Umm Al-Qura University
Faculty of Applied Science
Physics Department

General Physics 101 lab report

Student Name	
ID number	
Group no.	
Practical Teacher	
Theoretical Teacher	

Experiment Title	***Graphing***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Example 1: A student hangs various masses M from spring and records the resulting the spring has stretched X as see in the table blew to study Hook's law (F = - K X)

M (kg)	0.12	0.15	0.22	0.27	0.35	0.40
X (m)	0.30	0.45	0.67	1.09	1.15	1.4
F = Mg (N)	0.12x9.8	0.15 x 9.8				

M×9.8

1) Calculate the force by using the equation F = Mg where g is the acceleration of gravity and equal 9.8 m/s^2.
2) Plot the relation between X and F (F as the vertical axis and X as the horizontal axis)
3) calculate the spring constant K where the spring constant is the slope of the line. Find the percentage error if the theoretical value of spring constant is 4.5 N/m

Example 2: The data set given in Table below is expected to obey a linear relation $v = v_o + at$.

Plot the relation between v and t, and from your analysis of the graph find the acceleration a and initial velocity v_o?

T (sec)	1	2	3	4	5	6	7	8	9
V(m/sec)	0.6	0.7	0.82	0.96	1.08	1.16	1.26	1.34	1.5

Objective of the experiment

1. Plotting data

2- Determination of slope

Example 1 (F = - K X)

M (kg)	0.12	0.15	0.22	0.27	0.35	0.40
X (m)	0.30	0.45	0.67	1.09	1.15	1.4
F = Mg (N)	1.18	1.47	2.16	2.65	3.43	3.92

M x 9.8

the value of the x-axis is X (m)

0.1 x تدريج

Determine the scale of the graph on x – axis = $\frac{1.4}{14}$ = 0.1

Determine the scale Partial reading on x - axis = $\frac{0.1}{10}$ = 0.01

the value of the y-axis is F (N)

Determine the scale of the graph on y - axis = $\frac{3.92}{20}$ = 0.196 ≈ 0.2

Determine the scale Partial reading on y - axis = $\frac{0.2}{10}$ = 0.02

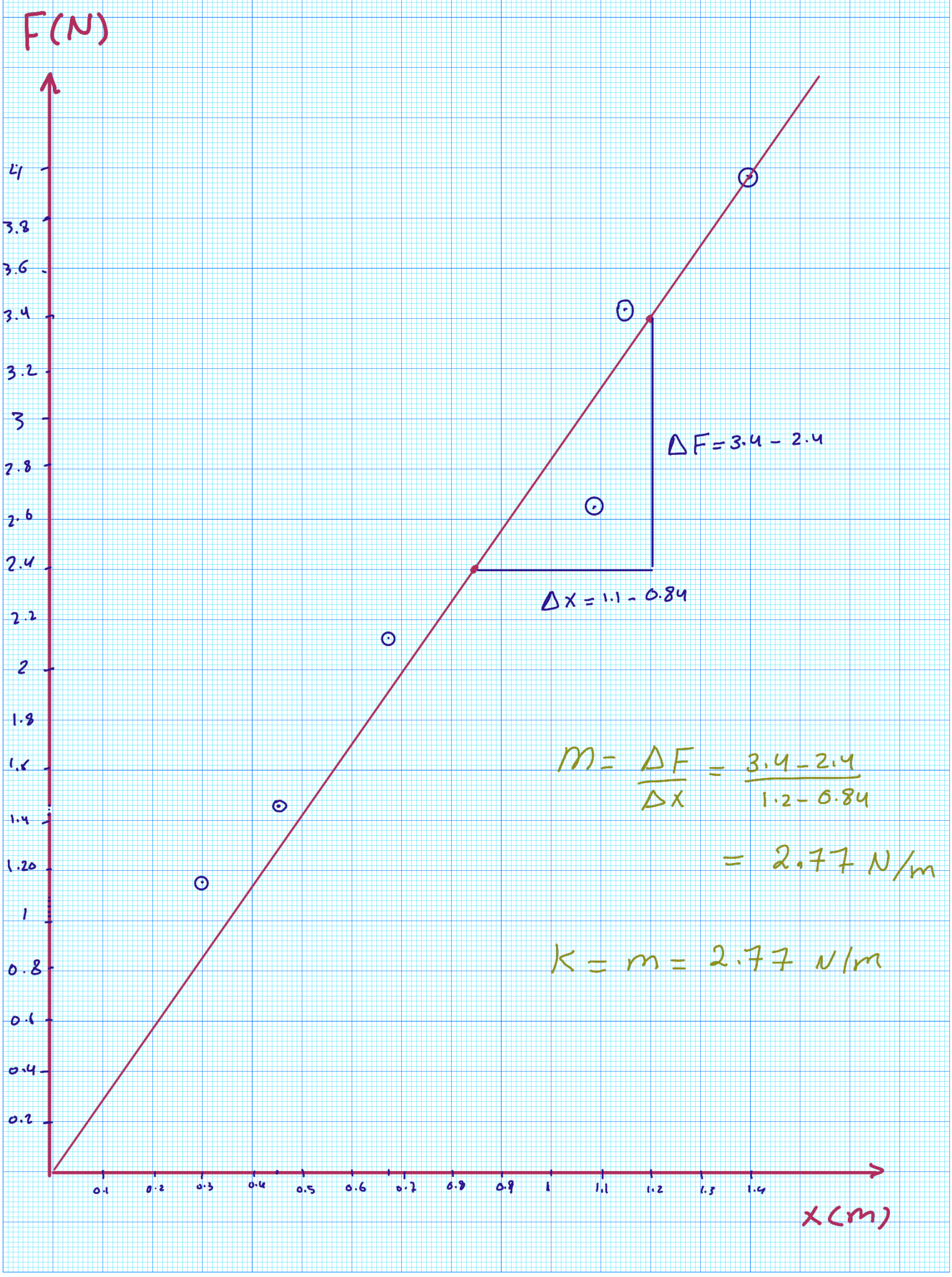
After the graph the slope is (which is k)

