Physics 122

Circular Motion: Unbanked and Banked Curves

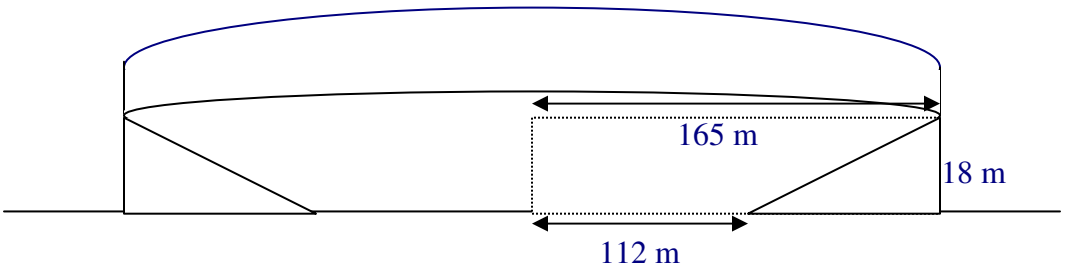
1. A car rounds an unbanked curve (radius = 92 m) without skidding at a speed of 26 m/s. What is the smallest possible coefficient of static friction between the tires and the road? (0.75)

2. At what angle should a curve of radius 150 m be banked so cars can travel safely at 25 m/s without relying on friction? (23^o)

3. A curve of radius 120 m is banked at an angle of 18^o. At what speed can it be negotiated under icy conditions when friction is neglected? (20 m/s)

4. A car is safely negotiating an unbanked circular turn at a speed of 21 m/s. The maximum static frictional force acts on the tires. Suddenly, a wet patch in the road reduces the maximum static frictional force a factor of three. If the car is to continue safely around the curve, to what speed must the driver slow the car? (12 m/s)

5. On a banked race track, the smallest circular path on which cars can move has a radius of 112 m, while the largest has a radius of 165 m, as the drawing illustrates. The height of the outer wall is 18 m. Find the smallest and largest speed at which cars can move on this track without relying on friction. (19 m/s, 23 m/s)



6. Two curves on a highway have the same radii. However, one is unbanked and the other is banked at an angle θ. A car can safely travel along the unbanked curve at a maximum speed v_o under conditions when the coefficient of static friction between the tires and the road is 0.81. The banked curve is frictionless, and the car can negotiate it at the same maximum speed v_o. Find the angle θ of the banked curve. (39^o)