UCM problems Solutions

v = 2πr/T ac = v2/r ΣF = mac = mv2/r

1. 13 g stopper

14 rev/30 s = T = 0.467 s v = 2πr/T = 2π(0.93)/0.467 = 12.5 m/s

Ac = v2/r = 12.52/0.93 = 168 m/s/s

Fnet = mac = 0.013 kg(168 m/s/s) = 2.18 N

1. Double mass, no effect on period (s/rev) no effect on period or acceleration, mass is not in those equations. Would double Fnet
2. Double radius means double v, but 4v2/2R means ac is only doubled Same for force increase by 2x
3. T = 0.467/2 cut period in half, double velocity (2πr/ ½ T) then 4x ac and 4x force.
4. 8.82/25 = ac = 3.09 m/s/s. Fnet due to friction
5. Change velocity to 25 m/s and radius to 90 m.

252/90 = ac = 6.94 m/s/s

ΣF = mac  = *f f = μmg*

mv2/r= μmg

v2/rg = μ = 0.708

1. V = 2πr/T = 6.26(50m)/24.3 s = 12.8 m/s

ac = v2/r = 12.82/50 m = 3.28 m/s/s

Fnet = mac = 615 kg) (3.28 m/s/s) = 2017 N

1. 60 s/33.33 rev = T = 1.80 s ac is toward center of circle

V5 = 2πr/T = 6.28 (0.05)/1.80 = 0.174 m/s ac5 = 0.1742/0.05) = 0.605 m/s/s

V10 = 6.28(0.10)/1.80 = 0.34 m/s 0.342/0.10) = ac = 1.156 m/s/s

V15 = 6.28 )(0.15)/1.80 = 0.52 m/s 0.522/0.15 = ac = 1.80 m/s/s

1. Tire

830 rev/s = 60 s/830 rev = T = 0.0723 s

v = 2πr/T = 6.28(0.29)/0.0723 = 25.2 m/s

1. ac = v2/r = 342/33m = 35.0 m/s/s 35/9.8 = 3.6 g’s

ac = v2/r = 342/24 = 48.2 m/s/s 48.2 /9.8 = 4.9 g’s

Fnet = ma = 350 (35m/s/s) = 12,250 N

Fnet = ma = 48.2 (350 kg) = 16,870 N

1. Fnet = mv2/r = 0.9 kg(19)2/17 m = 19.1 N

Fnet = mv2/r = 0.90 kg)(38)2/17m = 76.4 N