Slope = m = k = 2.77 N/m

the percentage error if the theoretical value of spring constant is 4.5 N/m

Percentage error = $\frac{|\text{theoretical} - \text{Expermenial}|}{\text{theor}} \times 100\%$

$= \frac{4.5 - 2.77}{4.5} \times 100\% = 38.4\%$


F(N)
x(m)
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.20
1
0.8
0.6
0.4
0.2
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
ΔF = 3.4 − 2.4
Δx = 1.1 − 0.84
m = ΔF/Δx = (3.4 − 2.4)/(1.2 − 0.84)
= 2.77 N/m
K = m = 2.77 N/m

Example 2: The data set given in Table below is expected to obey a linear relation $v = v_o + at$.

Plot the relation between v and t, and from your analysis of the graph find the acceleration a and initial velocity v_o?

T (sec)	1	2	3	4	5	6	7	8	9
V(m/sec)	0.6	0.7	0.82	0.96	1.08	1.16	1.26	1.34	1.5

Example 2:

the value of the x-axis is ……T(sec)……

Determine the scale of the graph on x – axis = $\frac{9}{10}$ = …0.9 ≈ 1…

Determine the scale Partial reading on x - axis = $\frac{1}{10}$ = …0.1…

the value of the y-axis is ……V (m/s)……

Determine the scale of the graph on y - axis = $\frac{1.5}{15}$ = …0.1…

