2-1

What area of physics deals with the subject of heat and temperature?

A. Mechanics
B. Thermodynamics
C. Electrodynamics
D. Quantum mechanics

2-2

What term describes a set of interacting objects considered to be a distinct physical entity for the purpose of the study?

A. System
B. Model
C. Hypothesis
D. Controlled experiment

2-3

If you ran an experiment and the results contradict your initial hypothesis, what should be dismissed?

A. Hypothesis
B. Experiment
C. Both
D. Neither

2-4

How many centimeters are in one kilometer?

A. 10^3
B. 10^6
C. 10^9
D. 10^5
E. 10^8

2-5

How many seconds are in one day?

A. 60
B. 3600
C. 86400
D. 1440

3-1

The expression "order of magnitude" corresponds to

a) one factor of ten.
b) one factor of two.
c) a factor of 2.5
d) two factors of ten.

3-2

You are deciding which computer to buy, based on how long it takes to start running your favorite computer game. Which computer starts your game program the most quickly?

a) Game starts in 1 centisecond.
b) Game starts in 1 kilosecond.
c) Game starts in 1 microsecond.
d) Game starts in 1 millisecond.
e) Game starts in 1 second.

3-3

At the start of the 21st century, the number of human beings alive on Earth was approximately 6,000,000,000 or

a) 6 to the 9th power.
b) 6 to the 9th power of ten.
c) 6 times ten to the 9th power.
d) 6,000 million.
e) both c and d.

3-4

Multiplying together two numbers $N \times 10^x$ and $M \times 10^y$ in scientific notation yields the following, again in scientific notation

a) $(N \times x) \times 10^{M \times y}$

b) $(N + M) \times 10^{(x+y)}$

c) $(N \times M) \times 10^{x \times y}$

d) $(N \times M) \times 10^{x+y}$

3-5

What do you get when you multiply 10^3 by 10^3?

a) 0

b) $1/10^3$

c) 10^9

d) 10^6

e) $2x10^3$

4-1

A tiny bug can produce 3 microwatt of power. How many bugs produce as much power as a small six-megawatt power station?

A. 2 quadrillion
B. 0.5 trillion
C. 2 billion
D. 0.5 billion
E. 2 trillion

4-2

Say you need to multiply together measurements of differing precision, some with more significant figures than others. For example, the product of 7.00 6.1 is properly written as

a) 42.70
b) 42.7
c) 43.
d) 43.0

4-3

Say you want to add measurements of different precision, some with larger uncertainties than others, such as the sum 4.371 (± 0.001) cm + 302.5cm (±0.1). This sum is correctly written as

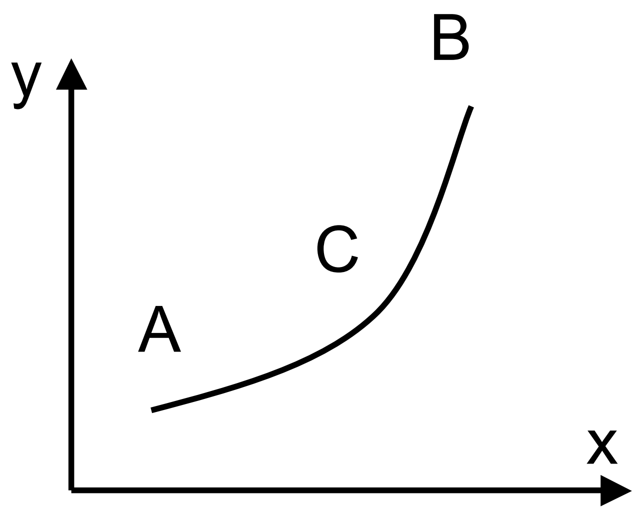
a) 306.001 cm.
b) 306.872 cm.
c) 306.9 cm.
d) 307 cm.

4-4

A PC microprocessor runs at 2.40 GHz. A movie projector displays images at a rate of 24.0 Hz. What is the ratio of the microprocessor's rate in cycles per second to the update rate of a movie projector?

