



Physics 101
Final Exam

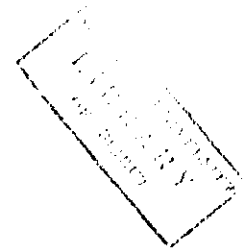
February 7, 1998
Time : 2 hours

NAME: _____

I.D. No. _____

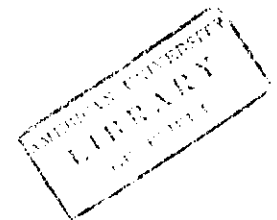
Section _____

Don't forget your Name, I.D. # and section



sect. 1.	11, MWF & 1 F	Dr. Tabbal
sect. 2.	9, TT & 11, TT	Dr. Zableet
sect. 4.	10, TT & 2-4 F	Dr. Trad
sect. 5.	11, MTTF	Dr. Abou-Ghantous

*You can see your corrected paper on Wednesday February 11, 1998 in Room 121
from 10:00 a.m. till 1:00 p.m.*



I. Given the vectors: $A(0i, 100j)$ and $B(173i, -100j)$ Find $A \times B$

II. The displacement vector A has a length of 350 m in the direction 45° west of north; the displacement vector B has a length of 120 m in the direction 20° east of north. Find the magnitude and direction of the resultant of these vectors?

III. An automobile enters a 60° curve at a constant speed of 30 m/s and emerges from this curve 8.0 s later. What is the average acceleration for this time interval?

VI. A curved road is designed in such a way that a car will not have to rely on friction to round the curve without skidding. Suppose that a typical car rounds the curve with speed of 72 km/h and that the radius of the curve is 100 m. At what angle should the curve be banked?

I. A runner runs 100 m on a straight track in 11 s and then walks back in 80s. What are the average velocity and the average speed for each part of this motion?

II. Suppose you throw a stone straight up with an initial velocity of 15 m/s and, 2.0s later, you throw a second stone straight up with the same initial velocity. The first stone going down will meet the second stone going up.

- a) At what time do the two stones meet?
- b) At what height do the two stones meet?

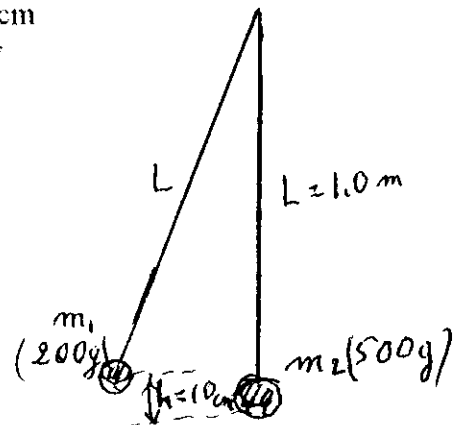
I. A child of mass 40.0 kg takes a ride on a slide of height 6.0 m. The child starts from rest at the top. Determine her speed at the bottom assuming there is no friction.

II. A 5.0 kg object with a speed of 30 m/s strikes a steel plate at an angle of 45° and rebounds at the same speed and angle.

- Find the linear momentum of the object (magnitude and direction)
- Determine the impulse experienced by the ball and the average force exerted by the ball on the wall if it stays in contact for 20 ms.

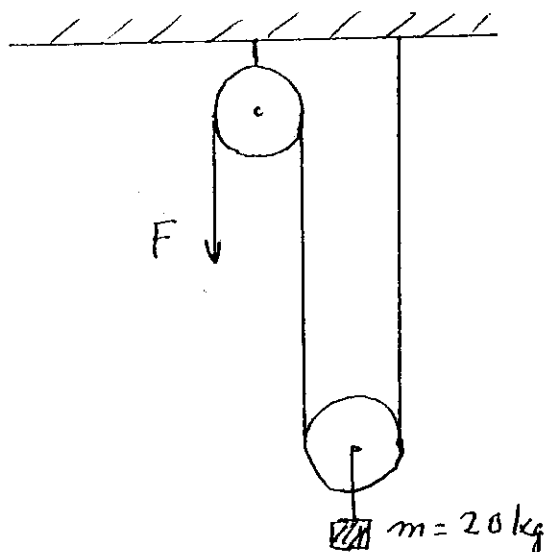
c) Draw a diagram.

III. Two pendulums, each of length $L = 1.0\text{m}$, are situated as shown in the figure. The first pendulum is released from a height $h = 10\text{cm}$ and strikes the second. If the collision is completely inelastic, how high does the center of mass rise after the collision?

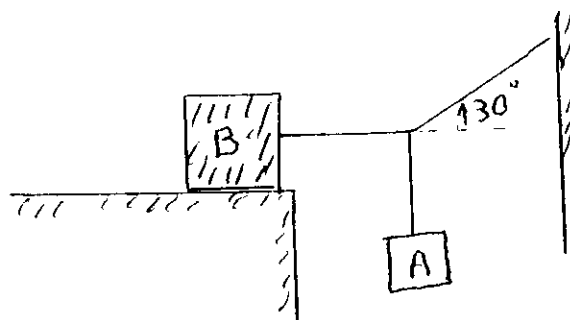


I. In the figure below, a cord runs around two massless, frictionless pulleys; a block of mass $m = 20 \text{ kg}$ hangs from one pulley; and you exert a force \vec{F} on the free end of the cord.

