

The torsion balance was an important tool in early studies of both gravitational force and the electrostatic force. As you know, Henry Cavendish was able to determine the universal gravitational constant, G , using a torsion balance. Charles Coulomb, unaware of Cavendish's balance, developed a very similar balance, which he used to develop the law now known as Coulomb's law.

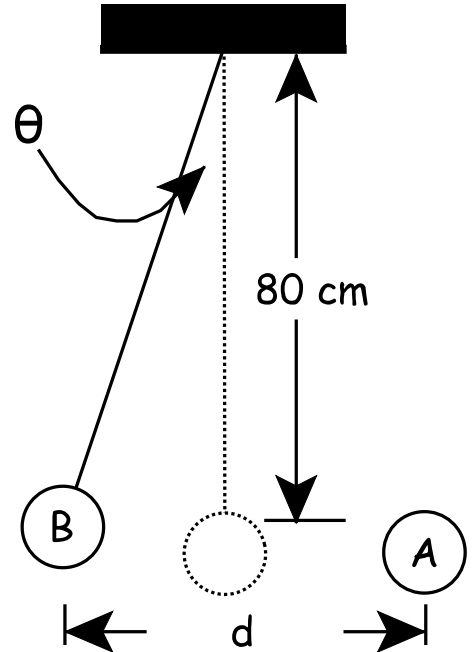
Task #1

Two identical pith balls are situated as follows: one ball (A) is attached to the end of a light rod made of insulating material; the other (B) is suspended from a fixed point by an insulated thread 80.0 cm long. When ball A is held at various horizontal distances from B, the angle between the thread and the vertical is measured. Determine whether the results support Coulomb's law. Be sure to show all your work and thinking!

Note: each student will get separate data re mass and charge!

#: ___ mass = _____ g & charge = _____ nC

Horizontal distance between A & B d (cm)	Angular displacement of thread θ
0.50	25.0°
1.00	6.65°
1.50	2.97°
1.80	2.06°
2.10	1.51°
2.50	1.07°



To help answer the question follow the steps below:

- 1 Draw a FBD of pith ball "B". {Note: you will need to resolve F_T into its components.}
- 2 Use the FBD to calculate F_g , F_T , and then F_E for $\theta = 25.0^\circ$.
- 3 Now use Coulomb's Law to calculate F_E for $d = 0.50$ cm (ie $\theta = 25.0^\circ$). Watch your units!
- 4 Calculate the % difference between the values you got for steps 2 and 3. {2 sig digs are sufficient.}
- 5 Repeat the process for the remainder of the " θ " and " d " values. You may find a table like the one below useful to record your values. Be sure to (a) include a sample set of calculations and (b) answer the question.

FBD			COULOMB'S LAW		% Difference
θ	F_g	F_T	F_E	F_E	
25.0				0.0050	

TASK#2

Q#7,10/P.333 Be sure to include diagrams and your work!

Average % Difference

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