Determine the scale Partial reading on y - axis = $\frac{0.1}{10}$ = …0.01…

After the graph the slope is

Slope = 0.11 m/s²

The intercept of $y - axis$

0.49

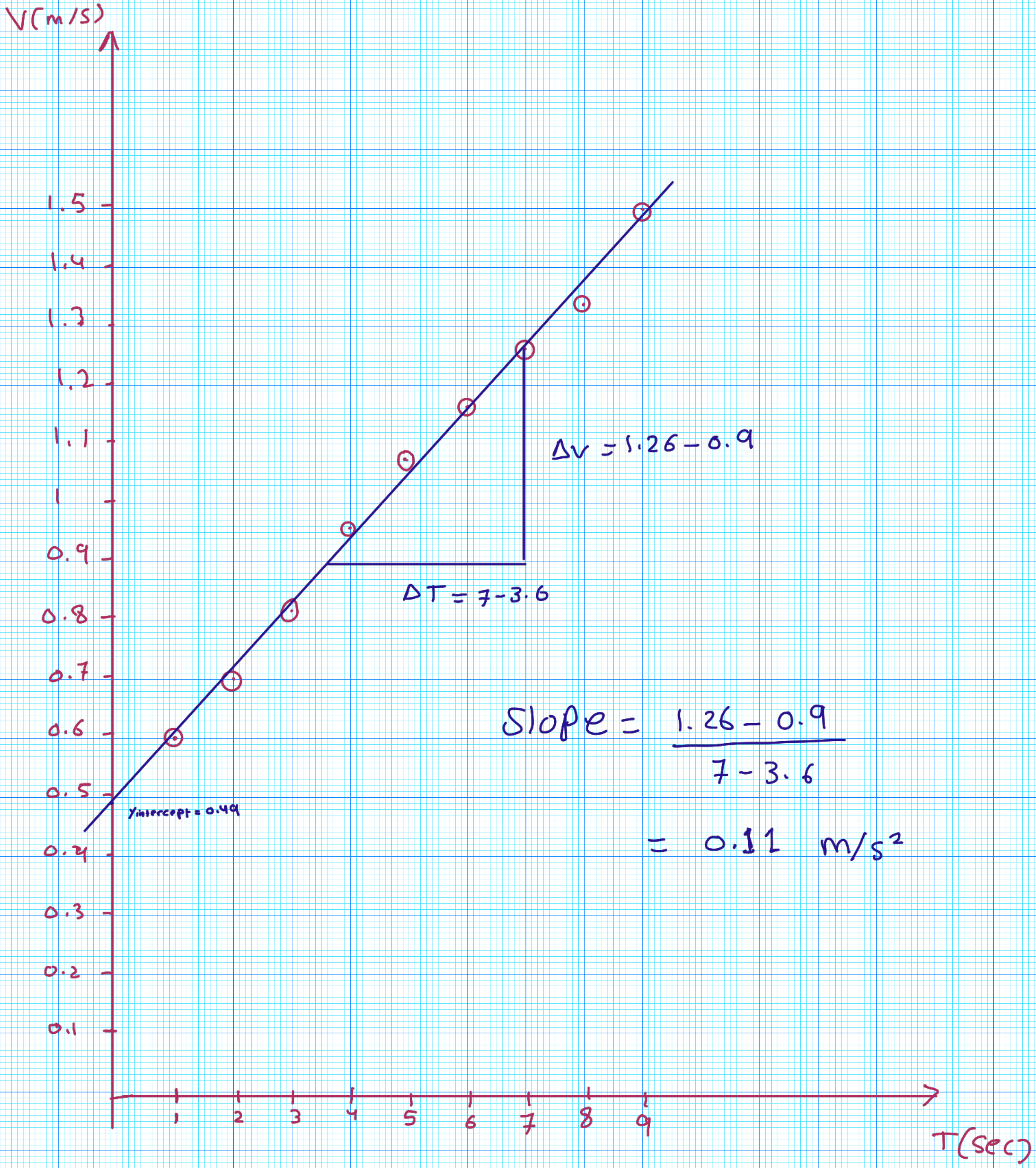
The equation for the relation between v & t is

V = at + Vo

V = 0.11 t + 0.49

The acceleration a is …0.11 m/s²…

The initial velocity v_o …0.49 m/s…



V(m/s)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Y intercept = 0.49
ΔV = 1.26 − 0.9
ΔT = 7 − 3.6
Slope = 1.26 − 0.9 / 7 − 3.6
= 0.11 m/s²
1 2 3 4 5 6 7 8 9
T(sec)

Experiment Title	***Accurate Measurements***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

1. Determination of dimensions of cylinder by means of a Vernier Calipers
2. Measuring a diameter of thin wire and thickness of the slide by means Micrometer.
3.Improvement of the measuring accuracy by means of a Vernier and Micrometer.

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Equipment of the experiment

Vernier Calipers – Micrometer - Some objects (cylinder, thin wire and slide or sheet of wood)

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First: Vernier Calipers

1-Less reading of the Vernier (accuracy):

