

***Engineering Science
Worksheets***
***POTENTIAL AND KINETIC
ENERGY KIT ES9***
3. ENERGY IN A FLYWHEEL

Name	
Date	
Course/Year/Group	

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Energy in a Flywheel

Aims

To prove the theory for energy in a flywheel.

Experiment Setup

As shown in Figure 1, fix the Bearing Block and Flywheel to the Work Panel. Count the holes in the Work Panel if you need to make sure everything fits correctly.

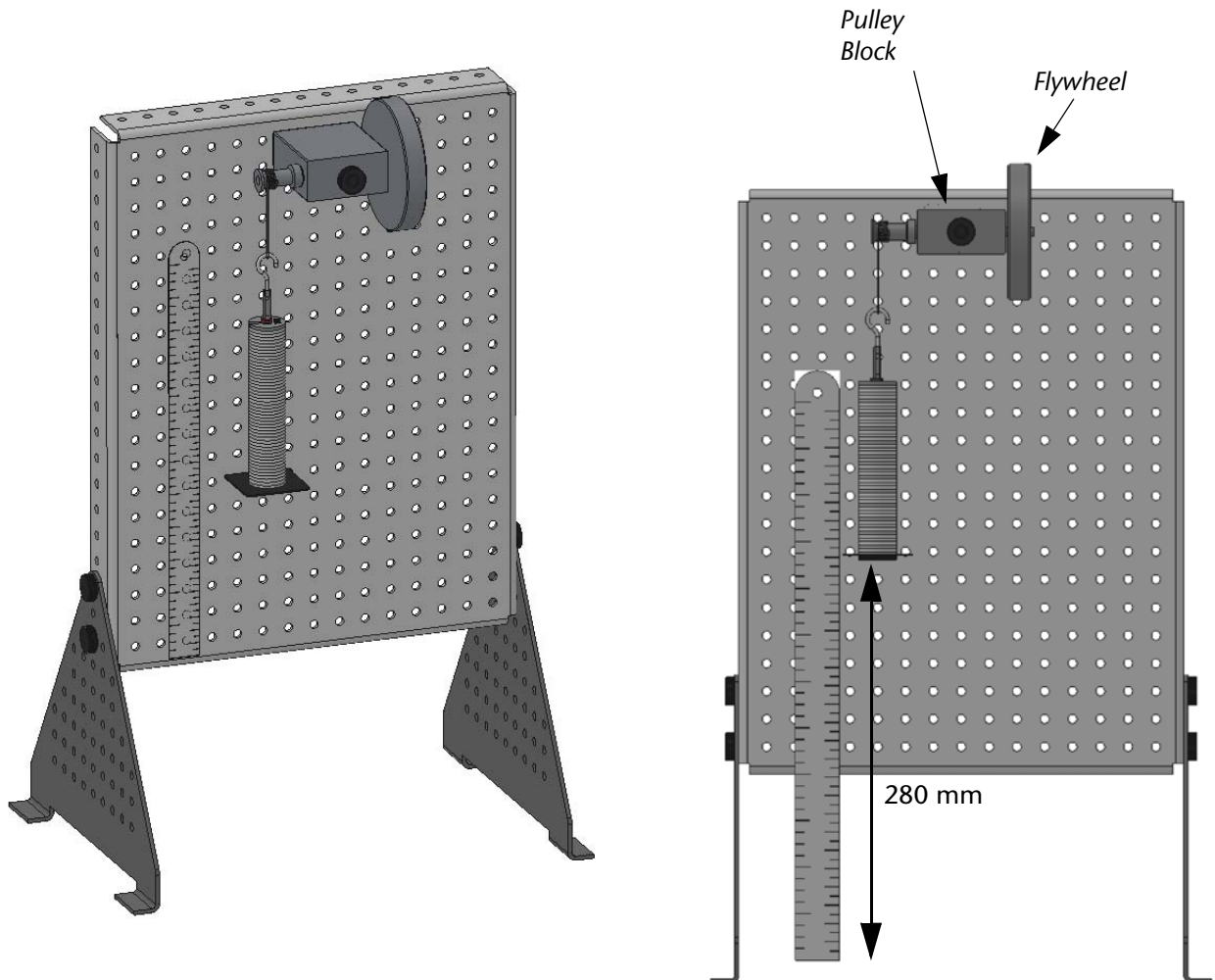


Figure 1 Experiment Setup

Experiment Procedure

1. Read the Guidance Notes (supplied).
2. Fit the plastic guide to the bottom of the Weight Hanger.
3. Your lecturer may have cut the cord to length for you. It should allow the bottom of the weight hanger to travel through a vertical drop of just under 290 mm.
4. Allow the Weight Hanger to fall to the bottom of its travel. Move the magnetic rule behind the Weight Hanger, so its 0 mm edge aligns with the plastic guide.
5. Add 90 g masses to give a total of 100 g on the Weight Hanger.
6. Slowly turn the flywheel to lift the weight hanger, (it doesn't matter which way) until the bottom of the weight hanger reaches 280 mm on the rule.
7. Use the stopwatch to measure how many seconds it takes for the Weight Hanger to fall from its 280 mm position to the 0 mm position and back up to its maximum height (h_2). Try this several times to get a good average value for the time and the height (h_2).
8. Calculate PE (mgh_1), the mg and PE loss (adjusted) values.