A. 10^3
B. 10^6
C. 10^9
D. 10^{12}
E. 10^{15}

6-1



A slope of a graph ACB is the greatest at

A. Point A
B. Point B
C. Point C
D. The same at all three points
E. Cannot be defined

7-1

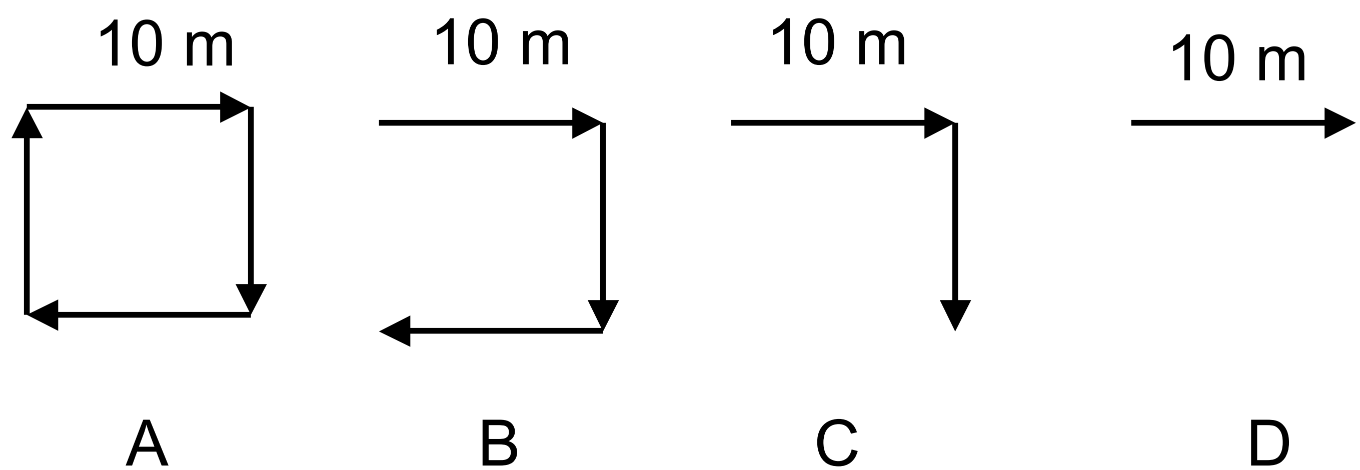
An object goes from one point in space to another. After it arrives at its destination, its displacement is:

A. either greater than or equal to
B. always greater than
C. always equal to
D. either smaller than or equal to
E. always smaller than

than the distance it traveled.

7-2

Which vector diagram represents the greatest magnitude of displacement for an object?

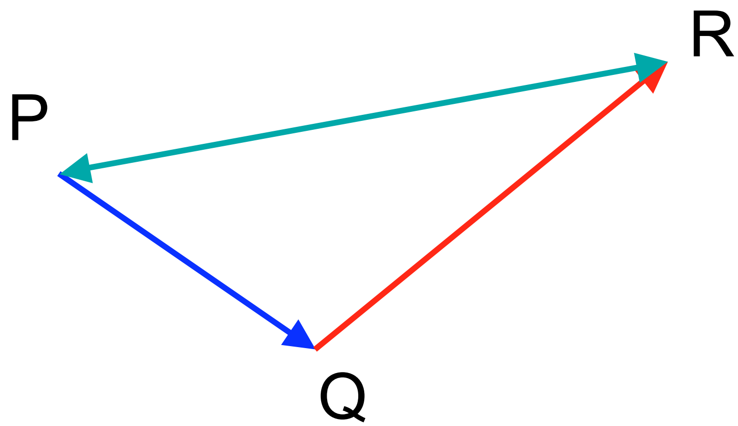


9-1

Two vectors with displacements 10 m north-east and 10 m north-west are added. The direction of the resultant vector is

A. South
B. North-east
C. North-west
D. North

9-2



The difference of vectors (***PQ*** - ***QR***) is

A. Vector ***PR***
B. Vector ***RP***
C. Zero vector
D. Not enough information

12-1

An airplane makes a straight back-and-forth round trip, always at the same airspeed, between two cities. If it encounters a mild steady tailwind going, and the same steady headwind returning, will the round trip take more, less, or the same time as with no wind?