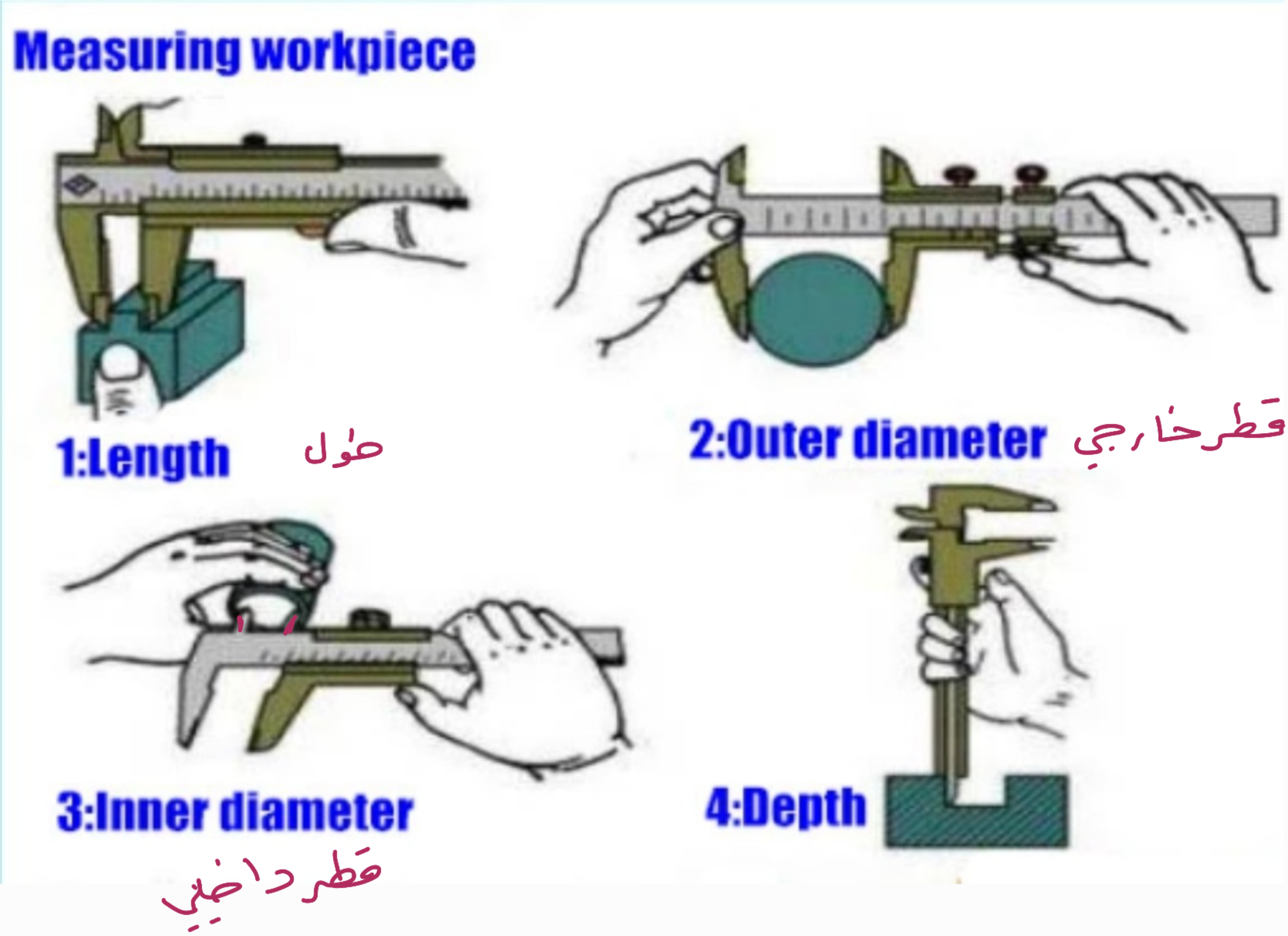
$0.05 = \frac{1}{20} = \frac{1}{\text{عدد تقسيمات المسطرة المنزلقة}} =$ دقة الجهاز

2-Zero error amount:

الخطأ: نغلق الورنيه ونأخذ القراءة

Sample Type: Cylinder

Measurement type	Reading	First reading (mm)	Second reading (mm)	Average (mm) معدل
External diameter القطر الخارجي	main scale	21 المسطرة الرئيسية	22	$\frac{21.5 + 21.6}{2}$
	vernier scale	10 مسطرة منزلقة		مجموع القرائتين / 2
	Zero error	الخطأ الصفري	أي دوره القراءة	
القراءة النهائية	total reading	21 + (10×0.05) + zero = 21.5	21.6	
Internal diameter القطر الداخلي	main scale			
	vernier scale			
	Zero error			
	total reading			
Height الارتفاع	main scale			
	vernier scale			
	Zero error			
	total reading			


Measuring workpiece
1:Length
طول
2:Outer diameter
قطر خارجي
3:Inner diameter
قطر داخلي
4:Depth

Depth عمق	main scale			
	vernier scale			
	Zero error			
	total reading			

Second: Micrometer Screw Gauge

1-Less reading of the Micrometer (accuracy):

.... 0.01 = أقل قراءة (الدقة) ....

