a)}{(\Delta L/L)} = \frac{FL}{a\Delta L} = \frac{mgL}{a\Delta L}$$

tension = weight

extension



- Measure original length of wire using meter ruler / tape measure
- Measure diameter in 3 places using micrometer, and find mean. (0.01m uncertainty)
- use vernier scale (0.1 mm resolution) with reference wire (with tension bar) to ensure that ambient changes (temperature, etc) are mitigated. (ensure scale is zeroed before adding masses).
- Add slotted masses to wire to increase force (∴ stress). 100g at a time
- Record extension every 100g until wire breaks.
- ensure masses are close to ground, → falling masses can cause damage/harm
  - place mat/carpet underneath
- Wear goggles to avoid wire hitting eyes if it snaps

- % Uncertainty in E = % uncertainty in gradient + % uncertainty in cross-sectional area

$$\frac{LovF - LoBF}{LoBF} \times 100$$

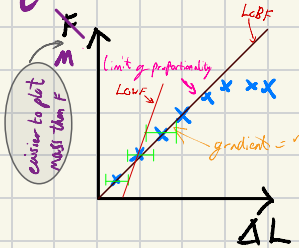
% uncertainty in diameter^2

- wire cutter can cause harm so cut wire in place to avoid risk of dropping
- mass falling can damage environment so put mat or something under mat to cushion fall.

Recording / graphing

M (kg)	ΔL (x10^{-3}m)

$F = mxg$



$\therefore E = \text{gradient} \times \frac{gL}{a}$

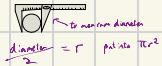
$\frac{mgL}{a\Delta L}$

Stress = Tension / cross sectional area Strain = extension / length

to use a micrometer to measure the diameter you clamp the wire in it and make sure it has just got enough grip so wire doesn't move and read off the measurement provided (this will be diameter).

Practical Write up:

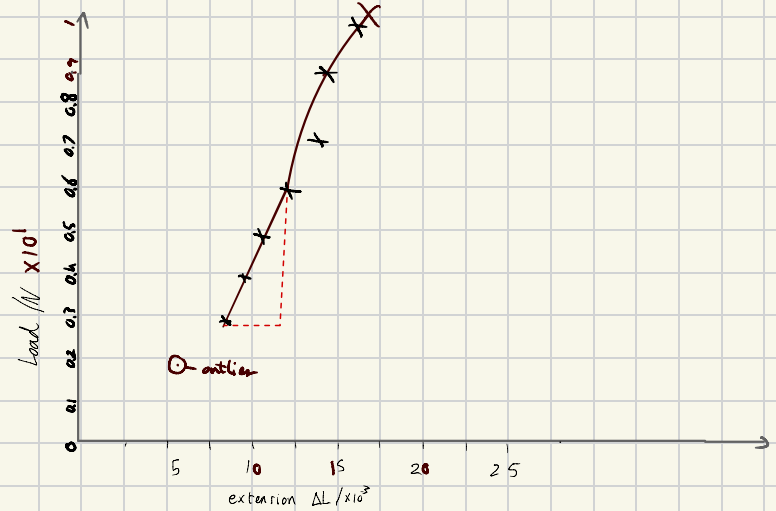
area of a circle $= \pi r^2$

to calculate cross sectional area (a) =  (to maximum diameter; diameter / 2 = r; put into πr^2)

Strain $\varepsilon = \pm 0.2\%$

my uncertainty in d = 1%

$Y = \frac{\sigma}{\varepsilon}$ unit = Pa



Cross sectional area

m	F	a	ΔL	L	young modules
0.1	0.981	5.91×10^{-7}		1.5 m	1709 GPa
0.2	1.962		0.0006		
0.3	2.943		0.0009		
0.4	3.924				
0.5	4.905				
0.6	5.886				
0.7	6.867				
0.8	7.848				

d mm

0.26

0.25

young modules = E = gradient $\times \frac{L}{a}$

= gradient $\times$ 25780710.66

$\frac{L}{A} = \frac{1.5}{5.91 \times 10^{-7}} = 25780710.66$

4.905 − 2.943 = 1.962

1.962 ÷ (0.001 − 0.0006) = 4905

4905 × 25380710.66 = 1.24×10^{11} Pa

124 GPa

generally young modules is $\times 10^{10}$

Link to table

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47%
you ng modules table
Home Insert Draw Page Layout Formulas Data Review View
Calibri (Body) 11 General
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Column10	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column
Mass / kg	Force / N / load	Cross sectional area	Extension	Length		Stress	Strain		Young modules
0.1	0.981	5.30929E-08	0	1.5		18477056.9	0		#DIV/0!
0.2	1.962	4.90873E-08	0.0006	1.5		39969569.5	0.0004		1E+11
0.3	2.943	4.90873E-08	0.0008	1.5		59954354.3	0.00053333		1.1E+11
0.4	3.924	4.90873E-08	0.0008	1.5		79939139.1	0.00053333		1.5E+11
0.5	4.905	4.15475E-08	0.001	1.5		118057566	0.00066667		1.8E+11
0.6	5.886	3.80132E-08	0.0011	1.5		154840791	0.00073333		2.1E+11
0.7	6.867	3.4636E-08	0.0013	1.5		198261754	0.00086667		2.3E+11
0.8	7.848	3.14159E-08	0.0014	1.5		249809810	0.00093333		2.7E+11
0.9	8.829	3.14159E-08	0.0014	1.5		281036036	0.00093333		3E+11
1	9.81	2.83528E-08	0.0016	1.5		345996966	0.00106667		3.2E+11

Sheet1

In this experiment I was pleased with the way it turned out as during the application I added mass/force until the wire snapped.

However, One way I could have done it better with the materials and apparatus I had access to is to remove the possibility of parallax error. By making it so that the wire going downward is parallel to the ruler.

It was a successful experiment as I was within the percentage uncertainty for this trip.