Physics 20

Chapter 4 Worksheet

1. **Determine** how long it takes a car to travel 30.0 m if it accelerates from rest at a rate of $2.00 m/s^2$?

$d = v_i t + \frac{1}{2} a t^2$

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$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(30.0)}{2.00}}$

$t = 5.48 s$

2. A baseball pitcher throws a fastball at a velocity of 44m/s. Assume that the distance the ball travels in the pitcher's hand from behind his body to the point when it is released is 3.5 m. **Determine** the acceleration of the ball.

$v_f^2 = v_i^2 + 2ad$

$a = \frac{v_f^2 - v_i^2}{2d} = \frac{44^2 - 0}{2(3.5)}$

$a = 2.8e2 m/s^2$

3. A person throws a penny off the roof of a building with an initial velocity of -10m/s (she throws it down). If the roof is 125 m above the ground, **determine** how fast the penny will be going when it reaches street level.

$v_f^2 = v_i^2 + 2ad$

$v_f = \sqrt{v_i^2 + 2ad} = \sqrt{-10^2 + 2(-9.81)(-125)}$

$v_f = 51 m/s$

4. I'm driving my Camaro down the street at 68 km/h. I notice I'm speeding a bit (it's a 50 km/h zone), so I hit the brakes for 2.9 s. I happen to measure the acceleration on my car (using a new gizmo I bought) as being $-1.03 m/s^2$. **Determine** if I am still speeding.

$a = \frac{v_f - v_i}{t}$

$v_f = v_i + at = 19 + (-1.03)(2.9)$

$v_f = 16 m/s = 57 km/h$

Yes, I'm still speeding.

5. I'm still in my car, driving at 57 km/h, when I notice that a train is going to cross the tracks 100 m ahead of me in 5.5 s. I hit the gas and accelerate at $4.2 m/s^2$ for the 5.5 s. **Determine** if the train hit me, or if I am safely past the tracks.

$d = v_i t + \frac{1}{2} a t^2$

$= 16(5.5) + \frac{1}{2}(4.2)(5.5)^2$

$d = 1.5e2 m$

I am easily past the tracks by the time the train passes.

6. A plane is moving at 13m/s as it turns onto the runway for takeoff. The pilot revs up the engines and during the next 8.50s increases the plane's speed to 53m/s. At this point he is able to lift off from the ground. **Determine** how long the runway was.

$$d = \left(\frac{v_f + v_i}{2}\right)t = \left(\frac{53+13}{2}\right)8.50$$
$$d = 2.8e2m$$

7. **Explain** how an object moving backwards can have a positive acceleration.
   If the object is moving backwards (negative velocity), but is slowing down, then it will have a positive acceleration.

8. **Explain** what "three gee's" means.
   Three gee's just means three times the normal acceleration due to gravity ("g"), so this would be an acceleration equal to 29.4m/s^2.

9. If I throw a ball straight up into the air at 14.28m/s, **determine** how long it will take to fall back down to my hand.

$$a = \frac{v_f - v_i}{t}$$
$$t = \frac{v_f - v_i}{a} = \frac{0 - 14.28}{-9.81}$$
$$t = 1.46s$$

Since this is the time to the half way point of the flight (at it's maximum height), we need to multiply it by two…

$t = 2.91s$