

Worksheet: Newton's Third Law of Motion



Q1: Which of the following statements most correctly describes Newton's third law of motion?



Question Video

- A When a force is applied to an object, the object exerts an equal-sized force in the opposite direction to the applied force.
- B When a force is applied to an object, the object exerts a force in the opposite direction to the applied force that is proportional to the mass of the object that applies the force.
- C When a force is applied to an object, the object exerts an equal-sized force in the direction of the applied force.
- D When a force is applied to an object, the object exerts a force in the opposite direction to the applied force that is proportional to the mass of the object that the force is applied to.

Q2: A stone of mass 686 g is thrown vertically upward from Earth with a force of 45 N.

► What magnitude force does the gravitational field of Earth exert on the stone?

- A 9.8 N
- B 65 N
- C 0.07 N
- D 6.72 N
- E 686 N

► What magnitude force does the gravitational field of the stone exert on Earth?

A 9.8 N

B 65 N

C 0.07 N

D 6.72 N

E 686 N

► Which of the following statements most correctly describes the motion of Earth due to the gravitational field of the stone?

A The magnitude of the acceleration of Earth due to the stone's gravitational field is equal to the mass of the stone divided by Earth's mass.

B The magnitude of the acceleration of Earth due to the stone's gravitational field is equal to the acceleration of the stone but in the opposite direction.

C Earth is not accelerated at all by the gravitational field of the stone.

D The magnitude of the acceleration of Earth due to the stone's gravitational field is equal to the force applied by the gravitational field of the stone divided by Earth's mass.

► What magnitude force does the stone exert on the person who throws it?

A 6.72 N

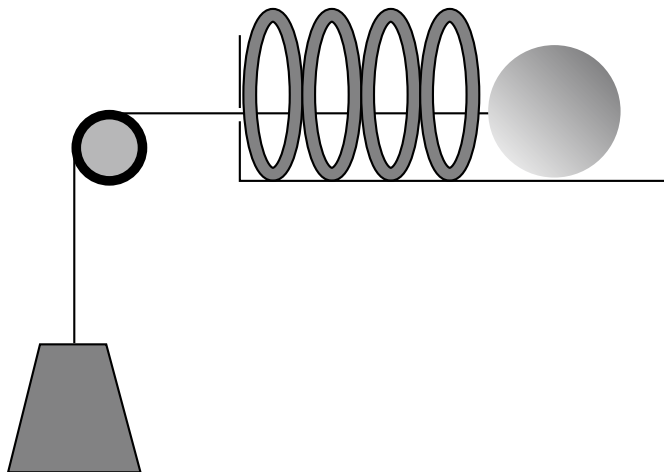
B 9.8 N

C 686 N

D 45 N

E 0.07 N

Q3: A block has a mass of 500 g. The block is part of a system of objects. One end of the block is attached to a string and the other end of the string is attached to a ball by passing over a pulley, as shown in the diagram. The ball is inside a box that also contains a spring. A hole in a wall of the box allows the string to enter the box, pass through the gap in the center of the spring, and connect to the ball. All the objects in the system are at rest.



► How much force does the block apply to the string?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

► How much force does the string apply to the ball?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

► How much force does the ball apply to the spring?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

► How much force does the spring apply to the ball?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

► How much force does the ball apply to the string?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

► How much force does the string apply to the block?

A 4 900 N

B 9.8 N

C 500 N

D 65 N

E 4.9 N

Q4: A rock of mass 5 kg is dropped onto Earth and decelerates from a speed of 1 m/s to rest in a time of 0.1 s.

► What magnitude force does the deceleration of the rock exert on Earth?

A 98 N

B 360 N

C 490 N

D 50 N

E 500 N

► What magnitude force does the collision with Earth exert on the rock?

A 98 N

B 360 N

C 490 N

D 50 N

E 500 N

► Which of the following statements most correctly describes the motion of Earth due to the collision with the rock?

