Physics 11 Name: _____

Chapter Test: Gravity

For this page, g = 9.80m/s^2

1. A large watermelon is released from the top of the Empire State Building. The water melon falls for 8.8s. How high is the Empire State Building?

$d = v_i t^{0} + \frac{1}{2} a t^2$

$d = -4.9 (8.8)^2$

$= 379 m$

2. What is the period of a pendulum that is 1m long?

$T = 2\pi \sqrt{\frac{l}{g}} = 2\pi \sqrt{\frac{1}{9.8}} = 2.0s$

3. A car is released from rest at the top of a ramp. The car accelerates at 2.0m/s^2.
   a. What is the angle of inclination of the ramp? $60 \div 3.6 = 16.7 m/s$
   b. The car attains a speed of 60km/h by the time it reaches the bottom of the ramp. Determine the length of the ramp.

a) $a = g \sin\theta$

$2 = 9.8 \sin\theta$

$\sin\theta = 0.204$

$\theta = 11.8^\circ$

b) $v_f = 16.7 m/s$

$v_i = 0$

$d = ?$

$a = 2$

$t = x$

$2ad = v_f^2 - v_i^2$

$2(2)d = 16.7^2 - 0^2$

$d = 69.7m$

For this page, do NOT assume that g = 9.80m/s^2.

4. A pendulum that is 3.0m long completes 20 swings in 50s. Determine g.

$T = \frac{50}{20} = 2.5s$

$g = \frac{4\pi^2 l}{T^2} = \frac{4\pi^2(3)}{2.5^2} = 18.9 m/s^2$

5. A child slides down a frictionless slope on a toboggan. Starting from rest, she slides a distance of 30m, while going through a vertical drop of 10m. Determine g if she reaches a speed of 15m/s at the bottom of the slope.

$v_f = 15$
$v_i = 0$
$d = 30$
$a = ?$
$t = x$

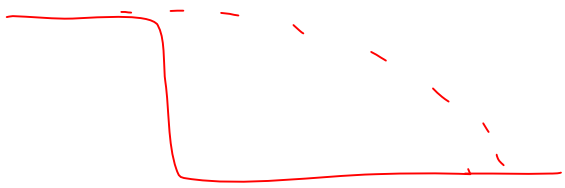
$2ad = v_f^2 - v_i^2$
$2(a)(30) = 15^2 - 0^2$
$a = 3.75 m/s^2$

$g = a\left(\frac{d}{h}\right)$
$= (3.75)\left(\frac{30}{10}\right) = 11.25 m/s^2$

6. Wile E. Coyote is going to drop a priceless vase off a tall building (height = 150m) on Planet X. After releasing the vase, he races down the stairs, and catches the vase just before it smashes on the ground. It takes him 4.3s to make the trip. What is 'g' on planet X?

$d = v_i t + \frac{1}{2}at^2$
$150 = \frac{1}{2}a(4.3)^2$
$a = 16.2 m/s^2 = g$

7. A stunt car driver drives off an 80m cliff with a speed of 180km/h. How far from the base of the cliff should a mattress be placed so that he can land safely?



$d = \cancel{v_i t^0} + \frac{1}{2}at^2$

$-80 = -4.9t^2$

$t = 4.0\text{s}$

$d = vt$

$= 50(4)$

$= 200\text{m}$

$180\text{km/h} \div 3.6 = 50\text{m/s}$

8. A stunt car driver drives her car off a 6.00m high cliff. She leaves the cliff traveling horizontally and needs to land 10.5m from the base of the cliff. How fast should she drive?

9. $d = \cancel{v_i t^0} + \frac{1}{2}at^2$

$-6 = -4.9t^2$

$t = 1.11\text{s}$

$v = \frac{d}{t} = \frac{10.5}{1.11}$

$= 9.5\text{m/s}$

A cannon ball is shot at 120.0m/s at a 40^0 angle on level ground. How far from the cannon does it land?

$v_x = 120\cos 40 = 91.9\ m/s$

$v_y = 120\sin 40 = 77.1\ m/s$

	x	y
d	?	0
a		-9.8
t		?
v_f		
v_i	91.9	77.1

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

$0 = 77.1t + \frac{1}{2}(-9.8)t^2$

$t = 15.8\ s$

$d = vt$

$= (91.9)(15.8\ s)$

$= 1452\ m$