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Faculté des sciences
Physique

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Physics

PHY 1121

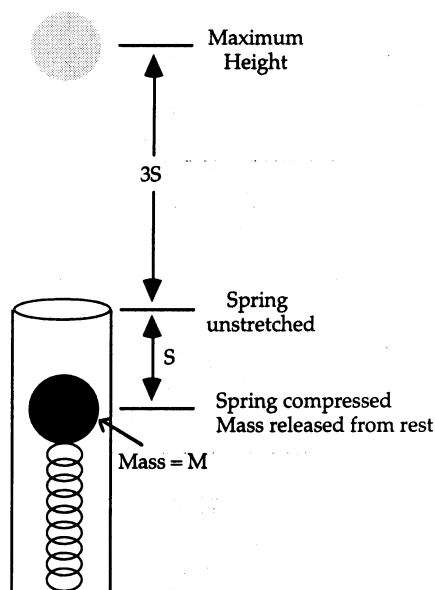
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Mid-Term Examination One

Dr. Zbigniew M. Stadnik
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1. A ball is dropped from the top of a high tower at time $t = 0$. A second ball is dropped from the same point at time t_0 . Neglect air resistance. The time at which the balls are separated by a distance h is
- A) $\frac{h}{gt_0} - \frac{t_0}{2}$.
 - B) $\frac{h}{gt_0} + \frac{t_0}{2}$.
 - C) $\frac{2h}{gt_0} - \frac{t_0}{2}$.
 - D) $\frac{2h}{gt_0} + \frac{t_0}{2}$.
 - E) None of the above is correct.
2. A particle, which was initially at rest, begins to move under the action of constant force. If the distance travelled in the first 10 seconds is s_1 , and in the next 10 seconds is s_2 , then
- A) $s_2 = s_1$.
 - B) $s_2 = 2s_1$.
 - C) $s_2 = 3s_1$.
 - D) $s_2 = 4s_1$.
 - E) $s_2 = 5s_1$.

3. A river is flowing from north to south at a speed of 6 m/min. A man, who can swim at a speed of 12 m/min in still water, wants to go directly across the river to the east. The direction in which he should swim is
- A) 30° north of east.
 - B) 60° north of east.
 - C) 30° south of east.
 - D) 60° west of south.
 - E) None of the above is correct.
4. The displacement of a particle in rectilinear motion varies with time as $x = 4t^3 - 3t^2 + 2t + 11$, where x is in cm and t is in s. The acceleration of the particle at $t = 7.0$ s is
- A) 176 cm/s².
 - B) 162 cm/s².
 - C) 111 cm/s².
 - D) 101 cm/s².
 - E) 95 cm/s².
5. A plane is flying horizontally at 162 km/h at an altitude of 1500 m. If it has to bomb a target on the ground, the horizontal distance from the target at which the bomb should be dropped is
- A) 540 m.
 - B) 787 m.
 - C) 963 m.
 - D) 322 m.
 - E) 217 m.
6. Two steel spheres are shot at each other and then collide head-on. Sphere A has a mass of 10 kg and the velocity just before the collision of 3 m/s to the right. Sphere B has mass of 4 kg and the velocity just before the collision of 4 m/s to the left. Immediately after the collision the velocity of sphere B is observed to be 6 m/s to the right. The magnitude and direction of the velocity of sphere A immediately after the collision are
- A) 1 m/s, to the left.
 - B) 1 m/s, to the right.
 - C) 2 m/s, to the left.
 - D) 2 m/s, to the right.
 - E) None of the above is correct.

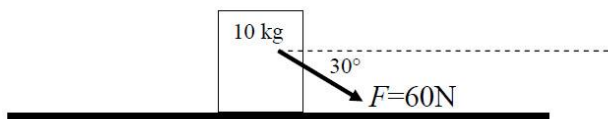
7.



A spring-loaded toy gun is used to shoot a ball of mass M straight up in the air. The ball is not attached to the spring. The ball is pushed down onto the spring so that the spring is compressed the distance S below its unstretched point. After release, the ball reached the maximum height $3S$, measured from the spring's unstretched position. The spring constant of the spring is

- A) $16Mg/S$.
- B) $12Mg/S$.
- C) $10Mg/S$.
- D) $8Mg/S$.
- E) None of the above is correct.

