Kinematics (pg. 1)

1) An object is released from rest on a planet that has no atmosphere. The object falls freely for 3.0 meters in the first second. What is the magnitude of the acceleration due to gravity on the planet?

(A) 1.5 m s^{-2}
(B) 3.0 m s^{-2}
(C) 6.0 m s^{-2}
(D) 10.0 m s^{-2}
(E) 12.0 m s^{-2}

2) In which of the following situations would an object be accelerated?

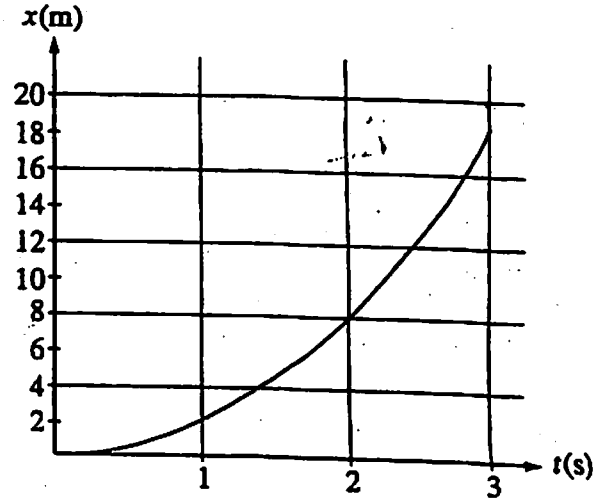
I. It moves in a straight line at constant speed.
II. It moves with uniform circular motion.
III. It travels as a projectile in a gravitational field with negligible air resistance.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3) For which of the following motions of an object must the acceleration always be zero?

I. Any motion in a straight line
II. Simple harmonic motion
III. Any motion in a circle

(A) I only
(B) II only
(C) III only
(D) Either I or III, but not II
(E) None of these motions guarantees zero acceleration.



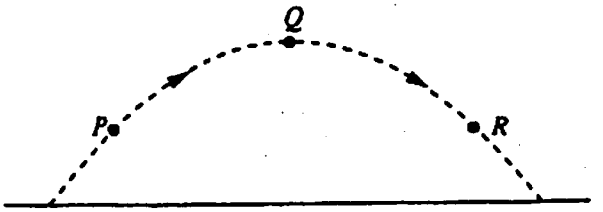
4) The graph above represents position x versus time t for an object being acted on by a constant force. The average speed during the interval between 1 s and 2 s is most nearly

(A) 2 m/s
(B) 4 m/s
(C) 5 m/s
(D) 6 m/s
(E) 8 m/s

5) A ball is thrown straight up in the air. When the ball reaches its highest point, which of the following is true?

(A) It is in equilibrium.
(B) It has zero acceleration.
(C) It has maximum momentum.
(D) It has maximum kinetic energy.
(E) None of the above

Kinematics



Questions 6-8

A ball is thrown and follows the parabolic path shown above. Air friction is negligible. Point Q is the highest point on the path. Points P and R are the same height above the ground.

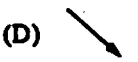
6) How do the speeds of the ball at the three points compare?

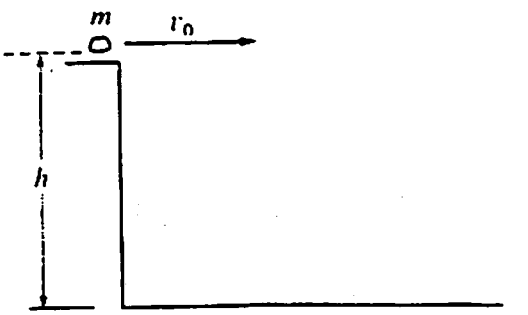
(A) $v_P < v_Q < v_R$
(B) $v_R < v_Q < v_P$
(C) $v_Q < v_R < v_P$
(D) $v_Q < v_P = v_R$
(E) $v_P = v_R < v_Q$

8) Which of the following diagrams best shows the direction of the acceleration of the ball at point P?

(A) 
(B) 
(C)
(D) 
(E) 

7) Which of the following best indicates the direction of the net force, if any, on the ball at point Q?

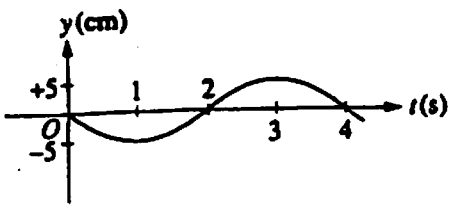
(A) 
(B)
(C)
(D) 
(E) There is no net force on the ball at point Q.



10) A rock of mass m is thrown horizontally off a building from a height h, as shown above. The speed of the rock as it leaves the thrower's hand at the edge of the building is v_0.

i. How much time does it take the rock to travel from the edge of the building to the ground?

(A) $\sqrt{hv_0}$
(B) h/v_0
(C) hv_0/g
(D) $2h/g$
(E) $\sqrt{2h/g}$

9) 

A particle oscillates up and down in simple harmonic motion. Its height y as a function of time t is shown in the diagram above. At what time t does the particle achieve its maximum positive acceleration?

(A) 1 s
(B) 2 s
(C) 3 s
(D) 4 s
(E) None of the above, because the acceleration is constant