

1.

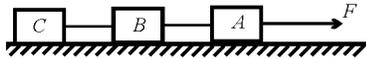


In the frictionless system shown above, all blocks have the same mass, and the entire system is accelerated by an applied force of magnitude  $F$ .

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  $\frac{1}{j}F$ .



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?

- |               |               |
|---------------|---------------|
| $mg/\sqrt{b}$ | $\sqrt{g/b}$  |
| 1)            | 4)            |
| $\sqrt{mg/b}$ | $\sqrt{mg/b}$ |
| 2)            | 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)  $0 \text{ m/s}^2$
- 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  $9.8 \text{ m/s}^2$ . 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  $5 \text{ m/s}^2$  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  $\mu$ . What is the net force on the box?
- 1)  $\mu mgv$
  - 2)  $mgv$
  - 3)  $\mu mv^2$
  - 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 \_\_\_\_\_

Class \_\_\_\_\_

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