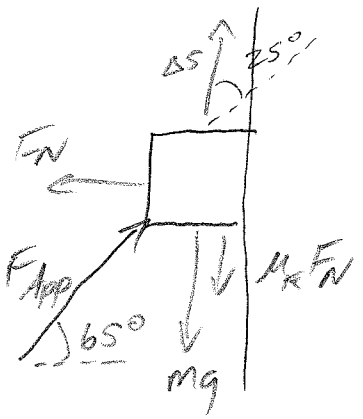
Physics 10154 - Exam #5D

Answer the following two questions. Be sure to clearly indicate your answer with a circle or box. Show all work. If I cannot see how you arrived at an answer, I will deduct points!

1. A 4.5-kg block is being pushed vertically up a rough wall by a 75-N applied force that makes a 65° angle with the horizontal. The block slides at a constant speed of 3.0 meters/sec. What is the coefficient of kinetic friction between the block and the wall?



$F_{App} = 75\,N$

$F_N = F_{App}\cos 65 = 31.7\,N$

$W_N = 0$

$W_{grav} = mg\,\Delta s \cos 180°$

$= -44.1\,\Delta s$

$W_{App} = F_{App}\,\Delta s \cos 25°$

$= 68.0\,\Delta s$

$W_{Fric} = \mu_K F_N \Delta s \cos 180°$

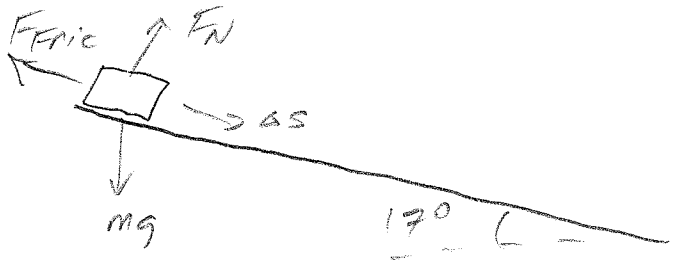
$= -31.7\,\mu_K \Delta s$

$-44.1\,\Delta s + 68.0\,\Delta s - 31.7\,\mu_K\,\Delta s = 0 - 0$

$23.9 = 31.7\,\mu_K$

$\boxed{\mu_K = 0.75}$

2. Starting from rest, a 2500-kg car rolls down a 12-meter long driveway that makes an angle of 17° with respect to the horizontal. An average frictional of 1600 Newtons impedes the car's motion. What is the speed of the car at the bottom of the driveway?



$W_N = 0$

$W_{grav} = mg\,\Delta s \cos 73°$

$= (2500)(9.8)(12)\cos 73° = 86000\,J$

$W_{Fric} = -F_{Fric}\,\Delta s$

$= -(1600)(12) = -19200\,J$

$W_{grav} + W_{Fric} + W_N = \frac{1}{2}mv^2 - 0$

$86000 - 19200 + 0 = \frac{1}{2}(2500)v^2$

$66800 = 1250v^2$

$\boxed{v = 7.3\ m/s}$