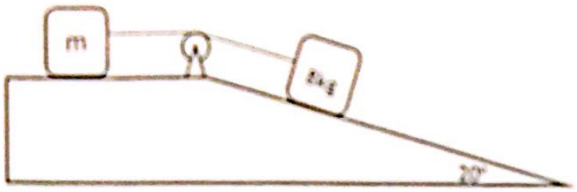
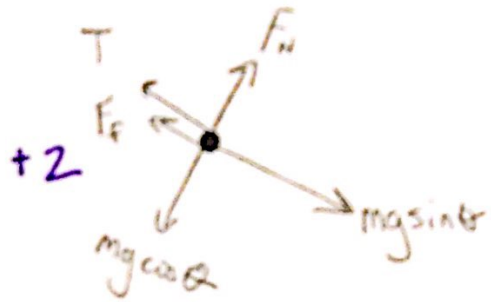
AP Physics 1&2
Newton Test

Name: Andromeda Black
Period: _____

The system below is in static equilibrium. The coefficient of friction between both blocks and the surface is 0.2.



a) Draw the free body diagram for the 8kg block. Use the dot provided.



+2

b) Calculate the tension in the string.

$\Sigma F = 0$

LOOKING AT THE 8kg BLOCK

+3

$T + F_f = mg\sin\theta$

$T + \mu mg\cos\theta = mg\sin\theta$

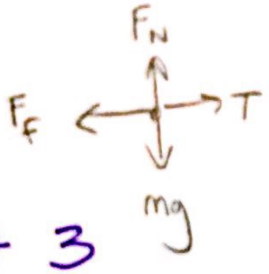
$T + (.2)(8)(9.8)\cos 20 = 8(9.8)\sin 20$

$T + 14.73 = 26.81$

$T = 12.1N$

12.1N

c) What must be the minimum mass of the block on the flat section to create this static situation?



+3

LOOKING AT m BLOCK

$\Sigma F = 0$

$T = F_f$

$T = \mu mg$

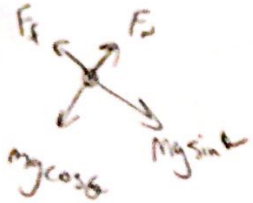
FROM PART (a)

$12.1 = (.2)(m)(9.8)$

$6.17kg = m$

6.17kg

d) If the string is cut, what will be the resulting acceleration of the 8kg block down the ramp?



+3

$\Sigma F = ma$

$mg\sin\theta - F_f = ma$

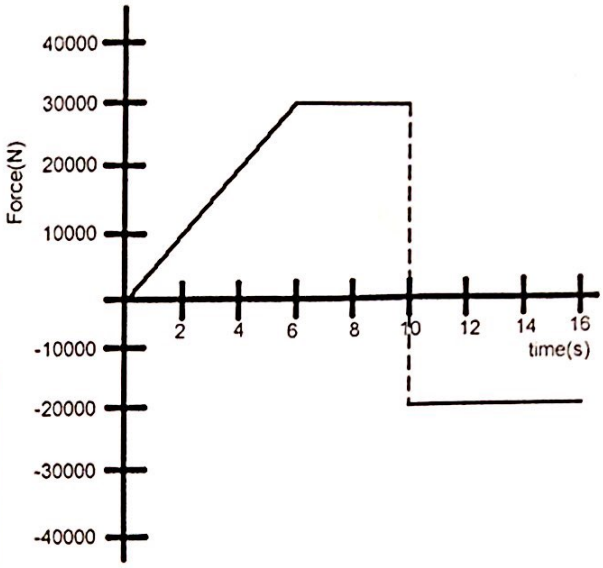
$mg\sin\theta - \mu mg\cos\theta = ma$

$9.8\sin 20 - .2(9.8)\cos 20 = a$

$1.51 m/s^2 = a$

1.51 m/s²

Col. David Lapp subjects himself to several experiments to determine the thresholds for acceleration on the human body. In one such experiment, he is seated inside of a railway car with a rocket booster attached. The rocket booster thrusters exert the following force as a function of time for the first 10 seconds. After 10 seconds the brakes are applied. The force from the breaks is represented on graph as well. You can assume there is NO friction for the first 10 seconds and that that there is friction after 10 seconds.



Other Information	
Mass of train tracks: 850 kg	Mass of Col. Lapp: 80 kg
Mass of railway car: 150 kg	Length of track: 400 m
Mass of thrusters: 30 kg	Wheel diameter: 0.8 m
Mass of fuel: IGNORE	

a) Determine the maximum acceleration of Col. Lapp in the first 10 seconds.

$115.4\ m/s^2$

$F_{MAX} = 30000\ N$ from graph

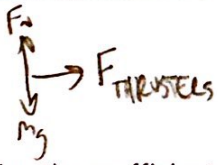
$m = 80 + 150 + 30kg = 260kg$

+ 3

$\Sigma F = ma$

$30000 = 260a$

$115.4\ m/s^2 = a$



b) Determine the coefficient of friction between the wheels and the tracks during the breaking period?

7.85

$F_f = 20000\ N$ from graph

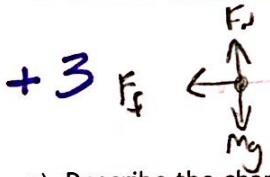
$F_f = \mu F_N$

$F_f = \mu mg$

$-20000 = \mu(260)(9.8)$

$7.85 = \mu$

+3



c) Describe the change in velocity of Col. Lapp during the 6-10 second period on the graph?

CONSTANT CHANGE NOT CONSTANT VELOCITY

+ 2

d) What was the rate at which the force changed in the first 6 seconds?

5000 N/s

FIND SLOPE

$\frac{\Delta y}{\Delta x} = \frac{30000 - 0\ N}{6 - 0s} = 5000\ N/s$

+ 2

10/10