

Phys 220 – Bucket swing

Materials and Equipment: Bucket, water, stopwatch, meter stick

Do you trust physics?

Take the bucket of water out in the hall and swing it around in a circle over your head. What do you have to do to make sure the water stays in the bucket and does not end up on your head?

Warning: A very tall person may hit the ceiling with the bucket so check this before swinging!

Analysis

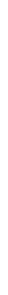
Draw two free body diagrams of the bucket, one at the top of the loop and one at the bottom. Identify the direction of the acceleration and apply Newton's second law (sum the forces).

Loop Top

Loop Bottom



Solve the equation(s) from the above step for an expression for the tension in your arm/on the handle (all in variable form - no numbers).



Collect the necessary data to determine the tension of your swing. The relationship $v = 2\pi r/T$ will be helpful here.

What is your experimental value for tension at the top and at the bottom?



Critical speed

The critical speed is the point where the bucket will just make it around the loop instead of falling and spilling water all over you.

What can you assume about the tension at the top of the swing at the critical speed?

Using this information, determine the period of your bucket swing at the critical speed.
(Try it if you dare!)