

Physics 1114 - General Physics I

In Class Quiz - 2014.09.24

Solutions

1. An object of mass m starts moving from rest at a constant acceleration. After t seconds, a distance d is covered. What is the kinetic energy of the object at that moment? (Check all that ARE correct).

(b) $K = mad$

(g) $K = 2m \left(\frac{d}{t}\right)^2$

Remember that $K = \frac{1}{2}mv^2$. So if we want to know K after t seconds, we need to find v at this time. Note that we are given acceleration, a . We use

$$v_f^2 = v_0^2 + 2ad$$

Since $v_0 = 0$, we have that $v_f^2 = 2ad$. Thus, $K = \frac{1}{2}m(2ad) = mad$. So (b) is correct.

Next, we try to figure out if any of the formulas involving t are correct. So we use $d = v_0t + \frac{1}{2}at^2$. Once again, $v_0 = 0$, so

$$d = \frac{1}{2}at^2$$

If we multiply both sides by d , we get

$$d^2 = \frac{1}{2}adt^2$$

Solving for ad on the right gives

$$2\frac{d^2}{t^2} = ad$$

Plugging this into (b) gives (g).

2. A block of mass m is at rest at the top of a ramp of vertical height h . The block starts to slide down the frictionless ramp and reaches a speed v at the bottom. If a block of mass $2m$ were to reach the same speed v at the bottom, it would need to slide down the ramp starting at the height of:

(b) h

So the only work done is that by gravity. If we look at example 7.2, we know that $W = mgh$. So for the first block, we have $mgh = \frac{1}{2}mv^2$. For the second block, we have $2mgh = \frac{1}{2}(2m)v^2$. Solving for h in both of these yields the same result. Thus h is the correct answer.