- What must be the magnitude of \vec{F} if you are to lift the block at a constant speed?
- To lift the block by 2.0 cm , how far must you pull the free end of the cord?
- During that lift, what is the work done on the block by your force (via the cord)?
- What is the work done by the weight mg of the block?



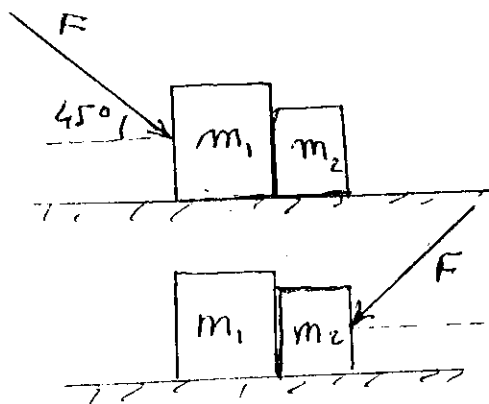
II. Block B in the figure weighs 711 N . The coefficient of static friction between block and horizontal surface is $\mu_s = 0.25$. Find the maximum weight of block A for which the system remains at rest?



- I. Two blocks are in contact on a frictionless table. A force \vec{F} directed downward at 45° with the horizontal is applied to the block (m_1) as shown in the figure.

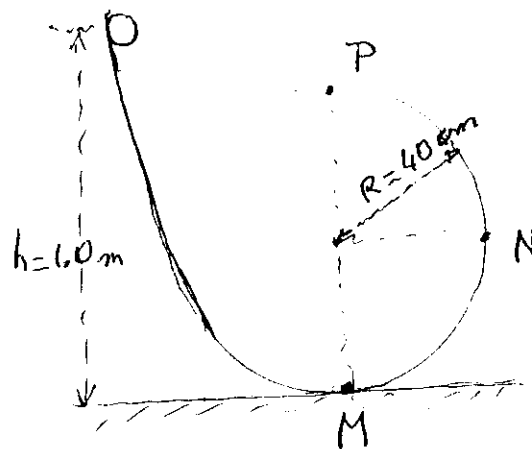
If $m_1 = 2.3 \text{ kg}$, $m_2 = 1.2 \text{ kg}$ and $F = 5.0 \text{ N}$, Find:

- The acceleration of the 2 blocks
- The force \vec{F}_{12} acting by m_1 on m_2 .
- If \vec{F} is applied symmetrically to m_2 , what is the force applied by m_2 on m_1 , \vec{F}_{21} ?

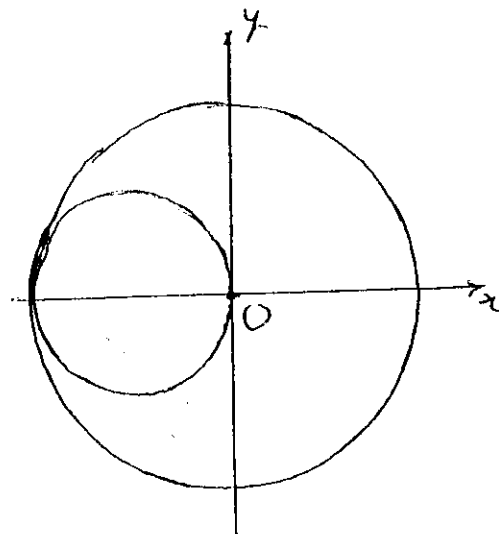


- II. A small solid sphere of mass $m = 1.0 \text{ kg}$ and radius $r = 10 \text{ cm}$ rolls without slipping along the track shown in the adjacent figure.

- Determine the angular speed of the sphere when it reaches the bottom of the track?
- Calculate the force with which the sphere acts on the track at point N.
- Calculate the total kinetic energy of the sphere at point P.



- I. You are given a circular metal plate of radius $2R$ from which a disk of radius R has been removed. Find the position of the center of mass of this object, if the center of mass of the $2R$ radius metal plate has coordinates of $(0,0)$.



- II. A constant torque of $20 \text{ N}\cdot\text{m}$ is exerted on a pivoted wheel for 10 s , during which the angular velocity of the wheel increases from zero to 100 rev/min . The external torque is then removed and the wheel is brought to rest by friction torque in its bearings in 100 s . Compute.
- the moment of inertia of the wheel
 - the friction torque
 - the total number of revolutions made by the wheel during its decelerated motion.
- III. A solid cylinder of mass 15 kg , 30 cm in diameter, is pivoted about a horizontal axis through its center and a rope wrapped around the surface of the cylinder carries at its end a block of mass 0.5 kg .
- How far does the block descend in 5 s , starting from rest?
 - What is the tension in the rope?