Physics 11 U1 Kinematics Review Sheet

$\boxed{\text{Key}}$

Name: _____

Show all your work, even write yourself some notes on your work, little mental reminders of what you are doing.

1. The frequency of a pendulum is 25 Hz. What is the period?

$$T = \frac{1}{f} = \frac{1}{25} = 0.04 \text{ sec}.$$

2. A pendulum swings 9 times in 31 seconds. Find the period and the frequency.

$$T = \frac{31 \text{ sec}}{9 \text{ events}} = 3.44 \text{ sec} \qquad f = \frac{1}{T} = 0.290 \text{ Hz}.$$

3. If a spark timer is set at 10 Hz how many dots does is make in 1 second? ____10____

4. A car travels at 120 km/hr for 38 mins. How far does it go?

0.63 hr.

$$d = v \cdot t = (120)(.63) = 76 \text{ Km}.$$

5. If a car travels 457 km at a speed of 124 km/hr how long does it take?

$$t = \frac{d}{V} = \frac{457}{124} = 3.69 \text{ hrs}.$$

6. A car travels at 14 m/s for 122 seconds and then at 28m/s for 56 seconds.

a) What is the total distance covered for the entire trip?

Part 1
$$d_1 = v \cdot t = (14)(122) = 1708$$

p+2
$$d_2 = v \cdot t = (28)(56) = 1568$$

$$d_{TOT} = 1708 + 1568 = 3276 \text{ m}$$

b) What was the average speed for the entire trip?

$$V_{AVG} = \frac{d_{TOT}}{t_{TOT}} = \frac{3276}{178} = 18.4 /m.$$

7. A runner travels 1500m in 190 seconds and then travels 1000 m in 133 seconds. Calculate the average velocity.

$$d_{TOT} = 2500 \ m$$

$$V_{AVG} = \frac{2500}{323} = 7.74 \ m/s$$

8. A cop times your car and finds that your car takes 4.6 seconds to cover 150m. Are you speeding if the limit is 90 km/hr? Is the cop measuring your average or instantaneous speed?

$$V = \frac{d}{t} = \frac{150}{4.6} = 32.6 \ m/s = 117 \ Km/hr \ - \ You \ are \ speeding.$$

$$\llcorner \times 3.6$$

* avg velocity is your vel over a long time interval.
* inst. vel is over a short time interval. (Radar gun .5 sec. to find vel.)

9. Convert the following. Show the full conversion.

20 m/s = _____ km/hr

$$20 \ \frac{m}{s} \times \frac{3600 \ sec}{1 hr} \times \frac{1 \ Km}{1000m} = 72 \ Km/hr$$

120 km/hr = _____ m/s

$$120 \ \frac{Km}{hr} \times \frac{1000m}{1 Km} \times \frac{1 \ hr}{3600 \ sec} = 33.3 \ m/s$$

10. Identify the correct number of sigfigs.
a) 2001 __4__   b) 2665 __4__   c) 0.201 __3__   d) 200 __1__

11. Find the final velocity of a car if it accelerates at 2.3 m/s^2 for 11.1 seconds and starts at 2 m/s

$$V_f = V_i + at = 2 + (2.3)(11.1) = 27.5 \ m/s$$

12. A truck crashes into a hedge and de-accelerates at 31 m/s². The truck is originally going 100 km/hr. $= 27.\overline{7}$ m/s

a) How long does it take the truck to stop (time)? $V_f = 0$ $V_i = 27.\overline{7}$ $a = -31$ $t = ?$

$$V_f = V_i + at$$

$$\hookrightarrow \frac{V_f - V_i}{a} = t = \frac{0 - 27.\overline{7}}{-31} = 0.896 \text{ sec}$$
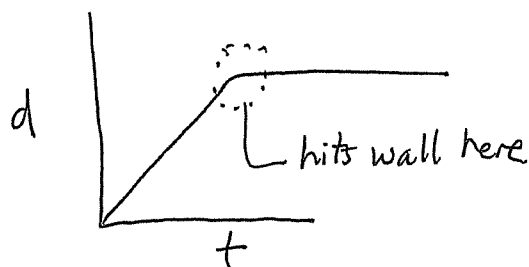
b) What distance does the truck travel while stopping?

$$d = V_i t + \tfrac{1}{2}at^2 = (27.777)(.89606) + \tfrac{1}{2}(-31)(.89606)^2$$
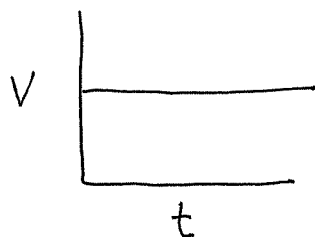
$$d = 12.4 \text{ m}$$

13. a) The slope of a distance vs time graph is ... $\frac{d}{t} = \text{vel}$

b) The slope of a velcity vs time graph is... $\frac{\text{rise}}{\text{run}} = \frac{\text{vel}}{\text{time}} = \text{accel.}$

c) Draw a distance vs time graph that represents a car hitting a brick wall.

d — hits wall here — t

d) Draw a velocity vs time graph that represents a car travelling at a constant speed.

