

Force - Physical Science

CFA Assessment

Name, Date, Period

Target	Question	Score																
I can graph force and mass using experimental or actual data.	1. Using the data in the table below, create a motion graph for <u>mass and force</u> where force is on the y-axis and mass is on the x-axis. Don't forget to label your X and Y axis! <table><tr><td></td><td>Acceleration</td><td>Mass</td><td>Force</td></tr><tr><td>Car 1</td><td>3 m/s²</td><td>2 kg</td><td>6 N</td></tr><tr><td>Car 2</td><td>2 m/s²</td><td>1 kg</td><td>2 N</td></tr><tr><td>Car 3</td><td>4 m/s²</td><td>3 kg</td><td>12 N</td></tr></table> 2. Explain what is happening in the graph above by circling the correct terms in the parentheses. (4pt) a. As the _____ (force / mass) _____ (increases / decreases / stays the same), then the _____ (force / mass) _____ (increases / decreases / stays the same).		Acceleration	Mass	Force	Car 1	3 m/s ²	2 kg	6 N	Car 2	2 m/s ²	1 kg	2 N	Car 3	4 m/s ²	3 kg	12 N	9pts
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I can calculate Newton's 2nd Law (or F=ma) in order to explain the relationship between mass and acceleration of a force.	1. If a car is accelerating at 50 m/s² and its mass is 4 kg, how much force is needed to move the car? Show your work, and include units of measurement! (3pts) 2. When a box is being pushed with 60N to the right and it has a mass of 30 kg, how fast is it accelerating? Show your work, and include units of measurement! (3pts) 3. If the force on an object is decreased and the mass remains the same, how is the acceleration affected? (1pt) a. The acceleration remains the same b. The acceleration increases c. The acceleration decreases 4. What is the relationship between mass and acceleration? (1pt) a. Proportional (Direct. When one increases, the other also increases.) b. Inverse Proportional (Reverse. When one increases, the other decreases.)	8pts																
I can explain how forces act on an object by	1. Is an object accelerating (moving) if a 5 N force is being applied to the right, and 5 N of friction is being applied to the left? Explain. (2pts)	4pts																

pushing or pulling.	- If two people are applying force on an object in the same direction, would it require more force or less force (per person) than one person applying a force? (1pt) - More force - Less force - If there are two people pulling in opposite directions will it require more or less force (per person) to move the object? (1pt) - More force - Less force	
I can compare and contrast inelastic and elastic collisions.	<i>A collision is between two objects that have made an impact. There are two types of collisions: elastic and inelastic.</i> - When the total energy is conserved (saved) after a collision, then this is known as an ____ (1pt) - Elastic Collision - Inelastic Collision - What type of collision is shown in the model below? (1pt) The diagram illustrates an inelastic collision. In the 'Before' state, a red ball is moving to the right (indicated by a blue arrow) and a green ball is at rest. In the 'After' state, the two balls are stuck together and moving to the right (indicated by a red arrow). The text '© Byjus.com' is visible in the background. - Elastic Collision - Inelastic Collision - During a car crash between a bus and an SUV, what type of collision is seen when the two vehicles become stuck and move forward together? (1pt) - Elastic Collision - Inelastic Collision	3pts
I can model the direction of applied forces and energy acting on an object.	Draw a model of the forces acting on the box being pushed below. Make sure to label the forces using normal force, gravitational force, applied force, and friction. Include arrows to indicate direction! (5pts) A stick figure is shown pushing a large rectangular box to the right. The figure is leaning forward, applying a force to the box.	5pts
I can calculate the force applied during a collision.	- The classes are playing tug of war pulling a rope from either side. Mrs. Major's class pulls with a force of 60N east and Mrs. Loy's class pulls from the west with a force of 45N in the opposite direction. What is the net force? - What type of force is described in the problem above? - Balanced - Unbalanced	3pts

I can explain how to reduce the impact of a force.	1. If you are in a car accident, what are two things you can do to prevent injury/movement? (2pts) 2. When you are riding in a bus, how can the seat in front of you reduce the impact of a force if the bus is in an accident? (2pts)	4pts
I can predict how the total object is affected by a force.	1. If a soccer ball is kicked, how does the force of the kick affect the object? (2pt) a. Its mass is decreased b. Its mass is increased c. Its acceleration is decreased d. Its acceleration is increased 2. If a cyclist is riding their bike down the road and a dog runs in front of them, they pedal backwards to brake. How does this action affect the bike? (2pt) a. It creates friction and slows the bike b. It makes the bike go faster around the dog c. It reduces the mass of the bike.	4pts
I can design and refine a device to prove Newton's Second Law of motion.	1. What is Newton's 2nd law of motion? (1pt) a. $F = m - A$ b. $F = m \times A$ c. $F = m + A$ 2. What type of device can measure the force an object exerts? (2 pt) 3. A group of students designed a protective case to prevent an egg from breaking when dropped from a height. They used bubble wrap, cotton balls, craft sticks, rubber bands, and a plastic cup to cushion the impact. Their design involved placing the egg inside the plastic cup, surrounding it with cotton balls for padding, securing the lid with rubber bands, and reinforcing the exterior with craft sticks and bubble wrap for extra protection. After testing their design, they found that the egg survived some drops but cracked when dropped from a greater height. a. Based on the materials provided, analyze the students' design. Do you agree with their design choices? Why or why not? How would you modify or improve the case to better protect the egg?	8pts

I can collect data experimentally and communicate findings within an experiment.	1. What type of data would you need to collect during experimentation to calculate the force exerted on an object? (1pt) a. Mass, time, acceleration b. Mass, time, gravity c. Mass, time, distance d. Gravity, mass, time 2. Mrs. Majors class collected data about different materials through testing how they protect the egg during materials testing. They collected data about mass, time, and distance to calculate acceleration and force. She instructed them to create a graph of the data using the mass and force. a. Create a How does ____ affect ____ statement using the information. 3. Calculate the acceleration of a device if the egg device fell 6m in 10s. $a=2d/t^2$	6pts
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- Standard:
- PSI-PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. [AR Clarification Statement: This PE is partially addressed in this course. Emphasis on qualitative analysis of data. Examples of data could include tables or graphs of position or velocity as rolling down a ramp, or a moving object being pulled by a constant force.] [AR Assessment Boundary: Assessment is limited to qualitative analysis of one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]
 - Student Friendly Terms: The students will graph force and mass using data that was collected or calculated using $F=ma$. The students will be able to explain how forces act on an object by pushing or pulling.
 - Guiding Question: How does pushing or pulling an object affect the force? How does mass and acceleration affect the force of an object?
 - PSI-PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during collision. [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device in protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]
 - Student Friendly Terms: The student will design and test a prototype to reduce the force of a collision.
 - Guiding Question: How can you design a prototype to protect an object within a package?.