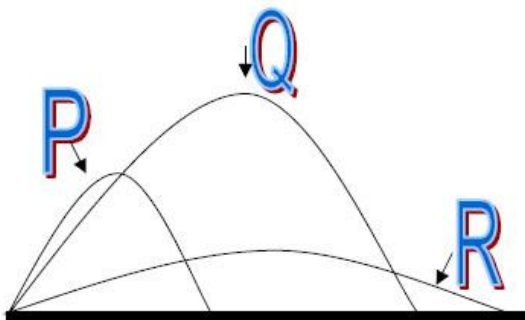
8.



A block of mass 10 kg is initially at rest on the horizontal surface where friction is present. The coefficients of friction are $\mu_k = 0.25$ and $\mu_s = 0.50$. At $t = 0$ a steady external force of magnitude 60 N directed at an angle of $\theta = 30^\circ$ below the horizontal begins to act on the block. How much does the block move between 0 and 2.0 s ?

- A) 0.0 m
- B) 4.0 m
- C) 12 m
- D) 13 m
- E) 17 m

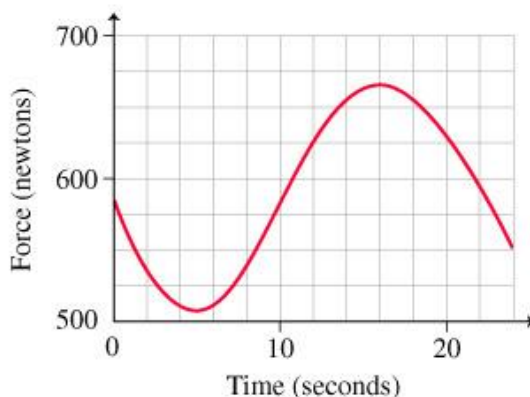
9.



The figure above shows the trajectories of three cannon balls fired simultaneously. In which order do they strike the ground? Neglect air resistance.

- A) P Q R
- B) R Q P
- C) R P Q
- D) Q P R
- E) Cannot be determined without more information.

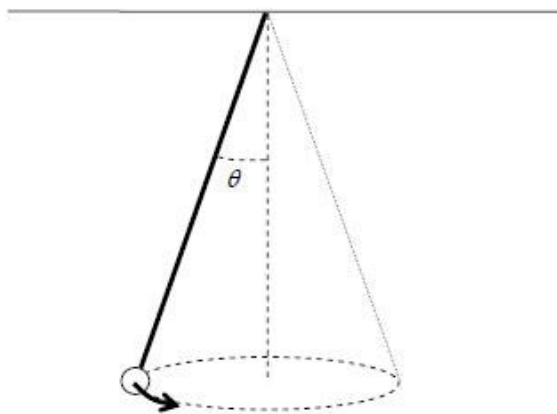
10.



A woman rides on a Ferris wheel of radius 18 m that maintains the same speed throughout its motion. To better understand physics, she takes along a digital bathroom scale (with memory) and sits on it. When she gets off the ride, she uploads the scale readings to a computer and creates a graph of scale reading versus time (see above). Note that the graph has a minimum value of 510 N and a maximum value of 666 N. The acceleration due to gravity, $g = 9.80 \text{ m/s}^2$. What is the woman's mass?

- A) 75 kg
- B) 71 kg
- C) 66 kg
- D) 60 kg
- E) 57 kg

11.



A conical pendulum made of a bead of mass 2.0 kg and a 50 cm long massless rope completes 1.2 turns every second. Determine the angle θ between the string and the vertical.

- A) 30°
 - B) 40°
 - C) 50°
 - D) 60°
 - E) 70°
12. A lump of putty and a rubber ball have equal mass. Both are thrown with equal speed against a wall. The putty sticks to the wall. The ball bounces back at nearly the same speed with which it hit the wall. Which object experiences the greater momentum change?
- A) The putty experiences the greater momentum change.
 - B) Not enough information is given to determine the answer.
 - C) The ball experiences the greater momentum change.
 - D) They both experience the same momentum change.

13. A rocket is fired in deep space, where gravity is negligible. In the first second it ejects $\frac{1}{150}$ of its mass as exhaust gas and has an acceleration of 14.1 m/s^2 . What is the speed of the exhaust gas relative to the rocket?
- A) 2.26 km/s
 - B) 2.35 km/s
 - C) 2.43 km/s
 - D) 2.12 km/s
 - E) 2.02 km/s
14. The magnitude of the drag force of air resistance on a certain 20.0-kg object is proportional to its speed. If the object has a terminal speed 80.0 m/s, what is the magnitude of the drag force on the object when it is falling with a speed 30.0 m/s?
- A) 196 N
 - B) 7.50 N
 - C) 15.0 N
 - D) 42.7 N
 - E) 73.5 N