

THE FLYING PIG

CONICAL PENDULUM LAB

MISSION

Use a spinning pig to experimentally determine the value of g .

You'll measure only r , L , and T . No mass. No force sensors. Just geometry & timing.

□ **Connection:** This is the *exact same setup* as yesterday's homework! But instead of solving for velocity when you know g , you'll measure velocity and solve for g .

1. DESIGN YOUR MEASUREMENT STRATEGY

Plan before you measure. You cannot touch the pig while it's spinning.

Radius (r)

How to measure center to pig?

String Length (L)

From pivot to pig. When to measure?

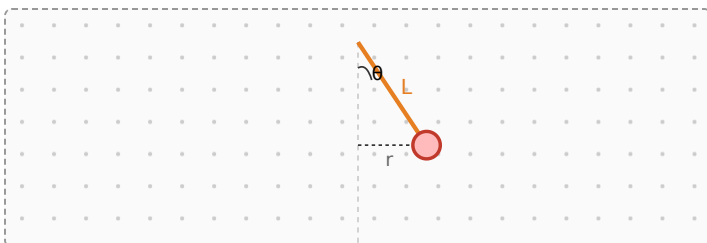
Period (T)

How many revs? How to minimize error?

2. PRE-LAB DERIVATION

Draw FBD, write ΣF equations, and **solve for g** .

FBD:



Equations:

Vertical (Y):

Radial (X):

Show algebra to isolate g :

3. DATA COLLECTION

□ **Experimental Freedom:** The table below is a suggestion. If you use video analysis or a different method, record your data on a separate sheet.

Trial	Length L (m)	Radius r (m)	Time (s)	# Revs	Period T (s)
1					
2					
3					
Avg					

4. CALCULATIONS

Step A: Find θ

Step B: Find v

Step C: Use derivation to find g

Your Experimental Value:

$$g_{\text{exp}} = \text{_____} \text{ m/s}^2$$

5. ANALYSIS & REFLECTION

PERCENT ERROR

$$\% \text{ error} = \left| \frac{9.80 - g_{\text{exp}}}{9.80} \right| \times 100\% = \text{_____} \%$$

A. Sources of Uncertainty: Which measurement (r , T , or L) had the most error? Effect on g ?

B. Mass Independence: Explain physically why mass didn't matter.

C. Connection: In the Gravitron, Normal force is centripetal. Here, what force is centripetal? What balances gravity?