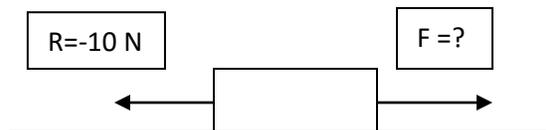


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) A Newton is a measure of an object's _____
 A) Volume.
 B) weight.
 C) mass.
 D) length.
- 2) A boy pushes on a 900 kg car with a constant force of 100 N. What is the wagon's acceleration in meters per second per second? _____
 A) 0.11 B) 10 C) 90,000 D) 9
- 3) An object maintains its state of motion because it has _____
 A) mass.
 B) speed.
 C) acceleration.
 D) weight.
 E) all of these
- 4) A car accelerates from rest at 2 m/s/s. What is the car's speed 3 s after it starts moving? _____
 A) 2 m/s
 B) 3 m/s
 C) 4 m/s
 D) 6 m/s
 E) none of these
- 5) The force of friction on a sliding crate is -10 N. How much force should be applied to it to keep it moving at a constant velocity (see diagram)? _____
 A) 10 N. B) less than 10 N. C) more than 10 N.



- 6) An object is pulled southward with a force of 15 N and northward with a force of 30 N. The net force on the object (assume the positive direction is north): _____
 A) +15 N.
 B) -15 N.
 C) +10 N.
 D) 0 N.
 E) none of the above
- 7) When a falling object has reached its *terminal velocity*, its acceleration is _____
 A) zero. B) constant. C) g.

- 8) What is the **acceleration** of a car that maintains a *constant velocity* of 100 km/h for 10 s? 8) _____
A) 0 m/s² B) 10 km/h/s C) 10 m/s² D) 1000 km/h/s
- 9) A baseball is tossed upwards by a pitcher. During its free-fall flight it: 9) _____
A) Gains 10 m/s each second in the upward direction.
B) Loses 20 m/s in the upward direction
C) Loses 10 m/s each second in the upward direction.
D) depends on the initial speed
- 10) Find the *force* exerted on a 0.4 kg baseball by an all star pitcher who accelerates it at 80 m/s² 10) _____
- 11) A sheet of paper can be withdrawn from under a container of milk without toppling it if the paper is jerked quickly. This best demonstrates that 11) _____
A) the milk carton has no acceleration.
B) there is an action-reaction pair of forces.
C) gravity tends to hold the milk carton secure.
D) the milk carton has inertia.
- 12) A batter hits a baseball. The ball soars into the outfield while the batter feels the bat recoil backwards just a little. The effect of the bat on the ball is different than the effect of the ball on the bat because: 12) _____
A) The bat hits the ball harder than the ball hits the bat
B) The ball hits the bat harder than the bat hits the ball
C) The ball accelerates more than the bat & batter combination because it has more mass than they do.
D) The ball accelerates more than the bat & batter combination because it has less mass than they do
- 13) A car traveling at 100 km/h strikes an unfortunate bug and splatters it. The force of impact is greater on the 13) _____
A) bug. B) car. C) is the same for both
- 14) A 2.5 kg mass at the Earth's surface weighs about 14) _____
A) 2.5 N.
B) 25 N.
C) 2.5 kg.
D) None of these.

15) Find the acceleration of a bike that, from rest speeds up to 10 m/sec in 4 seconds.

- A) 40 m/sec² B) 0.4 m/sec² C) 2.5 m/sec² D) None of these

16) It takes 4 s for a stone to fall to the bottom of a mine shaft. About how deep is the shaft (use $g=10 \text{ m/s}^2$)? 16) _____

- A) more than 200 m B) about 60 m
C) about 80 m D) about 125 m

17) A package falls from a truck which moves along the road at 30 m/s. Neglecting all resisting forces, the package strikes the ground at a speed of:

17) _____

- A) zero.
B) less than 30 m/s but larger than zero.
C) more than 30 m/s.
D) about 30 m/s.
E) more information needed for an estimate

18) T or F. It could be a scientific statement to say that there is an undetectable substance in the universe with electromagnetic properties that allow it to conduct light at 186,000 miles/second.

19) A submarine travels 10 m/sec at a depth of 500 meters under the ocean surface. Its heading is to shore which is 429 kilometers away. How long will it take the submarine to get there?

20) T or F. Speed is measured in m/sec².

Short Essay (choose *one* question to answer in a short paragraph for 10 points):

1) Describe the difference between violent motion and natural motion according to Aristotle.

2) A soccer ball rolls across a field and eventually stops. How would Aristotle interpret this observation? How would Galileo interpret it?