2-Zero error amount:

.... نغلق الميكرومتر ثم نقرأ الخطأ الصفري ....

Sample and type of measurement	Reading	First reading (mm)	Second reading (mm)	Average (mm)
سمك شريحة زجاج The thickness of the slide	main scale	مقياس المحور الرئيسي	نكرر القراءة	معدل القراءتين $\frac{5+6}{2}$
	vernier scale	مقياس الطوق الدوارة		
	Zero error	الخطأ الصفري		
	total reading	5 القراءة ١	6	
قطر سلك معدني Diameter of metal wire	main scale			
	vernier scale			
	Zero error			
	total reading			

Experiment Title	***Force Table***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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Part 1: experimental method

Experiment	*First Force*	*Second Force*	*Balancing force*
θ			
M(g)			
M (Kg)			
F(N)= mg			
Result force (F_R)			
Result angle θ_R			

Part 2: component method:

	First force	second force
$\boldsymbol{\theta}$		
$F = mg$		
x – component $F_x = F \cos \boldsymbol{\theta}$		
Total component in x – direction $F_x = F_{1x} + F_{2x}$		
y – component $F_y = F \sin \boldsymbol{\theta}$		
Total component in y – direction $F_y = F_{1y} + F_{2y}$		
$F_R = \sqrt{F_x^2 + F_y^2}$		
$\theta_R = \tan^{-1}\left(\frac{F_y}{F_x}\right)$		

Calculate the percentage error:

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Part 3: Graphical method.

	First force	*second force*
$\boldsymbol{\theta}$		
$F = mg$		
drawing scale = *0.3 N = 1 cm* $\frac{\ldots\ldots\ldots x1\ cm}{0.3\ N}$		

graph

Result Force (F_R) from graph = ……………………………………….

F_R after using drawing scale =

$$\frac{\text{……………………}\times 0.3\ N}{1\ cm}$$ ……………………………………………………………

$\boldsymbol{\theta_R}$ from graph = ……………………………………………………………

Calculate the percentage error:

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Experiment Title	***Forces on an Inclined Plane***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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Calculation:

M (mass of the roller) = ………………………..g = ……………………………. Kg

m_p (mass of the pan) = …………………g = ……………………………. Kg

Angle of inclination (θ^0)	$sin\theta$	$M\ g\ sin\theta$ (N)	Weight in pan when roller moves		Total weight when roller moves $M_{1,2} = m_{1,2} + m_p$		Force acting on roller downward $W = \frac{(M_1+M_2)g}{2}$ (N)
			Upwared m_1 (g)		Upwared M_1 (kg)		
			Downwared m_2 (g)		Downwared M_2 (Kg)		
			Upwared m_1 (g)		Upwared M_1 (kg)		
			Downwared m_2 (g)		Downwared M_2 (kg)		
			Upwared m_1 (g)		Upwared M_1 (kg)		
			Downwared m_2 (g)		Downwared M_2 (kg)		
			Upwared m_1 (g)		Upwared M_1 (kg)		
			Downwared m_2 (g)		Downwared M_2 (kg)		
			Upwared m_1 (g)		Upwared M_1 (kg)		
			Downwared m_2 (g)		Downwared M_2 (kg)		

What is relation between downward force and angle of inclination of the plane?

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Experiment Title	***Atwood Machine***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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Calculation:

y_0 (the maximum height of m_2) = …………...cm = ………..m

	The hanging mass (g)	*The holder mass (g)*	*The total mass (Kg)*
m_1 =			
m_2 =			

y (cm)	*y (m)*	*Δy (m)*	*Time t (s)*	*Avenge of time T (s)*	T^2 *(s^2)*

Find the slope for your straight line.

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Find experimentally acceleration a.

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Find theoretically acceleration a.

