Test 1: Newton's Laws

PHY101
Arizona State University

09/10/2016 **Name:** _____

by writing my name I swear by the honor code

Read all of the following information before starting the exam:

- **Calculators are allowed.**
- **Don't panic.**

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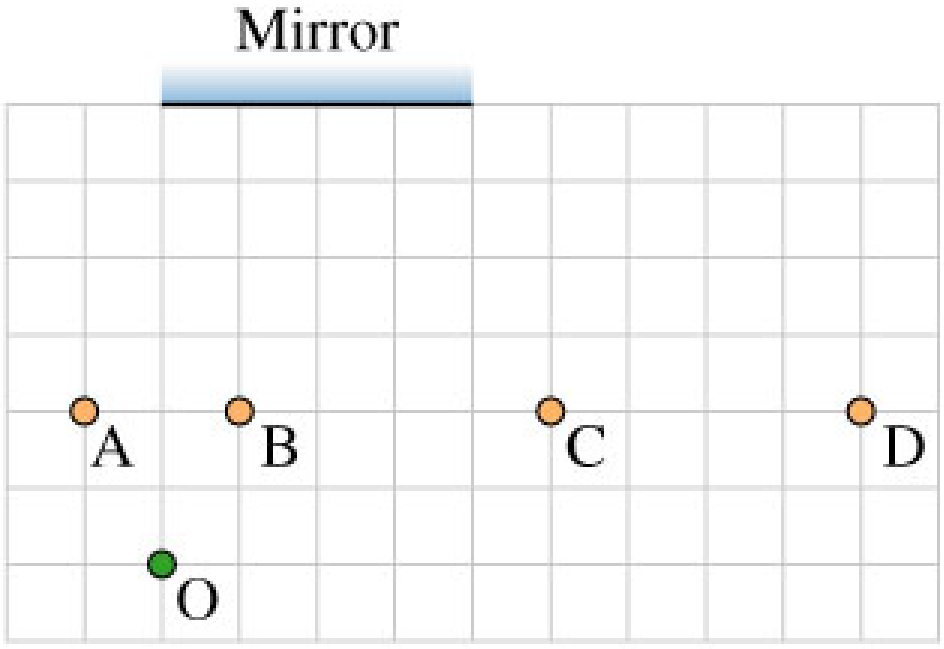
1. (*1 point*) **What does the fox say?**
A. There is no induced current? B. There is. C. For whom the bell tolls.



2. (*1 point*) **Two metal balls are the same size but one weighs twice as much as the others. The balls are dropped from the roof of a single-story building at the same instant of time. the time it takes the balls to reach the ground below will be:**
A. about half as long for the heavier ball as for the lighter one. B. about half as long for the lighter ball as for the heavier one. C. about the same for both balls. D. considerably less for the heavier ball, but not necessarily half as long. E. considerably less for the lighter ball, but not necessarily half as long.

3. (*1 point*) **A stone dropped from the roof of a single story building to the surface of the earth:**
A. reaches a maximum speed quite soon after release and then falls at a constant speed thereafter. B. speeds up as it falls because the gravitational attraction gets considerable stronger as the stone gets closer to the earth. C. speeds up because of an almost constant force of gravity acting upon it. D. falls because of the natural tendency of all objects to rest on the surface of the earth. E. falls because of the combined effects of the force of gravity pushing it downward and the force of the air pushing it downward.

4. (*1 point*) **A large truck collides head-on with a small compact car. During the collision:**
A. the truck exerts a greater amount of force on the car than the car exerts on the truck.
B. the car exerts a greater amount of force on the truck than the truck exerts on the car.

C. neither exerts a force on the other, the gets smashed simply because it gets in the way of the truck. D. the truck exerts a force on the car but the car does not exert a force on the truck. E. the truck exerts the same amount of force on the car as the car exerts on the truck.

5. (*1 point*) **A boy throws a steel ball straight up. Consider the motion of the ball only after it has left the boy's hand but before it touches the ground, and assume that forces exerted by the air are negligible. For these conditions, the force(s) acting on the ball is (are):**
A. a downward force of gravity along with a steadily decreasing upward force. B. a steadily decreasing upward force from the moment it leaves the boy's hand until it reaches its highest point; on the way down there is a steadily increasing downward force of gravity as the object gets closer to earth. C. an almost constant downbward force of gravity along with an upward force that steadily decreases until the ball reaches its highest point; on the way down there is only a constant downward force of gravity. D. an almost constant force of gravity only. E. none of the above. The ball falls back to the ground because of its nautral tendency to rest on the surface of the earth.

6. (*1 point*) **A large truck breaks down on the road and receives a push back into town by a small compact car.**
While the car, still pushing the truck, is speeding up to get up to the cruising speed:
A. the amount of force with which the car pushes on the truck is equal to that with which the truck pushes back on the car. B. the amount of force with which the car pushes on the truck is smaller than that with which the truck pushes back on the car. C. the amount of force with which the car pushes on the truck is greater than that with which the truck pushes back on the car. D. the car's engine is running so the car pushes against the truck, but the truck's engine is not running so the truck cannot push back against the car. The truck is pushed forward simply because it is in the way of the car. E. neither the car nor the truck exert any force on the other. The truck is pushed forward simply because it is in the way of the car.

7. (*1 point*)
A. B. C. D. E.

8. (*4 points*) **A laser beam in air is incident on a liquid at an angle of** 36.0° **with respect to the normal. The laser beam's angle in the liquid is** 22.0°**.**

a. (*2 pts*) **Sketch the incident and refracted rays. Indicate and label the angles given above on your diagram.**

b. (*2 pts*) **Find the liquid's index of refraction.**

9. (*4 points*) **An underwater diver sees the sun** 60° **above horizontal.**

a. (*2 pts*) **Sketch the situation, including incident and refracted rays. Indicate and label the angle of incidence and the angle of refraction.**

b. (*2 pts*) **How high is the sun above the horizon to a fisherman in a boat above the diver? (The index of refraction for water is approximately** 1.33**.)**