A. More
B. Less
C. The same
D. Depends on the speed of wind

15-1

Can a car with negative velocity move faster than a car with positive velocity?

A. Yes
B. No

15-2

If you know only the initial position, the final position, and the constant acceleration of an object, can you calculate the final velocity?

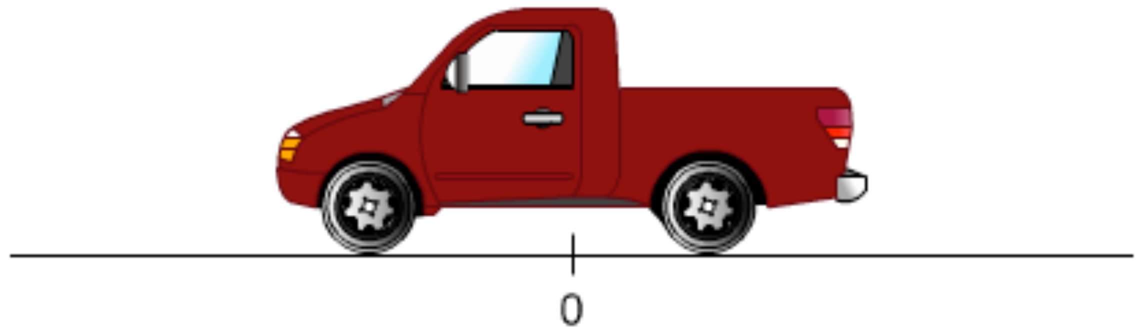
A. Yes
B. No

15-3

Can an object be increasing in speed as the magnitude of its acceleration decreases?

A. Yes
B. No

15-4

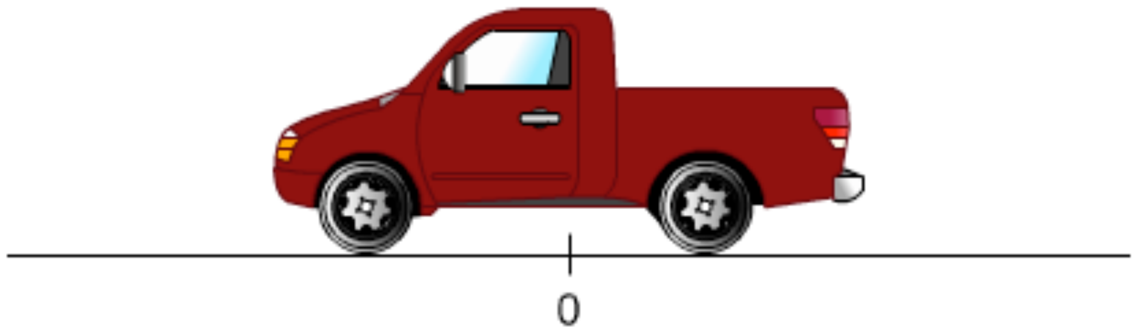


A truck full of corn is parked at x = 0 and is pointed in the negative direction. If the driver puts it into reverse and holds down on the accelerator, will the position be

A. positive
B. negative
C. zero

after one second?

15-5



A truck full of corn is parked at x = 0 and is pointed in the negative direction. If the driver puts it into reverse and holds down on the accelerator, will the velocity be

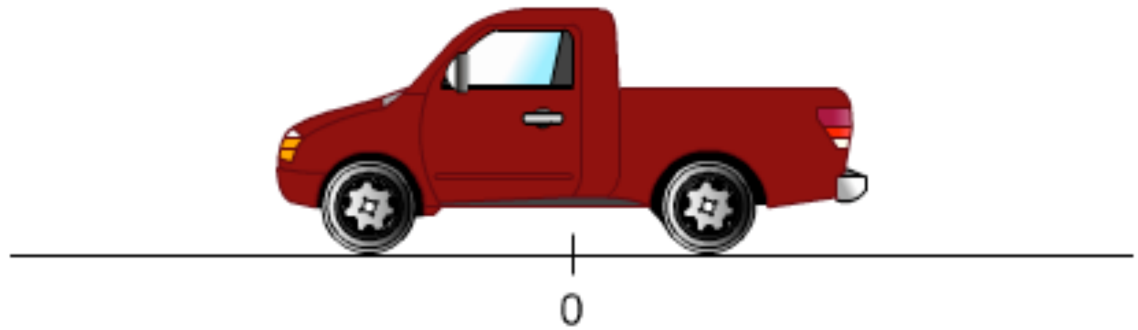
A. positive

B. negative

C. zero

after one second?

