

22.3: Checking Equations

When you are doing a complicated calculation involving difficult equations connecting several physical quantities, you must, routinely, check the dimensions of every line in your calculation. If the equation does not balance dimensionally, you know immediately that you have made a mistake, and the dimensional imbalance may even give you a hint as to what the mistake is. If the equation does balance dimensionally, this, of course, does not guarantee that it is correct - you may, for example, have missed a dimensionless constant in the equation.

Suppose that you have deduced (or have read in a book) that the period of oscillations of a torsion pendulum is $P = 2\pi\sqrt{\frac{I}{C}}$, where I is the rotational inertia and c is the torsion constant. You have to check to see whether the dimensions of the right hand side are indeed that of time. We have

$$\left[\sqrt{\frac{I}{C}}\right] = \sqrt{\frac{\text{ML}^2}{\text{ML}^2\text{T}^{-2}}}.$$

This does indeed come to T , and so the equation balances dimensionally.

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