

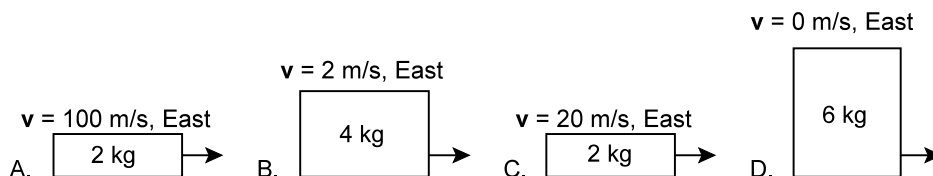
7 The Laws of Motion

In the blank to the left of each question, write the letter or letters indicating *EACH* choice that forms a correct statement. (One to four answers could be correct.)

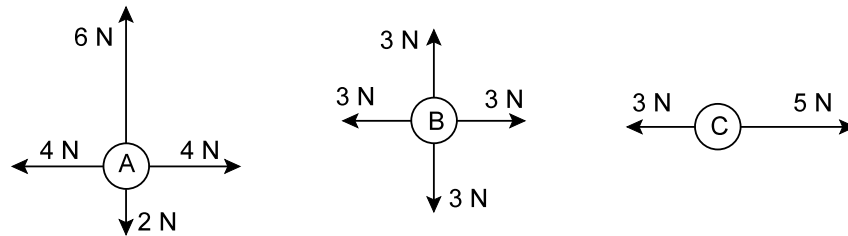
- _____ 1. The acceleration of a body is...
- A. directly proportional to the resultant applied force.
 - B. inversely proportional to the mass of the body.
 - C. in the same direction as the resultant applied force.
 - D. dependent on its initial velocity.
- _____ 2. As a body is moving in a straight line and a constant force is being applied in the direction of its motion...
- A. the velocity will change continually.
 - B. the acceleration will change continually.
 - C. the body could stop for a moment.
 - D. the body could move in the opposite direction.
- _____ 3. The newton...
- A. is a unit of mass.
 - B. is the force required to accelerate 1 kg of mass at the rate of 1 m/s^2 .
 - C. is $1 \text{ kg}\cdot\text{m/s}^2$.
 - D. is the same thing as 0.102 kg or 0.007 slugs.
- _____ 4. Newton's third law of motion deals with...
- A. one object and two forces.
 - B. two objects and one force.
 - C. two objects and two forces.
 - D. action and reaction.
- _____ 5. When an automobile is accelerated forward...
- A. the tires exert a forward action force on the road.
 - B. the road exerts a forward reaction force on the tires.
 - C. the tires exert a rearward action force on the road.
 - D. the road exerts a rearward reaction force on the tires.
- _____ 6. A rock is released from rest in a deep pool of water which provides a resistive force acting on the rock which increases as the velocity increases. This will cause the rock to...
- A. accelerate at less than 9.8 m/s^2 .
 - B. float downward at a constant velocity immediately after being submerged.
 - C. accelerate less and less until the resistive force of the water balances the rock's weight, at which time the rock will maintain a constant velocity.
 - D. accelerate less and less until the resistive force of the water balances the rock's weight, at which time the rock will stop.

In the blank to the left of each question, write the letter corresponding to the **SINGLE** correct answer.

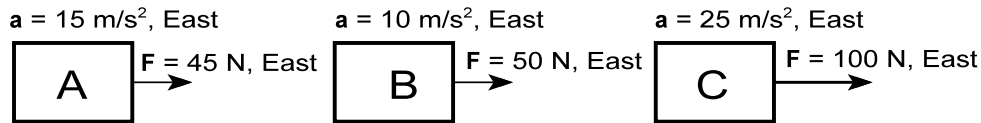
- _____ 7. Which of these objects has the greatest inertia?



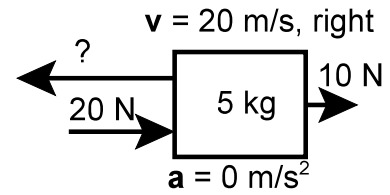
8. Which object could be moving at a constant velocity if the only forces acting (at this time) are those shown in the diagram?



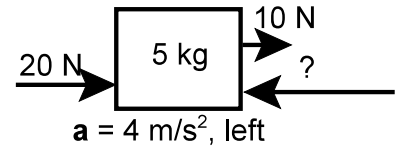
9. Which object is the most massive?



10. What is the magnitude of the missing force in the figure at right?
A. 10 N B. 20 N C. 30 N D. 40 N

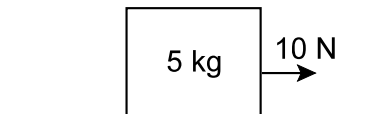


11. What is the magnitude of the missing force in the figure at right?
A. 10 N B. 30 N C. 50 N D. 70 N



12. What is the magnitude of the normal force on the 5 kg mass in the figure below?
(Read section 4.4 if you don't remember what a normal force is.)
A. 5 N B. 10 N C. 50 N D. 100 N

$$a_{\text{vertical}} = 0$$



13. A drag racer starts from rest and a constant force F is applied until the car reaches the finish line with a speed v_f . How will v_f change if the force on the car is doubled?
A. v_f B. $2v_f$ C. $\frac{v_f}{2}$ D. $v_f\sqrt{2}$ E. $v_f\sqrt{\frac{1}{2}}$

14. Identify the action-reaction pairs in the following situations:

Situation	Action	Reaction
Example: A softball player catches a ball.	The ball pushes the player's hand/mitt backward.	The player's hand/mitt pushes the ball forward.
A girl takes a forward step.		
A gust of wind strikes a window.		
A cat is in free-fall (ignore air resistance).		

Each statement below has at least one conceptual flaw. In two or three sentences, thoroughly *explain* why the statement is false. Include in your answer a correct interpretation of the stated concepts.

15. The apparent snapping back of one's head when the body is hit from behind is a consequence of Newton's third law of motion.

16. A ton (2,000 lbs) of feathers on the earth has the same inertia as a ton of feathers on the moon.

17. A car moving at constant speed along a highway still burns fuel because its inertia tends to make it slow down over time.

18. According to Newton's third law of motion, if a small steel ball collides with and bounces off a larger steel ball, each ball will accelerate at the same rate, but in opposite directions after impact.

19. When a gun exerts a constant force for a greater period of time, a bullet will achieve a greater acceleration, thus it will have a greater velocity when it leaves the gun, and it will travel a greater distance.
20. A rocket rises because the exhaust pushes against the atmosphere, and the atmosphere pushes back on the rocket by the third law of motion.
21. A tennis ball and a solid steel ball which are the same size are dropped from the same height at the same time. Since they strike the ground simultaneously, both balls must have the same gravitational force acting on them.
22. A spring scale reads 5.00 kg for an object on the earth. When the scale and the object are taken to the moon, the scale will still register 5.00 kg because the mass did not change.