

Physics

Newton's 2nd Law, Form: A

Name: _____

Date: _____

Period: _____

Primary Peer Reviewer: _____

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Section 1. Multiple Choice

- Two forces act on a 5 kg object. One force is 50N to the west. The other force is 25 N to the east. What is the acceleration of the object?
 - 5 m/s² East
 - 5 m/s² West
 - 15 m/s² East
 - 5 m/s² East
 - 0 5 m/s²
- A force of 47 N is needed to overcome a frictional force of 6 N to accelerate a 6 kg mass across a floor. What is the acceleration of the mass?
 - 4 m/s²
 - 5 m/s²
 - 7 m/s²
 - 41 m/s²
 - 53 m/s²
- A man pushes a frictionless shopping cart of mass m with a force \vec{F} , causing it to accelerate at \vec{a} . Suppose the man were to add groceries to the cart such that the new mass of the cart is $3m$. What force would he need to use in order to have the cart accelerate at the same rate, a ?
 - $\frac{F}{9}$
 - $\frac{F}{3}$
 - $3F$
 - $9F$
 - it is impossible to tell
- Two cars are racing a distance of 1 mile. One car has a full gas tank and one car has a $\frac{1}{8}$ full tank, but the cars are otherwise identical. Assuming the drivers of the cars are equally skilled, which car has the better chance of winning the race, and why?
 - The car with the full gas tank, because a full gas tank has more stored energy than a nearly empty one.
 - The car with the full gas tank, because the car has more inertia.
 - The car with the $\frac{1}{8}$ full tank, because less mass will accelerate more if the same force is applied.
 - The car with the $\frac{1}{8}$ full tank, because when the car accelerates forward, the gas pushes backward on the fuel tank, causing the car to be slower.
 - Both cars will cross the finish line at the same time.

Section 2. Multiple Correct Choice

For each of the following questions choose TWO answers. No credit will be given for incorrect or partially correct answers.

5. A space ship is in deep space, far away from any planets or stars. It is moving forward at a constant speed of 1000 m/s. Which of the following statements are true? (CHOOSE TWO)
- (a) There are no forces acting on the space ship.
 - (b) The engine must be running, providing a forward force.
 - (c) The spaceship will slowly slow down, eventually coming to a stop.
 - (d) In order to slow down, the space ship will have to run its engine in reverse.
 - (e) The space ship cannot speed up or slow down until it comes close to an object.

Section 3. Free Response

6. In the movie *Sharknado* a shark is able to change direction while airborne by “swimming” through the air. Explain why this cannot happen in real life. Be sure to include references to applicable laws of physics.
7. A tennis ball is at rest when it is hit by a tennis racket. Its final velocity is 35 m/s, and the force applied to the tennis ball is 10.238 N for 0.2 seconds. What is the mass of the tennis ball?

Answer Key for Exam A

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1. Two forces act on a 5 kg object. One force is 50N to the west. The other force is 25 N to the east. What is the acceleration of the object?
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