Experimental General Physics for Engineers I

Laboratory Report PHYS 192 spring 2022

Section: ___L06_

Experiment name: # Conservation law of mechanical energy

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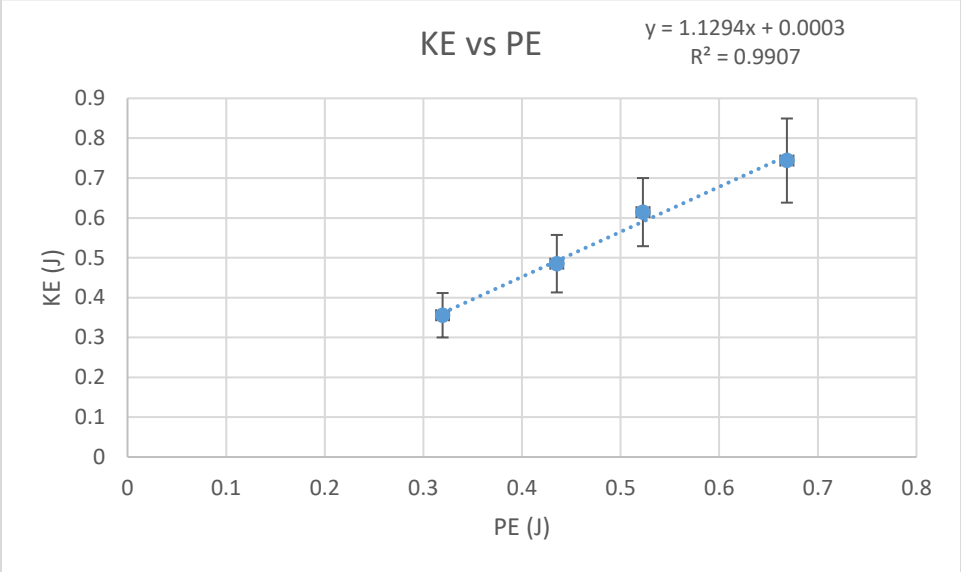
Table of results (1.25 pts)	
Graph (1.25 pts)	
Data analysis (2 pts)	
Discussion (0.5 pt)	
References	
Others	
Report Grade (5 pts)	

1. Table of results (Put correct units in the table, don't forget to convert to SI units to get energy in Joules)

hanged mass m (Kg)	v_1 m/s	v_2 m/s	v_3 m/s	v_{avg} m/s	u(v_{avg}) m/s	PE J	KE J	u(EP) J	u(KE) J
0.055	0.18	0.18	0.18	0.18	±0.01	0.3557	0.3194	0.006501	0.055
0.075	0.21	0.21	0.21	0.21	±0.01	0.4851	0.4352	0.006529	0.072
0.095	0.23	0.23	0.23	0.23	±0.01	0.6144	0.5226	0.006565	0.085
0.115	0.26	0.26	0.26	0.26	±0.01	0.7438	0.6686	0.006609	0.105

2. Graph of the kinetic energy vs. the potential energy

Plot total kinetic energy (y-axis) vs. the potential (x-axis) with error bars, best fit line, display equation of line and R^2.



3. Data analysis

3.1. Parameters of the experiment

Mass of the platter: M= 0.991 kg ± 0.001 kg

Radius of the platter: R= 0.126 ± 0.001 m

Radius of the pulley: r=0.020 ± 0.001 m

Falling height: h= 0.66 ± 0.001 m

3.2. Moment of inertia of the platter and its error

Calculate the value of the moment of inertia (I= ½ M R^2) of the platter and its error (Show your calculations and give the appropriate unit)

M= 0.991 kg ± 0.001 kg R= 0.126 ± 0.001 m

I= ½ M R^2 =1/2 *0.991 *0.126^2 =0.0079 Kg.m^2

U(I)= sqrt(((d(1/2 * MR^2)/d(M) *U(M))^2 + ((d(1/2 * MR^2)/d(R) *U(R))^2

=sqrt ((R^2/2 * 0.001)^2 + (MR * 0.001)^2)

= ± 0.000125 Kg.m^2

I = 0.0079 ± 0.000125 Kg.m^2

3.3. PE and KE

Show explicitly how you calculated (PE) and (KE) for the first row

E_{Tf}= 0 + KE = 0+(1/2 mv^2) + (1/2 I v^2/r^2)

E_{Ti}= PE = mgh + 0

For the first row

PE = 0.055 * 9.81 * 0.66 =0.3557 J

KE = (1/2 * 0.055 * 0.18^2) + (1/2 * 0.0079 * $0.18^2/0.02^2$) = 0.3194 J

3.4. Error of PE and KE

Show explicitly how you calculated the error of (PE) and (KE) for the first row

U(PE) = sqrt ((gh* U(m))^2 +(mh * U(g))^2+(mg*U(h))^2

= sqrt((9.81*0.66*0.001)^2 + (0.055*0.66*0.01)^2 + (0.055*9.81*0.001)^2)

= ±0.006354 J

U(KE) = sqrt((v^2/2 * U(m))^2 + ((mv+Iv/r^2)*U(v))^2 +(v^2/2r^2 * U(I))^2 +(v^2I/r^3 * U(r))^2)

= sqrt (0.18^2/2 * 0.001)^2 + ((0.055*0.18 + 0.0079*0.18/0.02^2) *0.01)^2 + (0.18^2/2*0.18^2 *0.00013)^2

+(0.18^2 *0.0079/0.02^3 * 0.001)^2)

=± 0.0557 J

3.5. Slope and intercept of the graph and their uncertainties

Give the values for the slope, intercept of your graph and their uncertainties

Slope :0.877215	Intercept(J) :0.004246
U(Slope) :0.060113	U(Intercept) (J) :0.034173

Error Percentage= |1-0.877215/1|*100 = 12.2785%

4. Discussion

Discuss your results

The results agree with what was expected and satisfy the theory, with a 12.2785% error due to many sources of error. One of the reasons was due to the neglection of friction and air resistance and human error. Due to this, there are some amounts of energy which is why the potential energy is not equal to kinetic energy and thus, the slope shows slope almost equal to 1.

5. References