15-6



A truck full of corn is parked at x = 0 and is pointed in the negative direction. If the driver puts it into reverse and holds down on the accelerator, will the acceleration be

A. positive

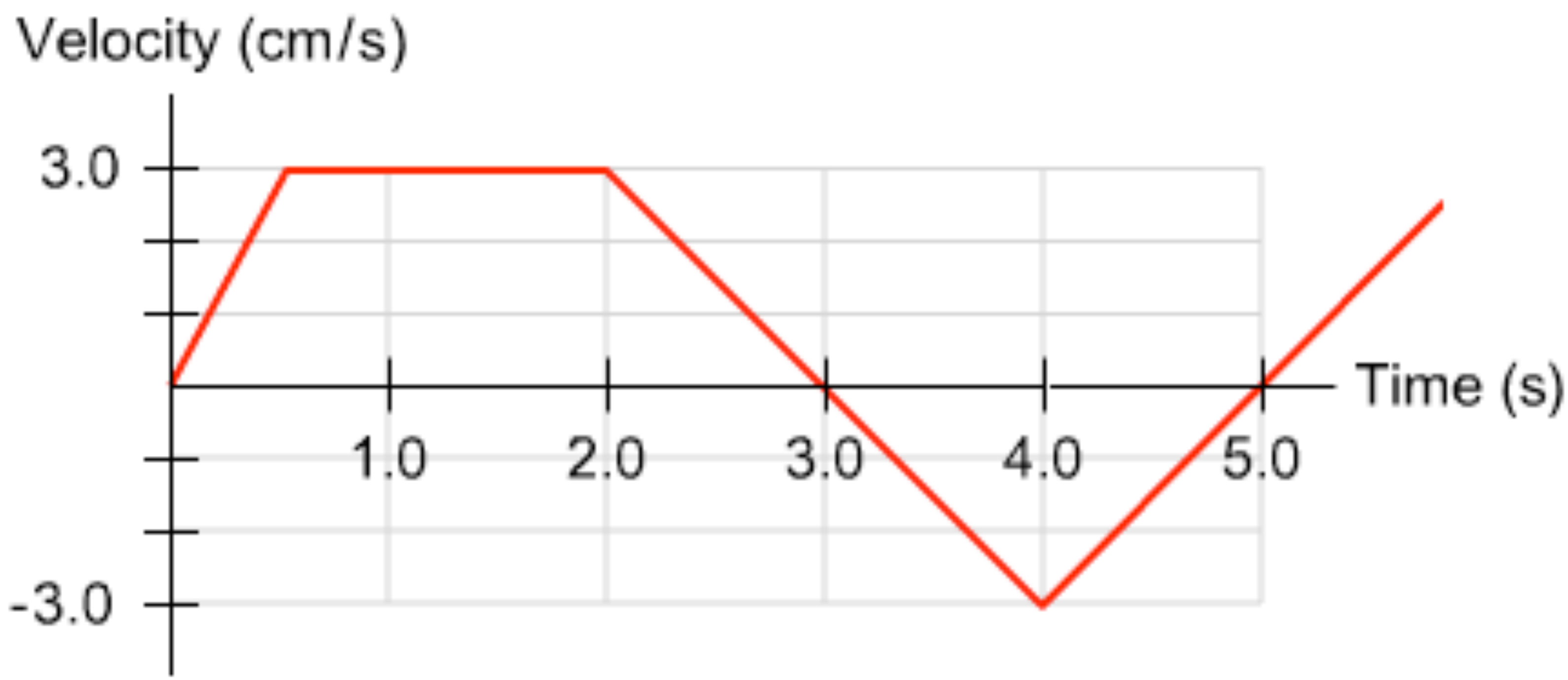
B. negative

C. zero

after one second?