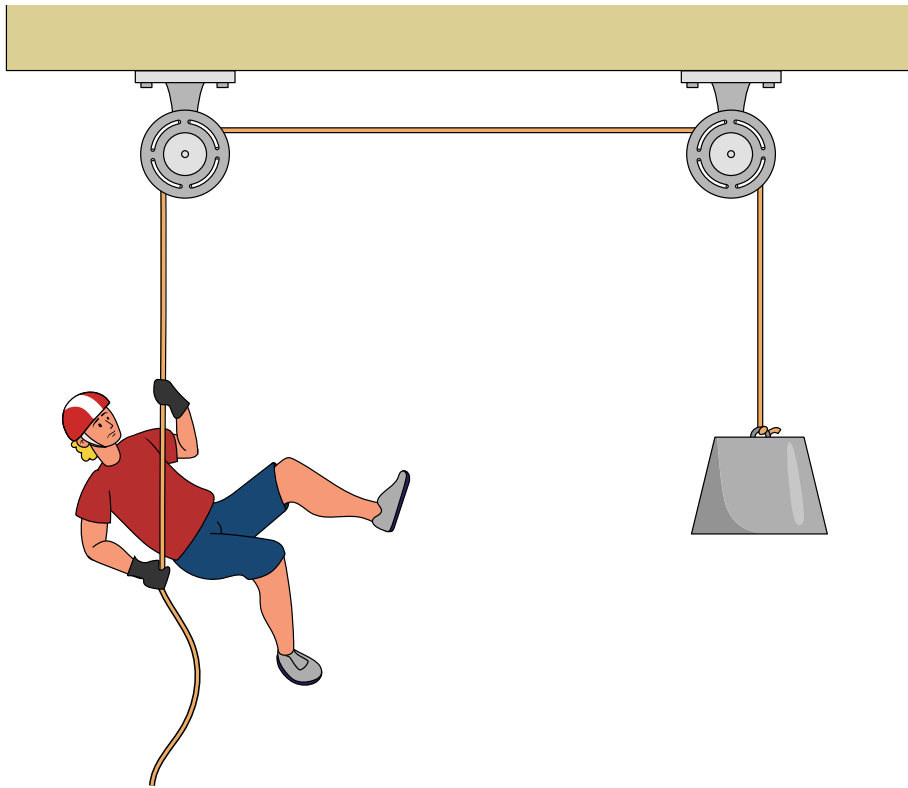
A The magnitude of the acceleration of Earth due to the collision is equal to the mass of the rock divided by Earth's mass.

B Earth is not accelerated at all by the collision with the rock.

C The magnitude of the acceleration of Earth due to the collision is equal to the acceleration of the rock but in the opposite direction.

D The magnitude of the acceleration of Earth due to the collision is equal to the force applied in the collision divided by Earth's mass.

Q5: A man holds onto a rope that is connected to a weight, strung across two pulleys, as shown in the diagram. The mass of the weight and the mass of the man are both 90 kg. When the man does not pull on the rope, neither he nor the weight moves. The man pulls downward on the rope to try and pull himself upward. Which of the following statements best describes the result of the man pulling on the rope?



- A The man moves upward and the weight moves downward.
- B The man moves downward and the weight moves upward.
- C The weight moves upward and the man stays in the same place.
- D The man moves upward and the weight stays in the same place.
- E Neither the man nor the weight moves.

Q6: An object with a weight $W = 20 \text{ N}$ is attached to a string. The other end of the string is attached to a spring, as shown in the diagram. The spring is stretched until it comes to rest.



Question Video



► How much vertically downward force does the string apply to the spring?

- A 10 N
- B 20 N
- C 9.8 N
- D 196 N
- E 65 N

► How much vertically upward force does the spring apply to the string?

- A 10 N
- B 20 N
- C 9.8 N
- D 196 N
- E 65 N

► How much vertically upward force does the string apply to the object?

A 10 N

B 20 N

C 9.8 N

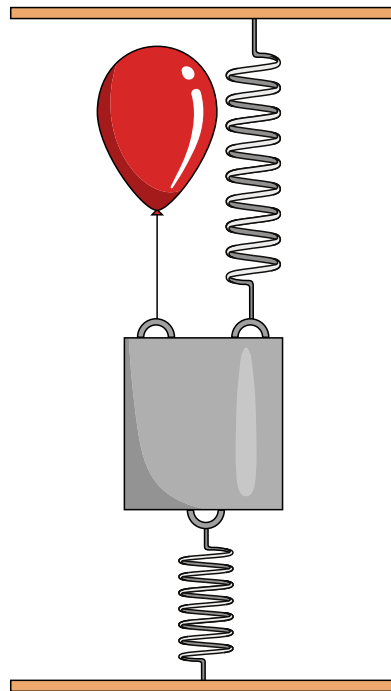
D 196 N

E 65 N

Q7: An object is attached to a spring below it and another spring above it, as shown in the diagram. The other ends of the springs, which are not attached to the object, are attached to fixed surfaces. A helium balloon is also attached to the object. The weight of the object is 900 N and the balloon provides an upward force of 100 N. The object is at rest and applies a downward force of 500 N on the spring that is connected to the lower surface. What force does the spring that is connected to the upper surface apply to the object? Consider downward to be the positive direction.



Question Video



- A -600 N
- B -500 N
- C -900 N
- D -300 N
- E -100 N