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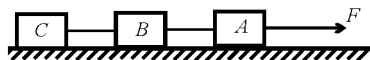


In the frictionless system shown above, all blocks have the same mass, and the entire system is accelerated by an applied force of magnitude F .

What is the tension in the cord between blocks B and C ?

- 1) $\frac{1}{3}F$
- 2) $\frac{2}{3}F$
- 3) F
- 4) $\frac{4}{3}F$
- 5) $2F$

Base your answers to questions 2 and 3 on the picture below, which represents a frictionless system accelerated by a force of magnitude F . The tension in the string connecting blocks A and B is $\frac{1}{3}F$.



2. If blocks B and C each have a mass m , what is the mass of block A ?

- 1) $\frac{m}{3}$
- 2) $\frac{m}{2}$
- 3) m
- 4) $2m$
- 5) $3m$

3. What is the tension in the string connecting blocks B and C ?

- 1) $\frac{1}{3}F$
- 2) $\frac{2}{3}F$
- 3) $\frac{1}{2}F$
- 4) F
- 5) $2F$

Base your answers to questions 4 and 5 on the following situation.

A ball of mass m is dropped down through the air in a gravitational field. The magnitude of the force of air resistance is bv^2 where b is a positive constant.

4. The magnitude of the acceleration of the ball at any time is

- 1) $g - b$
- 2) $g - bv^2/m$
- 3) $g + bv^2/m$
- 4) g/b
- 5) $bv^2 + g$

5. What is the terminal speed of the ball?

$$\frac{mg}{\sqrt{b}}$$

1)

$$\sqrt{g/b}$$

4)

$$\sqrt{mg/b}$$

2)

$$\sqrt{mg/b}$$

5)

$$\sqrt{mgb}$$

3)

6. A force F gives an object with a mass m an acceleration a . If this force F is applied to an object of mass $\frac{1}{2}m$, what would the acceleration be?

- 1) $\frac{1}{2}a$
- 2) $\frac{1}{4}a$
- 3) $2a$
- 4) $4a$
- 5) $8a$

7. An elevator is moving upwards at a constant velocity of 5 m/s. What is the net acceleration the elevator experiences?

- 1) 0 m/s^2
- 2) $\frac{1}{2}g$
- 3) $\frac{1}{4}g$
- 4) g
- 5) $2g$

8. A 15 N force is applied to a 12 kg box for 6 s. The box is initially at rest. What is the speed of the box at the end of the 6 s interval?

- 1) 1.8 m/s
- 2) 3 m/s
- 3) 7.5 m/s
- 4) 15 m/s
- 5) 30 m/s

9. A dog that weighs 500 N at rest on the Earth's surface is standing on a scale on the floor of an elevator. The elevator is accelerating upward in the Earth's gravitational field at a rate of 9.8 m/s^2 . What does the scale read?

- 1) 0 N
- 2) 250 N
- 3) 500 N
- 4) 1000 N
- 5) 2000 N

10. A student that has a mass of 100 kg is standing on a scale in an elevator car. The elevator is accelerating downward at 5 m/s^2 in the Earth's gravitational field. The reading on the scale in the elevator is most nearly

- 1) 150 N
- 2) 500 N
- 3) 1000 N
- 4) 1500 N
- 5) 50 N

11. A cat that weighs 50 N when at rest on Earth stands on a scale in an elevator moving upward at a constant velocity of 10 m/s. What does the scale read?

- 1) 0 N
- 2) 50 N
- 3) 100 N
- 4) 200 N
- 5) 1000 N

12. An object with mass m is at rest on a frictionless horizontal surface on Earth. If a horizontal force F is applied to this object, its resulting acceleration is a . An identical object of mass m is at rest on a frictionless horizontal surface on Planet Y, which has a gravitational acceleration of $0.1g$. If this mass is pushed on the same surface with the same horizontal force F , what will be its resulting acceleration?
- 1) $0.1a$
 - 2) $0.2a$
 - 3) $0.5a$
 - 4) a
 - 5) $10a$
13. Block A of mass m is at rest on a horizontal, frictionless surface. Block B of mass m is moving on a frictionless horizontal surface at constant velocity v . When a force F is applied to both blocks in the direction of B's motion, the resulting acceleration of Block B relative to Block A is
- 1) less, and in a different direction
 - 2) less, and in the same direction
 - 3) greater, and in a different direction
 - 4) greater, and in the same direction
 - 5) the same
14. How much force is required to vertically lift an object of mass m with acceleration g ?
- 1) mg
 - 2) $2mg$
 - 3) mg^2
 - 4) $2mg^2$
 - 5) m/g
15. A bullet is fired horizontally at a velocity of 200 m/s at a height of 1 m. At the same time, another bullet is dropped 1 m from rest. The difference between t_1 , the time it takes the fired bullet to hit the ground, and t_2 , the time it takes the dropped bullet to hit the ground is
- 1) 0 s
 - 2) 1 s
 - 3) 2 s
 - 4) 4 s
 - 5) 8 s
16. A box of mass m slides along a horizontal floor with constant velocity v . The coefficient of kinetic friction between the box and the floor is μ . What is the net force on the box?
- 1) μmgv
 - 2) mgv
 - 3) μmv^2
 - 4) 0 N
 - 5) $\mu mg/v$
17. A wagon of mass m is pulled by a string parallel to its direction of motion. If there is a frictional force F acting on the wagon and the tension in the string is T , what is the acceleration of the wagon?
- 1) $(T - F)/m$
 - 2) $(F - T)/m$
 - 3) T/m
 - 4) $(F + T)/m$
 - 5) $(F + T)m$

Answer Key
First Law General Questions [Mar 28, 2011]

1. 1
 2. 4
 3. 1
 4. 2
 5. 2
 6. 4
 7. 1
 8. 3
 9. 4
 10. 2
 11. 2
 12. 4
 13. 5
 14. 2
 15. 1
 16. 4
 17. 1
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Name _____

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