

ACP Physics Exam
Practice Exam

This exam consists of 10 multiple choice questions worth 5pts each
and 2 problems worth 25pts each.
Show your work on these sheets.

You may use a calculator and a one-page summary with formulas.

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Part I (50 pts). This part consists of 10 multiple choice questions. Each question has 5 answers to choose from. Only one is correct! Clearly mark (circle) the right answer.

Question 1.

A 100m long train traveling at 30m/s is passing a 200m long train traveling on a parallel track at 10m/s in the same direction. A passenger in the first train is seeing the 200m train for a period of

- A 5s
- B 10s
- C 20s
- D 30s
- E 40s

Question 2.

A stone thrown upward is hitting the ground with the speed of 20m/s. The maximal height reached by the stone was (ignore air resistance)

- A 10m
- B 15m
- C 20m
- D 30m
- E 35m

Question 3.

A 2kg mass is moving in 1-dimension under an influence of a constant force. The velocity of this body as a function of time changes according to $v(t)=3-4t$ with v measured in m/s and t in seconds. The magnitude of the force acting on this object is

- A 0N
- B 2N
- C 4N
- D 8N
- E 10N

Question 4.

A small chain of length l hangs from a table. It starts falling when the part that sticks out from the table has length l_1 ($l_1 < l$). The coefficient of static friction between the table and the chain is given by

- A $(l-l_1)/l_1$
- B l_1/l
- C $l_1/(l-l_1)$
- D $l_1/(l+l_1)$
- E $(l+l_1)/l_1$



Question 5

A car is riding on a horizontal curved road with a radius of curvature of 250m. If the coefficient of static friction is 0.4 the speed at which the car will start sliding off the road is

- A 10m/s
- B 20m/s
- C 30m/s
- D 40m/s
- E 50m/s

Question 6

Ignoring air resistance, in a free fall the total mechanical energy (kinetic plus potential)

- A increases with time
- B stays constant
- C decreases with time
- D is always zero
- E depends on the altitude

Question 7

A cube and a ball made of wood of the same density and having identical masses are lifted from a floor to a ceiling. The work done is

- A positive and identical for the ball and the cube
- B greater for the ball
- C greater for the cube
- D zero for both of them
- E negative and identical for both of them

Question 8

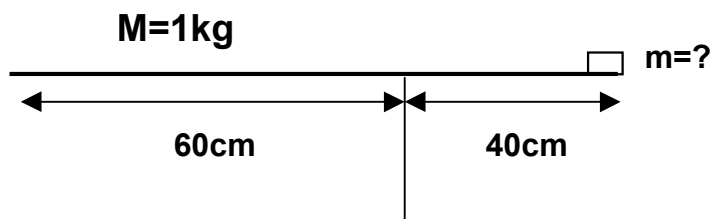
A 70kg student is climbing a 1000m high mountain during a 5h hike trip. The average power of the student during the hike is

- A 120W
- B 100W
- C 80W
- D 60W
- E 40W

Question 9

A 1m long bar of 1kg mass is placed on a table such that a 40cm long part is sticking out of the table. What is the mass of a small putty which is to be placed at the end of rod that will make the bar fall