15-7

The velocity versus time graph of an ant is shown. What is the ant's acceleration at (a) t = 1.0 s, (b) t = 3.0 s, and (c) t = 5.0 s?



16-1

If you drop an object in the absence of air resistance,
it accelerates downward at 9.8 m/s^2.
If instead you throw it downward,
its downward acceleration after release is

A. less than 9.8 m/s^2.
B. 9.8 m/s^2.
C. more than 9.8 m/s^2.

18-1

A person standing at the edge of a cliff throws one ball straight up and another ball straight down at the same initial speed. Neglecting air resistance, the ball to hit the ground below the cliff with the greater speed is the one initially thrown

A. upward.
B. downward.
C. neither—they both hit at the same speed.

18-2

You are throwing a ball straight up in the air. At the highest point, the ball's

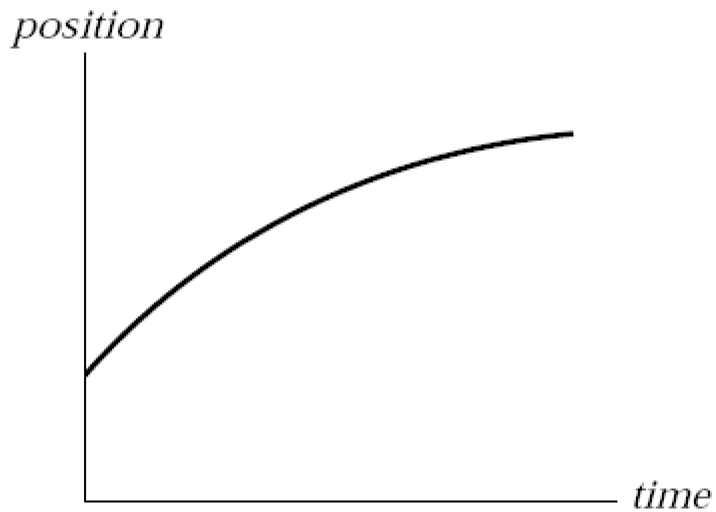
A. velocity and acceleration are zero.
B. velocity is nonzero but its acceleration is zero.
C. acceleration is nonzero, but its velocity is zero.
D. velocity and acceleration are both nonzero.

18-3

A ball is thrown vertically up, its speed slowing under the influence of gravity. Suppose (*a*) we film this motion and play the tape backward (so the tape begins with the ball at its highest point and ends with it reaching the point from which it was released), and (*b*) we observe the motion of the ball from a frame of reference moving up at the initial speed of the ball. The ball has a downward acceleration *g* in

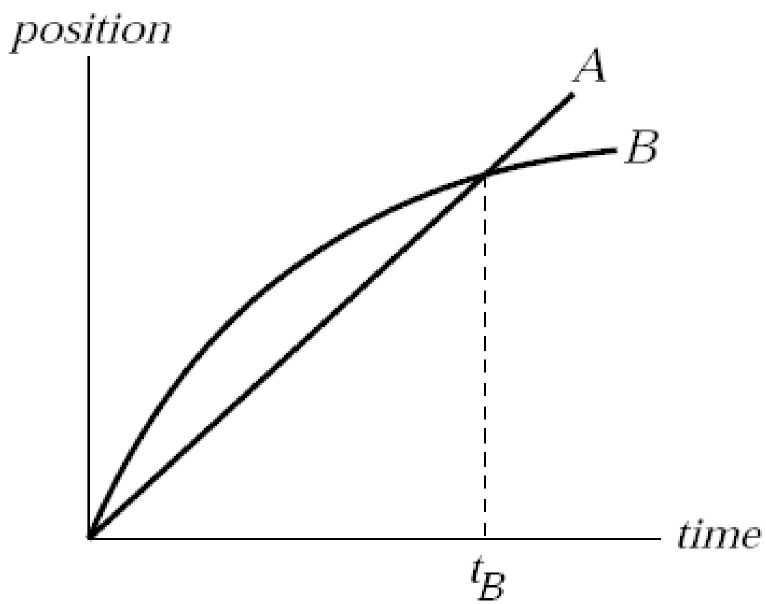
A. *(a)* and *(b).*
B. only *(a).*
C. only *(b).*
D. neither *(a)* nor (*b*).

