ave. = 6.7
σ = 2.1

Physics 4A
Fall 2025

Name Answer Key

Lab: 8:00 am 11:20 am 2:40 pm (circle one)

Quiz #5: Dynamics I

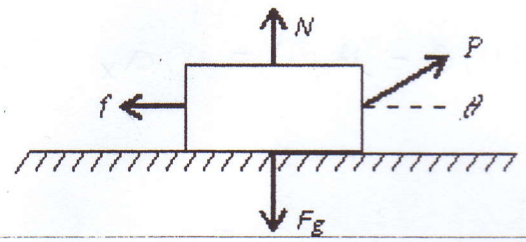
Problem 1 (1.5 points)
A fireman is sliding down a fire pole. As he speeds up, he tightens his grip on the pole, thus increasing the frictional force the pole exerts on the fireman. When the frictional force equals the weight of the fireman, what happens?

B

a) The fireman comes to a stop.
b) The fireman continues to descend, but with constant speed.
c) The fireman descends with slower and slower speed.

once $\sum F_y = 0$, then $a_y = 0$ and speed remains constant

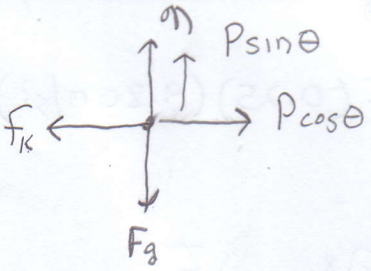
Problem 2 (1.5 points)
A girl pulls a wooden box along a rough horizontal floor at constant speed by means of a force **P** as shown in the figure below. In the diagram, f is the magnitude of the force of friction, N is the magnitude of the normal force, and F_g is the magnitude of the force of gravity. Which of the following must be true?



$\vec{F_g}$: force of gravity
$\vec{f}$: frictional force
$\vec{N}$: normal force

C

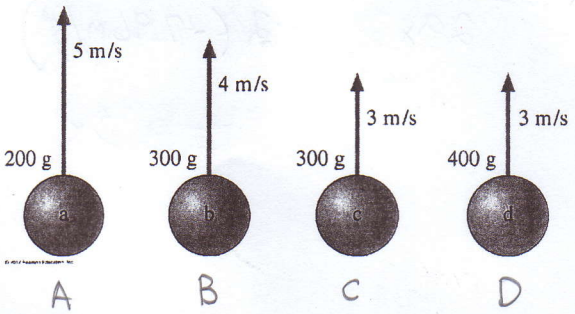
a) $P = f$ and $N = F_g$
b) $P = f$ and $N > F_g$
c) $P > f$ and $N < F_g$
d) $P > f$ and $N = F_g$
e) none of these



$\sum F_y = 0$
$n = F_g - P\sin\theta$
$\sum F_x = 0$
$P\cos\theta = f_K$

Problem 3 (2 points)
The four balls shown in the figure below have been thrown straight up. They have the same size, but different masses. Air resistance is negligible. Rank, in order, from largest to smallest, the magnitude of the net force acting on each ball. Some may be equal. Give your answer in the form a > b > c = d.

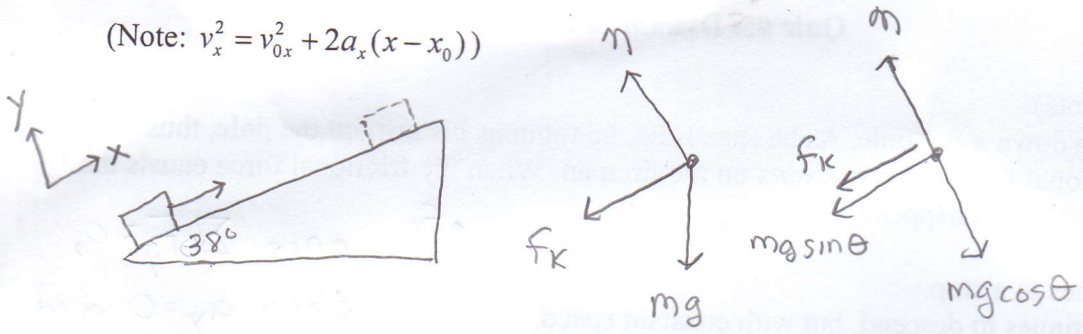
$\sum F_y = mg \rightsquigarrow$ only depends upon mass



D > B = C > A

Problem 4 (5 points)
A 5.00 kg block is launched at 6.25 m/s up a long ramp that is inclined at an angle of 38.0°. The coefficient of kinetic friction between the ramp and block is $\mu_k = 0.25$. How far *along the ramp* does the block travel before coming to rest?

(Note: $v_x^2 = v_{0x}^2 + 2a_x(x - x_0)$)



$$\sum F_y = ma_y = 0$$

$$n - mg\cos\theta = 0 \rightarrow n = mg\cos\theta$$

$$\sum F_x = ma_x$$

$$-mg\sin\theta - f_K = ma_x \rightarrow -mg\sin\theta - \mu_K n = ma_x$$

$$-mg\sin\theta - \mu_K(mg\cos\theta) = ma_x$$

$$a_x = -g\sin\theta - \mu_K g\cos\theta$$

$$= -(9.80\ m/s^2)\sin 38.0° - (0.25)(9.80\ m/s^2)\cos 38.0°$$

$$= -7.96\ m/s^2$$

x_0	x	v_{0x}	v_x	a_x	t
0 m	?	6.25 m/s	0 m/s	$-7.96\ m/s^2$	

$$v_x^2 = v_{0x}^2 + 2a_x(x - x_0) \rightarrow x = \frac{-v_{0x}^2}{2a_x} = \frac{-(6.25\ m/s)^2}{2(-7.96\ m/s^2)}$$

($v_x = 0$, $x_0 = 0$)

$$\boxed{x = 2.45\ m}$$