جامعة بيرزيت

BIRZEIT UNIVERSITY

Faculty of Science كلية العلوم

Department of Physics دائرة الفيزياء

Phys111 Report

Experiment #5: Focal Length of a Convex Lens

Name:		**ID #:**	
Partner:		**ID #:**	
Section:	3		
Date:			

(1) Abstract:

- **Aim of the experiment:**

Calculate the focal length of a convex lens

- **The main result is:**
  - The focal length of the convex lens is $f =$ (16.4 ± 0.2) cm

(2) Data:

B ⇒ the number of our lens

	1.	2.	3.	4.	5.	6.
$u\ (cm)$	78.4	67.3	55.8	49.8	42.4	31.7
$v\ (cm)$	21.6	22.7	24.2	25.2	27.6	33.3
$1/u\ (cm)^{-1}$	0.0128	0.0148	0.0179	0.0201	0.0236	0.0315
$1/v\ (cm)^{-1}$	0.0463	0.0441	0.0413	0.0397	0.0362	0.0300

$\Delta u \approx 0.4$ cm	$\Delta v \approx 0.4$ cm	$f_{true} \approx 17.2$ cm

Due 11/5/2021

(3) Calculations:

$\bar{u} =$	$\bar{v} =$	$\overline{\left(\frac{1}{u}\right)} =$	$\overline{\left(\frac{1}{v}\right)} =$
54.2 cm	25.8 cm	$0.0201\ cm^{-1}$	$0.0396\ cm^{-1}$

$f_1 = x_{intercept}^{-1} = 15.197568$ cm $f_2 = y_{intercept}^{-1} = 17.543854$ cm

$\bar{f} = \frac{f_1 + f_2}{2} = 16.3707\ cm \simeq \boxed{16.4\ cm}$

$\Delta\bar{f} = \bar{f}^2\left(\frac{\Delta v}{v^2} + \frac{\Delta u}{u^2}\right) = 0.1975 \simeq \boxed{0.2\ cm}$

(4) Results:

- The focal length of the convex lens is $f = (16.4 \pm 0.2)$ cm

(5) Conclusions:

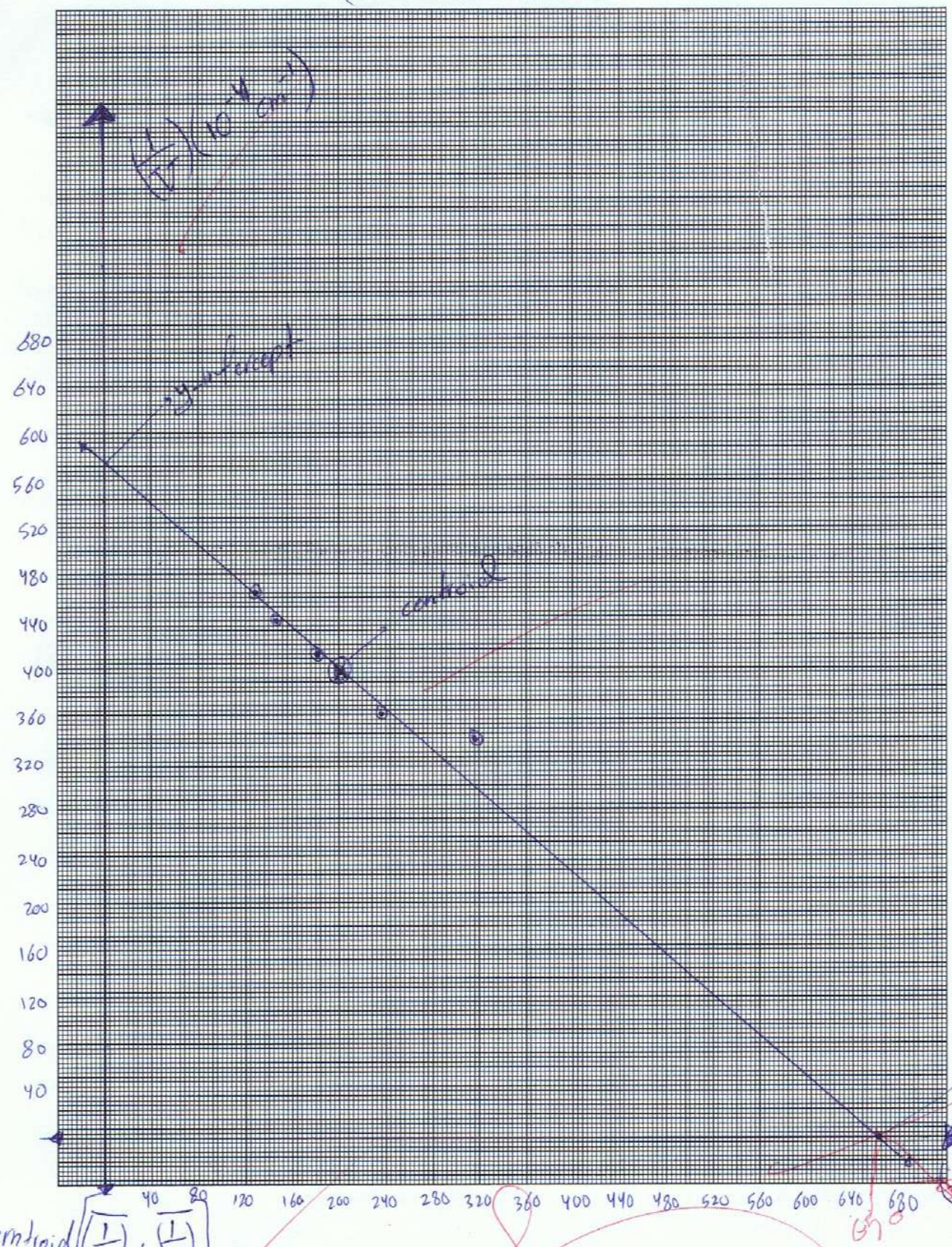
The result in this experiment is 16.4 cm with error 0.2 cm, by the discrepency test $|R_{True} - R_{exp}| \leq 2\Delta R \Rightarrow |17.2 - 16.4| \overset{??}{\leq} 2 \times 0.2$

$0.8 \geq 0.4 \Rightarrow$ so the result is not accepted in order to some sources of error. First, in this experiment, we have different perspectives, because measurements depend on the sharpest image, and this clearly depends on the person who is measuring. Second, when we measure the true value, the light in the room has a large effect on the measuring process, so we can't achieve a perfect light condition. Third, the ruler we used is old, and the measurements wasn't clearly seen, also, we may dislodge the source of light away from zero point, so measurements are not accurate. Also, the lens should be perpendicular to the soure of light, but in our case, the lens maybe obligne a bit because of the Repeated use by other students.

Finally, in Graphing process, the scale on the graph is large to show the x-intercept and y-intercept points, so plotting the points on the graph is estimated, and the x and y intercepts are also estimated, and they weren't equal, so we opted to take the averge between the two values.

The letter appearing on our lens is (X), we use the average of f_y and f_x because of the reasons mentioned above.

$\frac{1}{V}$ vs $\frac{1}{u}$ $(10^{-4}\ cm^{-1})$



Centroid $\left[\left(\frac{1}{u}\right), \left(\frac{1}{V}\right)\right]$ =

$= (0.0201, 0.0396)$

Not accurate ~0.5

x-intercept $= 0.0658\ cm^{-1} = \boxed{15.1975\ cm}$

y-intercept $= 0.0570\ cm^{-1} = \boxed{17.5438\ cm}$