Quiz #3 Solutions

1. 

Two forces:

① $T = k[(1+c)L - L] = kcL$ (tension of rubber band)

② mg (weight of ball)

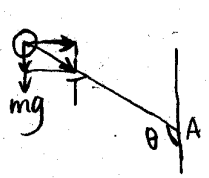
2. $kcL\cos\theta = mg$ (equilibrium in vertical direction)

$kcL\sin\theta = m\frac{v^2}{(1+c)L\sin\theta}$ (equation of motion)

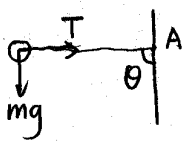
$v^2 = \frac{(1+c)L}{m}kcL\sin^2\theta$ $\quad \cos\theta = \frac{mg}{kcL}$

$\Rightarrow v = L\sqrt{\frac{kc(1+c)}{m}\left[1-\left(\frac{mg}{kcL}\right)^2\right]}$

(It is fine if your answer contains θ.)

3. 

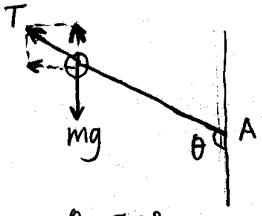
$\theta > 90°$



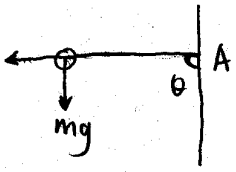
$\theta = 90°$

No.

Reason: In both $\theta > 90°$ and $\theta = 90°$, no force to balance mg.

4. 

$\theta > 90°$



$\theta = 90°$

No.

Reason: ① When $\theta > 90°$, the horizontal component of T doesn't provide the necessary centripetal force.

② When $\theta = 90°$, in addition to lack of centripetal force, mg can't be balanced.