



Physics Department

Physics 103
Final Exam

June 21, 1997

Time: 1 1/2 hours

Name: _____

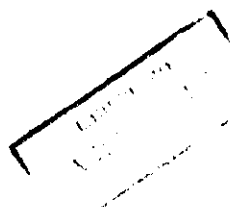
I.D. No. _____

- No make up of this exam without legal reason
- All questions are obligatory

Problem _____ Grade

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Total: _____



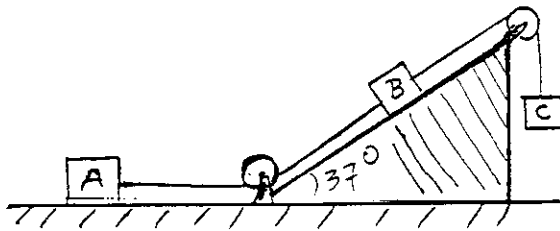
1. A golfer attempts to drive a ball directly over a 15 m high tree that is 100 m from the tee. The ball leaves the tee with a velocity of 40 m/s with an elevation angle of 35° to the horizontal.

(a) Does the ball clear the tree?
If so, by what amount?

(b) Is the ball rising or falling?

2. Two blocks A and B are connected by massless ropes to a block C as shown in the figure. The coefficient of kinetic friction is $\mu_k = 0.50$ everywhere. Assume that block C descends with constant velocity.

(a) What is the tension in the rope connecting the blocks A and B?
(b) What is the weight of block C?



$$W_A = W_B = 20\text{ N}$$

$$\mu_k = 0.50$$

3. A ball is thrown downward with a velocity of 12.0 m/s from a height of 36.0 m aboveground.

(a) How far aboveground is the ball after 1.25 s?

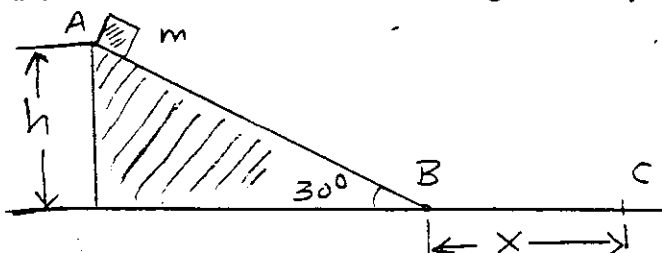
(b) What is the velocity at that time?

(c) With what velocity will it strike the ground?

4. A block with a mass $m = 3\text{ kg}$ starts from rest at a height $h = 0.60\text{ m}$ on an incline of an angle 30° . Upon reaching the bottom of the incline (at position B), the block slides along a horizontal surface BC. The coefficient of kinetic friction is $\mu_k = 0.20$ everywhere.

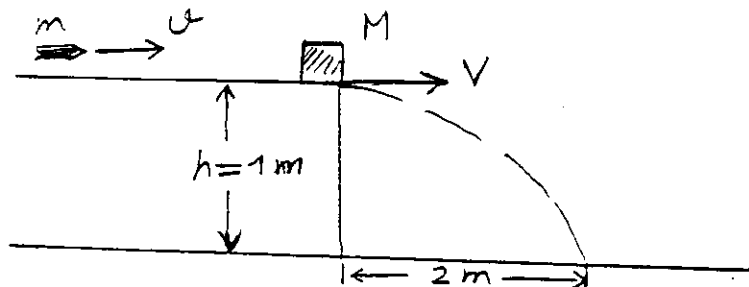
(a) What is the velocity of the block at position B?

(b) How far does the block slide before coming to rest?



5. An 8 g bullet is fired into a 2.5 kg block initially at rest at the edge of a frictionless table of height $h = 1$ m (see figure). The bullet remains in the block, and after collision, the block lands 2m from the bottom of the table.

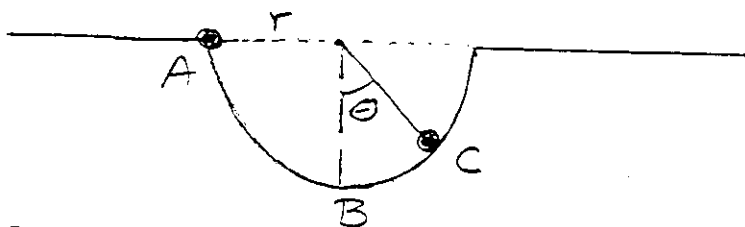
What is the initial speed of the bullet?



6. A particle of mass $m = 1$ kg is initially at position A (as shown in the figure below) slides on a frictionless circular track ABC of radius $r = 0.50$ m. When the ball is at position C, the angle to the vertical is $\theta = 60^\circ$.

(a) What is the angular velocity ω (in rad/s) of the ball at position C?

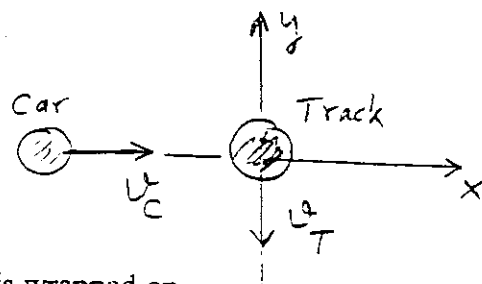
(b) What is the reaction force R exerted by the surface on the ball?



7. A 1000 Kg car moving eastward on the main street at 30 Km/h collides with a 8000 Kg truck crossing the main street in south direction at 20 Km/h (see Figure). The two vehicles stick together.

(a) How fast will they start to move?

(b) In what direction do the move?



8. A block of mass $m = 3.0$ kg is attached to a massless string that is wrapped on a drum of radius $r = 0.40$ m (see figure below). The drum rotates on a fixed horizontal axis on frictionless bearing. The block starts from rest at a height 3.0 m above the ground and strikes the ground with a speed of 4.0 m/s.

What is the moment of inertia I of the drum?

