

Mathematics Questions by Topic

Motion and Force

Answer 36

Source: K10SM2Q18

Question 36

An object of mass m kg is projected downwards from a point P , with an initial speed of U m/s. The object falls under the influence of gravity in a medium which offers resistance proportional to the velocity. Take the initial position as $y = 0$ and downwards as the positive direction. If k is a positive constant, which of the following most accurately reflects the situation ?

- A. $\ddot{y} - k\dot{y} = mg$ $y(0) = 0$ $\dot{y}(0) = U$
- B. $\ddot{y} - k\dot{y} = g$ $y(0) = 0$ $\dot{y}(0) = -U$
- C. $\ddot{y} + k\dot{y} = mg$ $y(0) = 0$ $\dot{y}(0) = U$
- D. $\ddot{y} + k\dot{y} = mg$ $y(0) = 0$ $\dot{y}(0) = -U$
- E. $\ddot{y} + k\dot{y} = g$ $y(0) = 0$ $\dot{y}(0) = U$

ANSWER E

motion is downwards, positive direction

$$m\ddot{y} = mg - R \quad \text{where} \quad R = Kv = K\dot{y}$$

$$m\ddot{y} = mg - K\dot{y}$$

$$m\ddot{y} = mg - K\dot{y}$$

$$m\ddot{y} + K\dot{y} = mg \quad \text{let} \quad k = \frac{K}{m}$$

$$\ddot{y} + ky = g \quad y(0) = 0 \quad \dot{y}(0) = U$$