9. Calculate the falling time, acceleration, velocity, $(mg-ma)r$ and a/r values.
10. Add the nominal I values for the flywheel and the pulley in the bearing block to find the total nominal I value for the flywheel. Use this to calculate the KE value for the flywheel for each line of results.
11. Use the chart paper to create a chart of $(mg-ma)r$ against a/r . Your results should give a reasonably straight line with little scatter. Use the chart to find an average value I for the flywheel.

Questions and Conclusions

Note the relationship between the mass you apply and the PE loss. Heavier masses should give larger PE losses up to a certain point. Why do you think this happens? Hint - try the other Engineering Science Kits that deal with friction.

Compare your value of I from the chart with that of the nominal values. Do they compare well?

Given that the frictional losses become less significant at higher loads, think about other sources of error that show discrepancies in the equation: $PE + PE \text{ loss} = KE$

Mass m (kg)	PE mgh_1 (J)	Time to fall and rise t_t (seconds)	h_2 (m)	mg	PE loss Adjusted (J)	Falling Time t_f (seconds)	Acceleration a ($m.s^{-2}$)	Velocity v ($m.s^{-1}$)	Velocity ω ($rad.s^{-1}$)	$(mg-ma)r$	a/r	KE
0	0	0	0	0	0	0	0	0	0		0	0
0.1												
0.2												
0.3												
0.4												
0.5												
$h_1 = 280\text{ mm (0.28 m)}$ $r = 0.0065\text{ m (allowing for the cord thickness)}$ Nominal $I =$												

Table 1 Blank Results Table

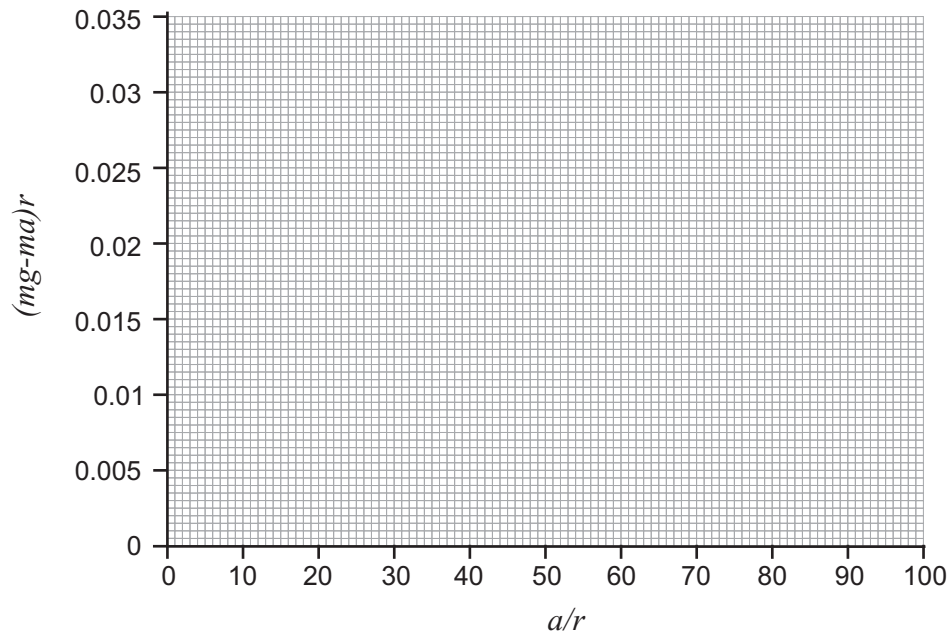


Figure 2 Blank Chart Paper

Notes

