Name: _____ **AP Physics C — Mechanics** **Date:** _____

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?

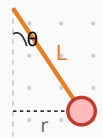
Period (*T*)

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:

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

5. ANALYSIS & REFLECTION

PERCENT ERROR

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

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?