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Find the percentage error of acceleration

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Experiment Title	***Archimedes Principle***
Experiment Date	/ /
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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The first method

Type of object	Weight in air W_{air} (N)	Weight in water W_{water}(N)	Buoyant force $F_B=W_{air} - W_{water}$ (N)
Floating objects (Plastic cylinder)			
Objects submerged in water (Aluminum cylinders)			
Objects submerged in water (copper cylinders)			
Objects submerged in water (Aluminum cube irregular)			

The second method

Remember:

1ml = 1 x 10^{-6} m^3

Density of water = 1000 kg /m^3

Type of object	Volume of displaced water V (m^3)	Mass of displaced water $m = \rho_{water} \times V$ (Kg)	Weight of displaced water $F_{displaced\ water} = mg$ (N)
Floating objects (Plastic cylinder)			
submerged object (Aluminum cylinders)			
Submerged object (copper cylinders)			
Submerged object (Aluminum cube irregular)			

<u>The third method</u>

	Aluminum cylinder	Copper cylinder
Hight of cylinder h (m)		
Diameter of cylinder d (m)		
Radius of cylinder r (m)		
Volume of cylinder $V = \pi r^2 h$ (m^3)		
$F_B = \rho_{water} \times V_{object} \times g$ (N)		

Finally , what can you get from this experiment ?

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Experiment Title	***Viscosity***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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Calculation:

L (distance between the two marker) = …………...cm = ………..m

ρ (the density of the sphere ball) = 7790 kg / m^3 . ρ_o (the density of glycerin) = 1260 kg / m^3

dimeter of ball d (mm)	*dimeter of ball d (m)*	*radius of the ball $r = d/2$ (m)*	*square radius r^2 (m^2)*	*Time t (s)*	*Avenge of time T (s)*	*velocity $v = L / T$ (m/s)*

Find the slope for your straight line.

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Find viscosity of glycerin η .

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Experiment Title	***Surface tension***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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Calculation:

d (diameter of the metal ring) = …………...cm = ……………….. m

$2\pi d$ = ………………………..……………………………………. m

F_0 (Weight the ring in air) = …………………………N

Type of Liquid	water	glycerine	
F_1 (N)			
$F = F_1 - F_0$ (N)			
$\sigma_{experiment} = \frac{F}{2\pi d}$ *(N/m)*			
$\sigma_{theoretical}$ *(N/m)*			
percentage error *(%)*			

Experiment Title	***Refractive Index of the Materials***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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First: a rectangular acrylic plate

graph

From graph the incident and refracted angles

i	r_1	r_2	e

What you observe between the incident and refracted angles

………
………
………

The index refraction is

………
………
………

Calculate the percentage error:

………
………
………

Second: an acrylic prim

graph

From graph the incident and refracted angles

i	r_1	r_2	e	Ψ	$\emptyset$

The index refraction is

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Calculate the percentage error:

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Experiment Title	***Focal Length of Thin Lens***
Experiment Date	*/ /*
Practical Mark	*/ 5*
report Mark	*/ 5*
Total Mark	*/ 10*

Objective of the experiment

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Equipment of the experiment

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First, determined the focal length of convex lens

Table 1

Object Distance $\boldsymbol{o}$ (cm)	Image Distance $\boldsymbol{i}$ (cm)	$1/o$ ((cm)$^{-1}$)	$1/i$ ((cm)$^{-1}$)

1. **Calculation method**

$\frac{1}{f}=\frac{1}{o}+\frac{1}{i}$ ((cm)$^{-1}$)	$\boldsymbol{f}$ (cm)	The average of $\boldsymbol{f}$ (cm)

the percentage error for focal length

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2. **Graphical method**

From graph,

$y_{intercept}$ $((cm)^{-1})$	$x_{intercept}$ $((cm)^{-1})$	$\frac{1}{f} = \frac{y_{intercept} + x_{intercept}}{2}$ $((cm)^{-1})$	f (cm)

the percentage error for focal length

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Second, determined the focal length of concave lens

Table 2

Object Distance o (cm)	Image Distance i (cm)	$1/o$ $((cm)^{-1})$	$1/i$ $(cm)^{-1})$

1. **Calculation method**

$\frac{1}{f} = \frac{1}{o} + \frac{1}{i}$ $((cm)^{-1})$	f (cm)	The average of f (cm)

the percentage error for focal length

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2. Graphical method

From graph,

$y_{intercept}$ $((cm)^{-1})$	$x_{intercept}$ $((cm)^{-1})$	$\frac{1}{f} = \frac{y_{intercept} + x_{intercept}}{2}$ $((cm)^{-1})$	f (cm)

the percentage error for focal length

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