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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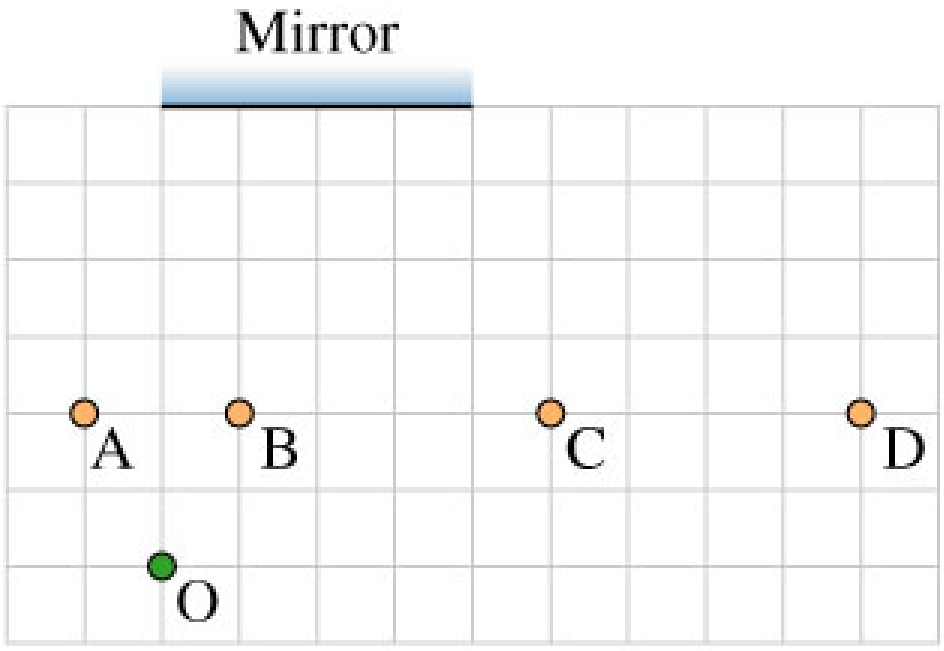
1. (*1 point*) **What does the fox say?**

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 other. 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*) **Consider the situation in the previous problem. After the car reaches the constant cruising speed at which its driver wishes to push the truck:**

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.

8. (*1 point*) **An elevator is being lifted up an elevator shaft at a constant speed by a steel cable. All frictional forces are negligible. In this situation, forces on the elevator are such that:**

A. the upward force by the cable is greater than the downward force of gravity.

B. the upward force by the cable is equal to the downward force of gravity.

C. the upward force by the cable is smaller than the downward force of gravity.

D. the upward force by the cable is greater than the sum of the downward force of gravity and a downward force due to the air.

E. none of the above. (The elevator goes because the cable is being shortened, not because an upward force is exerted on the elevator by the cable).

9. (*1 point*) **A woman exerts a constant horizontal force on a large box. As a result, the box moves across a horizontal force at a constant speed "v_0".**
The constant horizontal force applied by the woman:

A. has the same magnitude as the weight of the box.

B. is greater than the weight of the box.

C. has the same magnitude as the total force which resists the motion of the box.

D. is greater than the total force which resists the motion of the box.

E. is greater than either the weight of the box or the total force which resists its motion.

10. (*1 point*) **If the woman in the previous question doubles the constant horizontal force that she exerts on the box to push it on the same horizontal, the box then moves**

A. with a constant speed that is double the speed "v_0" in the previous question.

B. with a constant speed that is greater than the speed "v_0" in the previous question but not necessarily twice as great.

C. for a while with a speed that is constant and greater than the speed "v_0" in the previous question, then with a speed that increases thereafter.

D. for a while with an increasing speed, then with a constant speed thereafter.

E. with a continuously increasing speed.

11. (*1 point*) **If the woman in the questions above suddenly stops applying a horizontal force to the block, then the block will:**

A. immediately come to a stop.

B. continue moving at a constant speed for a while and then slow to a stop.

C. immediately start slowing to a stop.

D. continue at a constant speed.

E. increasing its speed for a while and then start slowing to a stop.

12. (*1 point*) **The first scientist to introduce the concept of inertia was:**

A. Galileo.

B. Copernicus.

C. Newton.

D. Aristotle.

E. Einstein.

13. (*1 point*) **When no forces act on moving objects their paths are normally:**

A. circles.

B. straight lines.

C. ellipses.

D. all of the above.

14. (*1 point*) **When you quickly jerk a cart forward that has a ball resting in the middle, the**

A. back of the cart hits the ball.

B. front of the cart hits the ball.

C. neither, for the ball rides along in the middle as the cart moves forward.

15. (*1 point*) **Force is a vector quantity because it has both:**

A. speed and direction.

B. mass and velocity.

C. action and reaction counterparts.

D. magnitude and direction.

16. (*1 point*) **A pair of** $10\,\mathrm{N}$ **vectors at right angles has a resultant of about:**

A. $20\,\mathrm{N}$**.**

B. $10\,\mathrm{N}$**.**

C. $14\,\mathrm{N}$**.**

D. None of the above.

17. (*1 point*) **The net force on any object in equilibrium is:**

A. equal to its weight.

B. zero.

C. less than its weight.

D. non-zero when motion is involved.

18. (*1 point*) **A hockey puck sliding at constant velocity across the ice is:**

A. nearly in equilibrium.

B. in equilibrium.

C. is nowhere near being in equilibrium.

D. none of the above.

19. (*1 point*)

A.

B.

C.

D.

E.