

AP Physics C Test #3 Pretest Problem

Name _____

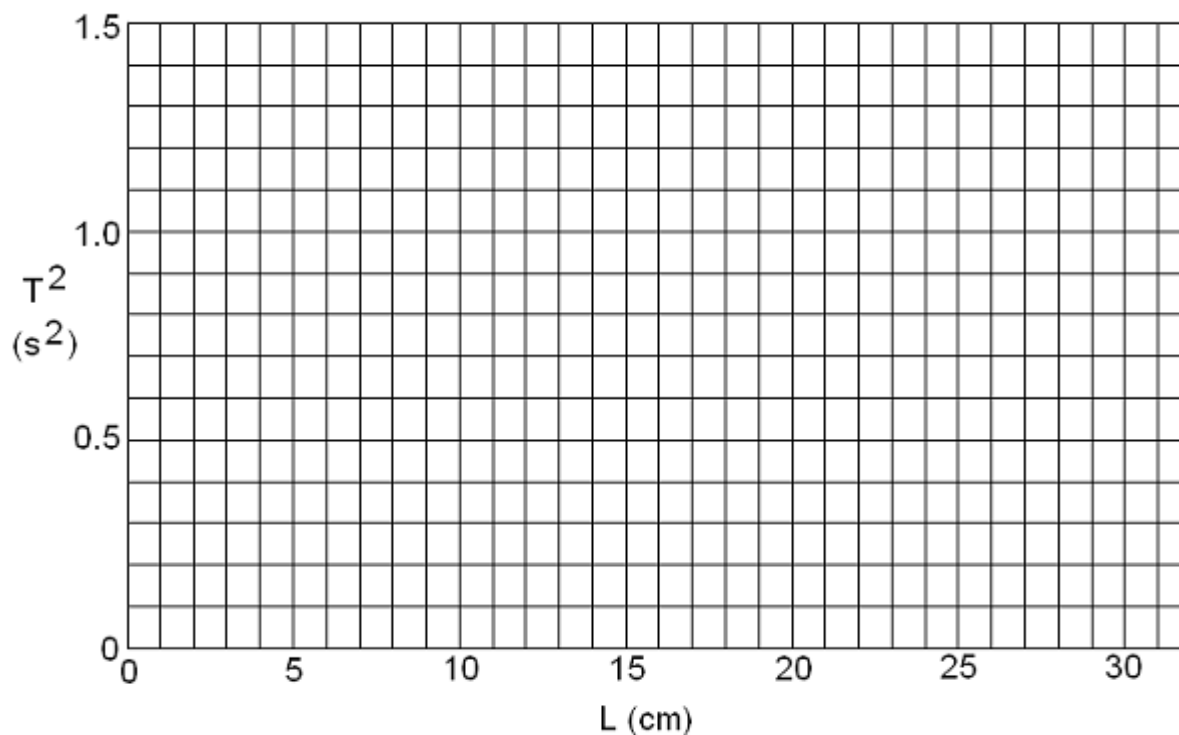
Period _____

You are conducting an experiment to measure the acceleration due to gravity g_u at an unknown location. In the measurement apparatus, a simple pendulum swings past a photogate located at the pendulum's lowest point, which records the time t_{10} for the pendulum to undergo 10 full oscillations. The pendulum consists of a sphere of mass m at the end of a string and has a length L . There are four versions of this apparatus, each with a different length. All four are at the unknown location, and the data shown below are sent to you during the experiment.

L (cm)	t_{10} (s)	T (s)	T^2 (s ²)
12	7.62		
18	8.89		
21	10.09		
32	12.08		

(a) For each pendulum, calculate the period T and the square of the period. Use a reasonable number of significant figures. Enter these results in the table above.

(b) On the axes below, plot the square of the period T versus the length L of the pendulum. Draw a best-fit straight line for this data.



(c) Assuming that each pendulum undergoes small amplitude oscillations, from your best fit line determine the experimental value g_{exp} of the acceleration due in gravity at this unknown location. Justify your answer.

(d) If the measurement apparatus allows a determination of g that is accurate to within 4%, is your experimental value in agreement with the value 9.80 m/s^2 ? Justify your answer.

(e) Someone informs you that the experimental apparatus is in fact near Earth's surface, but that the experiment has been conducted inside an elevator with a constant acceleration a . Assuming that your experimental value g_{exp} is exact, determine the magnitude and direction of the elevator's acceleration.