SUVA SANGAM COLLEGE

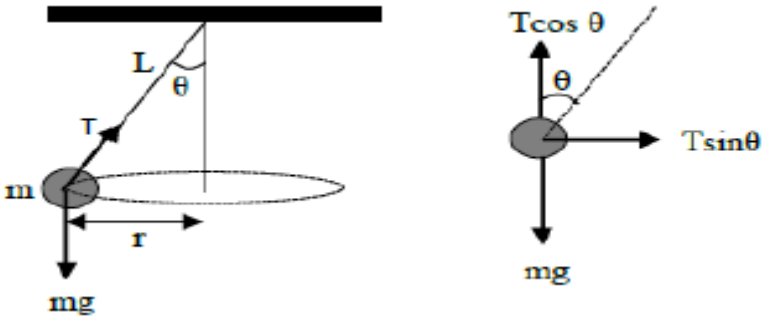
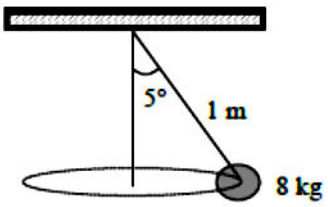
YEAR 13

PHYSICS

WORKSHEET 5

Strand 1 P13.1	Mechanics
Sub-Strand P13.1.4	Rotational Kinematics (Horizontal Circles and Banking of Ci=urves))
Content Learning Outcome P13.1.3.1	Apply the knowledge of Newton's Second Law and appreciate the concept of rotational kinematics.
Reference from Text	Pg 20 to 22

Questions

No.	
	CONCEPT IN BRIEF: **The conical pendulum.** The velocity of a mass moving in a conical pendulum is given by $v = \sqrt{gr\sin\theta} = \sqrt{Lg\sin\theta\cos\theta}$. The centripetal force $F_c = T\sin\theta = \frac{mv^2}{r}$. Also note $T\cos\theta = mg$ and the radial acceleration is $a = \frac{v^2}{r}$ 
1.	Consider a conical pendulum as shown.  Determine:
	a) the tension in the string.
	b) the horizontal and the vertical component of the force exerted by the wire on the pendulum
	c) the velocity of the mass.
	d) the radial acceleration of the mass.
	CONCEPT IN BRIEF: ***Unbanked curve :*** on an unbanked curve the static friction force

	provides the acceleration force , the maximum speed a car can turn without slipping is $v = \sqrt{\mu g r}$.
2.	A 1500-kg car moving on a flat, horizontal road negotiates a curve. If the radius of the curve is 35.0 m and the coefficient of static friction between the tires and dry pavement is 0.523, find the maximum speed the car can have and still make the turn successfully.
	CONCEPT IN BRIEF: **Banked curve:** For every banked curve, there is one speed at which the entire centripetal force is supplied by the horizontal component of the normal force, and no friction is required. The maximum speed a car can turn without slipping is $v = \sqrt{rg \tan\theta}$
3.	A civil engineer wishes to redesign the curved roadway in such a way that a car will not have to rely on friction to round the curve without skidding. In other words, a car moving at the designated speed can negotiate the curve even when the road is covered with ice. Suppose the designated speed for the ramp is to be 13.4 m/s and the radius of the curve is 35.0 m. At what angle should the curve be banked?