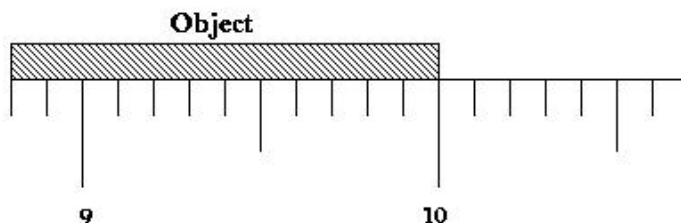
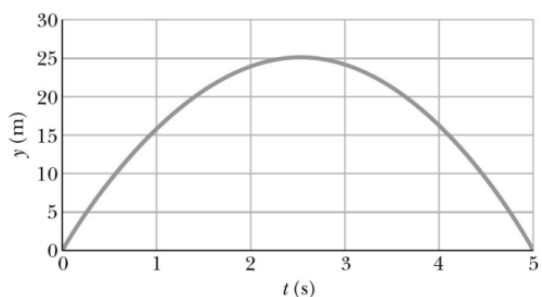


ATTENTION: All Division I students, **START HERE**.
 All Division II students, skip the first ten questions, begin on question 11.

1. A standard centimeter ruler is shown. Which recorded value is the most correct for the location of the shaded object's right end?



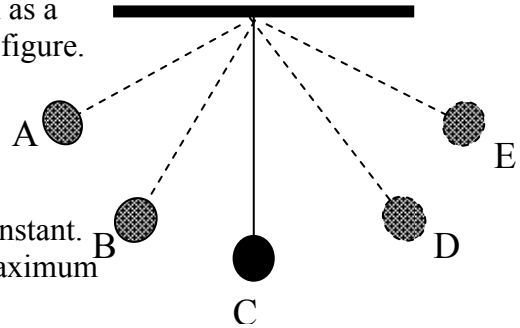
- (a) 10 cm (b) 10. cm (c) 10.0 cm (d) 10.00 cm (e) $10.\bar{0}$ cm
2. How thick is the average page of a physics textbook in micrometers?
- (a) 0.1 (b) 1 (c) 10 (d) 100 (e) 1000
3. Two automobiles are 150 kilometers apart and traveling toward each other. One automobile is moving at 60 km/h and the other is moving at 40 km/h. In how many hours will they meet?
- (a) 1.5 (b) 1.75 (c) 2.0 (d) 2.5 (e) 3.0
4. A particle moves on the x -axis. When the particle's acceleration is positive and increasing
- (a) its velocity must be positive.
 (b) its velocity must be negative.
 (c) it must be slowing down.
 (d) it must be speeding up.
 (e) none of the above must be true.
5. The position-time, y vs. t , graph for the motion of an object is shown. What would be a reasonable equation for the acceleration a that would account for this motion?



6. A 500-kg car is moving at 28 m/s. The driver sees a barrier ahead. If the car takes 95 meters to come to rest, what is the magnitude of the minimum average net force necessary to stop?

(a) 47.5 N
 (b) 1400 N
 (c) 2060 N
 (d) 19600 N
 (e) 133000 N

7. A mass connected to a string swings back and forth as a pendulum with snapshots of the motion seen in the figure. Ignore the friction in the system. Which of the following statements about the pendulum-Earth system is correct?



(a) The total mechanical energy in the system is constant.
 (b) The total mechanical energy in the system is maximum at B.
 (c) The potential energies at A and C are equal.
 (d) The kinetic energies at C and D are equal.
 (e) The kinetic energy at E equals the kinetic energy at C.

8. What does one obtain by dividing the distance of 12 Mm by the time of 4 Ts?

(a) 3 nm/s (b) $3 \text{ } \mu\text{m/s}$ (c) 3 mm/s (d) 3 km/s (e) 3 Gm/s

9. A block rests on an incline that makes the angle ϕ with the horizontal. The block remains at rest as ϕ is slowly increased. The magnitudes of the normal force and the static frictional force of the incline on the block

(a) both increase.
 (b) both decrease.
 (c) both remain the same.
 (d) increase and decrease, respectively.
 (e) decrease and increase, respectively.

10. Contact forces are examples of which of the fundamental forces?

(a) Strong (b) Electromagnetic (c) Weak (d) Gravitational (e) None of these

ATTENTION: All Division I students, turn page and continue through question 40.