

## AP Physics – Great, More Homework – 3 Ans

1. A race car accelerates at a rate of  $15.6 \text{ m/s}^2$ . If it starts from rest, how much time till it traveling at  $325 \text{ km/h}$ ?

$$a = \frac{v}{t} \quad t = \frac{v}{a} \quad t = 325 \frac{\text{km}}{\text{h}} \left( \frac{1}{15.6 \frac{\text{m}}{\text{s}^2}} \right) \left( \frac{1000 \text{ m}}{1 \text{ km}} \right) \left( \frac{1 \text{ h}}{3600 \text{ s}} \right) = \boxed{5.79 \text{ s}}$$

2. A truck falls off a cliff. If the cliff is  $33.5 \text{ m}$  high, how much time for the truck to reach the bottom?

$$x = \frac{1}{2} at^2 \quad t = \sqrt{\frac{2x}{a}} \quad t = \sqrt{2(33.5 \text{ m}) \left( \frac{1}{9.8 \frac{\text{m}}{\text{s}^2}} \right)} = \boxed{2.61 \text{ s}}$$

3. You toss a ball straight up in the air, it goes up, comes down, and you catch it. If it took  $5.6 \text{ s}$  from when you threw it to when you caught it, how high did it go?

$$x = \frac{1}{2} at^2 \quad x = \frac{1}{2} \left( 9.8 \frac{\text{m}}{\text{s}^2} \right) \left( \frac{5.6 \text{ s}}{2} \right)^2 = \boxed{38 \text{ m}}$$

4. The speed of sound is  $344 \text{ m/s}$ . You have built a really fantastic car that can really go fast. If the car can accelerate at  $22.4 \text{ m/s}^2$ , how much time till you reach the speed of sound? How many kilometers will you travel before you reach that speed?

$$a = \frac{v}{t} \quad t = \frac{v}{a} \quad t = 344 \frac{\text{m}}{\text{s}} \left( \frac{1}{22.4 \frac{\text{m}}{\text{s}^2}} \right) = \boxed{15.4 \text{ s}}$$

$$x = \frac{1}{2} at^2 \quad x = \frac{1}{2} \left( 22.4 \frac{\text{m}}{\text{s}^2} \right) (15.4 \text{ s})^2 = 2660 \text{ m} = \boxed{2.66 \text{ km}}$$

5. In 1947 Bob Feller, a pitcher for the Cleveland Indians, threw a baseball across the plate at  $98.6 \text{ mph}$  or  $44.1 \text{ m/s}$ . For many years this was the fastest pitch ever measured. If Bob had thrown the pitch straight up, how high would it have gone?

$$v^2 = v_0^2 + 2ax \quad x = \frac{v^2}{2a} = \left( 44.1 \frac{\text{m}}{\text{s}} \right)^2 \frac{1}{2 \left( 9.8 \frac{\text{m}}{\text{s}^2} \right)} = \boxed{99.2 \text{ m}}$$

6. You are on top of a building that is  $75.0 \text{ m}$  tall. You toss a ball straight up with an initial velocity of  $33.8 \text{ m/s}$ . How high does the ball travel? It goes up and then falls down to the ground below. How much time is it in the air?

$$\text{Height: } v^2 = v_0^2 + 2ax \quad x = \frac{v^2}{2a} = \left( 33.8 \frac{\text{m}}{\text{s}} \right)^2 \left( \frac{1}{2 \left( 9.8 \frac{\text{m}}{\text{s}^2} \right)} \right) = \boxed{58.3 \text{ m}}$$

$$\text{time up: } v = at \quad t = \frac{v}{a} = 33.8 \frac{\text{m}}{\text{s}} \left( \frac{1}{9.8 \frac{\text{m}}{\text{s}^2}} \right) = 3.45 \text{ s}$$

Time down:

$$x = \frac{1}{2} at^2 \quad t = \sqrt{\frac{2x}{a}} \quad t = \sqrt{2(58.3 \text{ m} + 75.0 \text{ m}) \left( \frac{1}{9.8 \frac{\text{m}}{\text{s}^2}} \right)} = 5.22 \text{ s}$$

$$\text{tot time: } 3.45 \text{ s} + 5.22 \text{ s} = \boxed{8.67 \text{ s}}$$