19-1. A train car moves along a long straight track. The graph shows the position as a function of time for this train. The graph shows that the train:



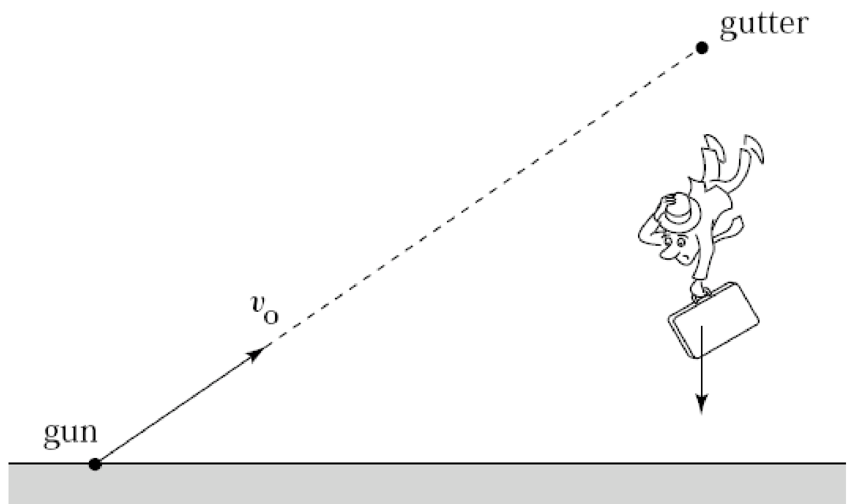
A. speeds up all the time.
B. slows down all the time.
C. speeds up part of the time and slows down part of the time.
D. moves at a constant velocity.

19-2. The graph shows position as a function of time for two trains running on parallel tracks. Which is true?



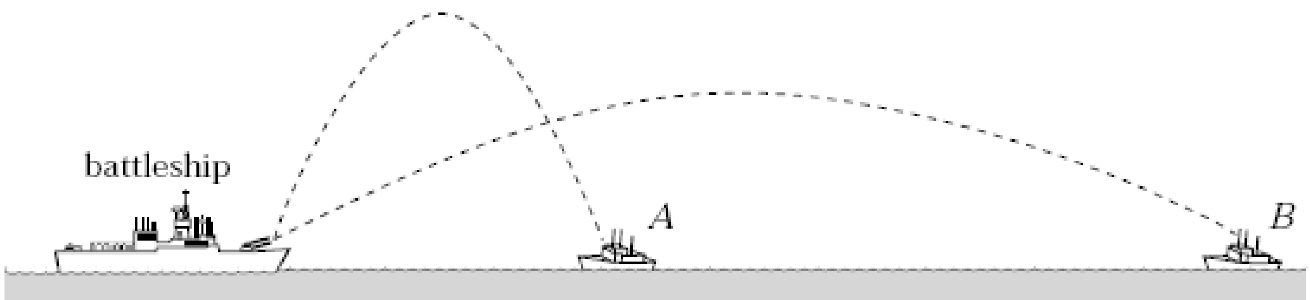
A. At time t_B, both trains have the same velocity.
B. Both trains speed up all the time.
C. Both trains have the same velocity at some time before t_B.
D. Somewhere on the graph, both trains have the same acceleration.

22-1. Consider the situation depicted here. A gun is aimed directly at a dangerous criminal hanging from the gutter of a building. The target is well within the gun's range, but the instant the gun is fired and the bullet moves with a speed v_o, the criminal lets go and drops to the ground. What happens? The bullet



A. hits the criminal regardless of the value of v_o.
B. hits the criminal only if v_o is large enough.
C. misses the criminal.

22-2. A battleship simultaneously fires two shells at enemy ships. If the shells follow the parabolic trajectories shown, which ship gets hit first?



A. *A*
B. both at the same time
C. *B*
D. need more information