Forces and Motion

Choose one answer per question. Circle A, B, C, or D.

1. What force does a horizontal table exert upward on a book resting on it?
   A. Normal force
   B. Kinetic friction
   C. Gravitational force
   D. Tension

2. Which SI unit would a correctly marked spring scale use to report the force needed to stretch it?
   A. Joule
   B. Kilogram
   C. Newton
   D. Watt

3. A wagon travels west in a straight line without speeding up or slowing down. What is its net force?
   A. A nonzero force west
   B. Zero
   C. A nonzero force east
   D. A nonzero force upward

4. Which force can act on a ball while it is in the air just after leaving a player’s hand, even in a vacuum?
   A. The support force from the hand
   B. The hand’s upward push
   C. Friction from the floor
   D. Earth’s gravitational pull

5. The carts in two separate tests receive the same net force. Cart A has twice the mass of cart B. What is A’s acceleration compared with B’s?
   A. Twice as large
   B. Half as large
   C. Four times as large
   D. The same

6. Two horizontal cords pull a cart with forces of 6 newtons east and 8 newtons north. No other horizontal forces act. What is the magnitude of the net horizontal force?

A. 10 newtons
B. 2 newtons
C. 14 newtons
D. 48 newtons

7. A crate hangs motionless from a rope. Which pair belongs on the free-body diagram for the crate alone?

A. The crate’s pull on Earth and Earth’s pull on the crate
B. The crate’s weight and the rope’s weight
C. Rope tension and the pull of the crate on the rope
D. Rope tension and the crate’s weight

8. A heavier skater’s hand and a lighter skater’s hand push against each other. While their hands touch, how do the push forces compare?

A. The lighter skater exerts the larger force
B. The heavier skater exerts the larger force
C. Their magnitudes are equal
D. They match only if the skaters have the same acceleration

9. A rider stands on a scale in an elevator. The elevator moves upward but slows down. How does the scale reading compare with the rider’s weight?

A. It is smaller
B. It is larger
C. It is equal
D. It must be exactly zero

10. A cable pulls a crate with 18 newtons to the right. The crate stays at rest and the cable is the only other horizontal force. What does static friction exert?

A. More than 18 newtons left
B. 18 newtons right
C. Zero newtons
D. 18 newtons left

11. A 60-newton crate is at rest on level ground. A cable pulls straight up on it with 25 newtons, and the crate remains on the ground. What normal force does the ground exert?

A. 85 newtons upward
B. 60 newtons upward
C. 35 newtons upward
D. 25 newtons upward

12. A block presses on a level surface with a normal force of 50 newtons. The coefficient of static friction is 0.40. How large a horizontal pull can static friction balance before the block starts to slide?

A. 0.8 newton
B. 20 newtons
C. 50 newtons
D. 125 newtons

13. On a frictionless floor, a 2-kilogram front cart pulls a 4-kilogram rear cart with a taut, massless cord. An 18-newton horizontal force pulls the front cart. What is the cord’s tension?

A. 3 newtons
B. 6 newtons
C. 18 newtons
D. 12 newtons

14. A floating foam block is pulled completely underwater and held still by a cord attached to the bottom. The block weighs 15 newtons and the cord pulls it down with 9 newtons. What is the buoyant force?

A. 24 newtons upward
B. 15 newtons upward
C. 9 newtons upward
D. 6 newtons upward

15. A box slides down a ramp. The downslope component of weight is 24 newtons and the normal force is 32 newtons. If the coefficient of kinetic friction is 0.25, what is the net force along the ramp?

A. 24 newtons down the ramp
B. 8 newtons up the ramp
C. 16 newtons down the ramp
D. 32 newtons down the ramp