- A 0.25kg
- B 0.33kg
- C 0.50kg
- D 1.00kg
- E 4.00kg



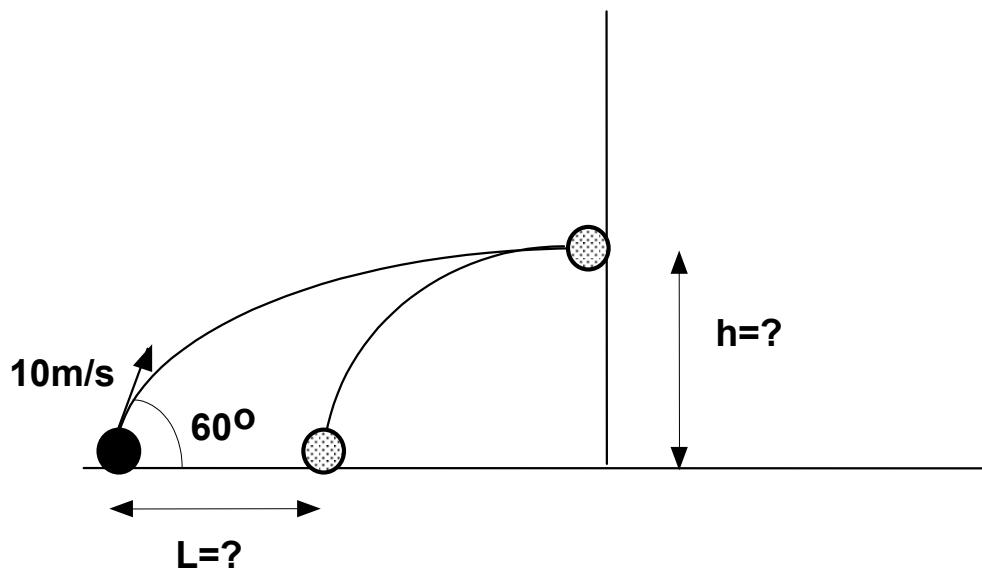
Question 10

The wheels of a bicycle have radius $R=0.25\text{m}$ and are rolling without slipping on a horizontal surface with angular velocity of 2 rad/s . After 5s the bicycle will travel the distance

- A 0m
 - B 2.5m
 - C 5m
 - D 7.5m
 - E 10m
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Problem 1 (25pt)

A ball is projected with an initial velocity of 10m/s at 60° angle with respect to the horizontal as shown in the figure. As the ball reaches the highest point on its trajectory it hits the wall and bounces inelastically. Assume that upon impact the magnitude of the horizontal component of velocity is reduced by 50% and right after impact the vertical component is zero.

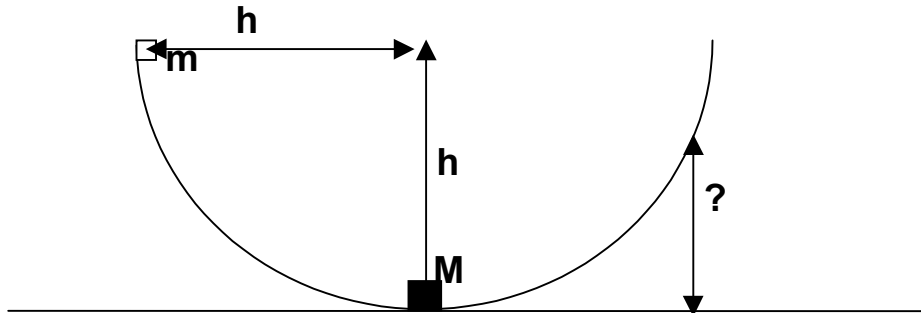


- At what height, $h=?$, is the ball hitting the wall ?
- What is the magnitude of the horizontal component of the velocity of the ball right before hitting the wall ?
- What is the magnitude of the velocity of the ball right after hitting the wall ?
- As the ball hits the ground how far will it be from the point it was originally projected from (L) ?
- What is the ratio of the final, total mechanical energy of the ball (as it hits the ground) to the initial energy with which it was projected .

Worksheet for Problem 1

Problem 2 (25pt)

A small object of mass $m=1\text{kg}$ is sliding down a circular-shaped frictionless track starting at rest from a height $h=2\text{m}$. At the bottom of the track it strikes elastically an object of mass $M=2\text{kg}$ which is initially at rest.



- A What is the speed of the sliding object at the bottom of the track, before collision with M ?
- B What is the magnitude of the acceleration of this object at the bottom of the track before collision with M ?
- C What is the speed of the object of mass M right after it is being hit ?
- D What is the maximum height that the heavier object will reach ?
- E How far, as measured along the track with this object travel ?

Worksheet for Problem 2