V — t

14. A runner accelerates from rest at a rate of 1.9 m/s2. How long does the runner take to reach her top speed of 6.2m/s?

$$V_f = V_i + at$$

$$\frac{V_f - V_i}{a} = t = \frac{6.2 - 0}{1.9} = 3.26 \text{ sec.}$$

15. A dragster accelerates from rest for 14.1 seconds at 10.4 m/s².
How far does the dragster go?

$$d = V_i t + \frac{1}{2}at^2 = (0)(14.1) + \frac{1}{2}(10.4)(14.1)^2 = 1034 \, m.$$

How fast is the dragster going at the end?

$$V_f = V_i + at = 0 + (10.4)(14.1) = 146 \, m/s \rightarrow \text{top fuel dragster only.}$$

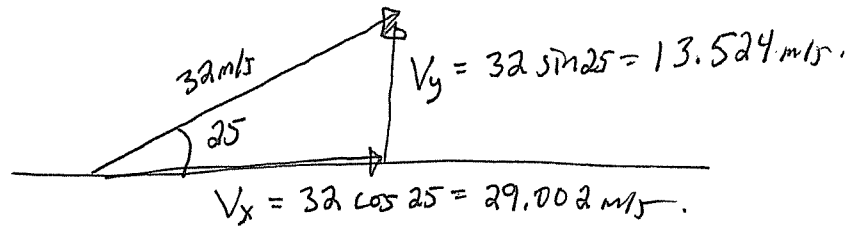16. How long does it take a rock to fall from a 243 m cliff?

$$t = \sqrt{\frac{2d}{a}} \qquad \text{* only works when } V_{iy} = 0$$

$$= \sqrt{\frac{2 \times 243}{9.8}} = 7.04 \, sec.$$

17. Construct a graph with the equation of
v=(4m/s²)t + 3m/s

See attached graph paper.

18. A ball is kicked at 32 m/s at an angle of 25 degrees above the horizontal.

$32 m/s$

25

$V_y = 32 \sin 25 = 13.524 m/s.$

a) Find Vx and Vy.

$V_x = 32 \cos 25 = 29.002 m/s.$

b) Find velocity at the very top of the flight. $V_y = 0 \quad V_x = 29.002 m/s$

c) Find flight time

d) Find max height

e) Find range, horizontal distance traveled

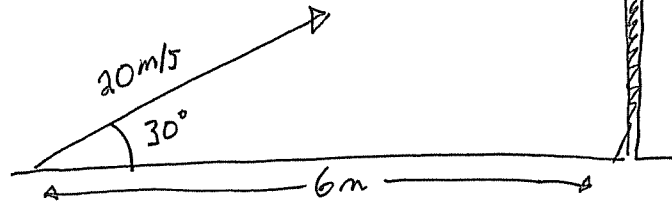c) $\updownarrow V_f = V_i + at \quad @ \; top \quad V_f = 0$

$0 = 13.524 + (-9.8)t$

$t = 1.38 \, sec,$

d) $\updownarrow \; \not{dir} \; V_f^2 = V_i^2 + 2ad \rightarrow$ not the only way to find d

$0 = (13.524)^2 + 2(-9.8)d.$

$d = 9.33 m.$

e) $d_x = V_x t = (29.002)(1.38) = 40.0 m.$

19. A ball is launched at 20 m/s at an angle of 30 degrees above the horizon but its flight is interrupted by a tall wall at a distance of 6 m.

a) Find Vx and Vy.

$$V_x = 17.321 \, m/s \quad V_y = 10 \, m/s$$

b) Find the time it takes to cover the 6m to the wall.

$$t = \frac{d}{V} = \frac{6}{17.321} = 0.346 \, sec.$$

c) Find the height of the ball when it hits the wall. (This one is tricky so don't fret if you do not get it)

$$d = V_i t + \tfrac{1}{2} a t^2$$

$$= (10)(0.346) + \tfrac{1}{2}(-9.8)(.346)^2 = 2.87 \, m.$$

vel

15

10

5

0   5   10   15

time