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Josh 54

76 C

Physics Semester Review Name Keg Hr. 1, 2, 4,
2007-2008

1. Physics is: the study of matter and Energy and their interactions.

2. List the 7 fundamental units and their symbols
Length - meter (m)
Mass - kilogram (kg)
Temp - Kelvin (K)
Light intensity - cd
Electric current - AMP (A)
Amount Substance - mole (mol.)
Time - second (s)

3. What is the difference between a derived unit and a fundamental unit? A derived unit is a unit created from the fundamental units i.e. Velocity $\frac{m}{s}$

4. Find the units for each of the following
a) momentum = (mass)(velocity) $\frac{kgm}{s}$
b) Friction on Teflon = (weight) (.04) $\frac{kgm}{s^2}$
c) acceleration = Vf-Vi/t = $\frac{m}{s^2}$
d) Z= (light intensity/volume)*current $\frac{cdA}{m^3}$
e) ~~Energy~~ Power = Work/Time $\frac{kg \cdot m^2}{s^3}$

5. Solve the following equations for x.
a) $x^2=12x+1$
b) $(1/x^2)+3= 150$
c) $x^9= 30x^2$

a) $x^2 - 12x - 1 = 0$ $x = 12.08$ $x = -.08$
b) $\frac{1}{x^2} = 147$ $\pm .08248$
c) $x^7 = 30$ $x = 1.625$

6. For each of the graphs state what each item represents be as specific as possible.

type	x-axis	y-axis	slope	area
momentum-time	s	$\frac{kgm}{s}$	$\frac{kgm}{s^2}$	kgm
position-time	s	m	m/s	$m \cdot s$
cost-length	m	$\$$	$\$/m$	$\$ m$
work-distance	m	$\frac{kgm^2}{s^2}$	$\frac{kgm}{s^2}$	$\frac{kgm^3}{s^2}$
energy-acceleration	$\frac{m}{s^2}$	$\frac{kgm^2}{s^2}$	$\frac{kgm^2}{s^2} \cdot \frac{s^2}{m} = kgm$	$\frac{kgm^3}{s^4}$
force-mass	kg	$\frac{kgm}{s^2}$	$\frac{m}{s^2}$	$\frac{kg^2m}{s^2}$
velocity-time	s	$\frac{m}{s}$	$\frac{m}{s^2}$	m

7. What is the difference between speed and velocity?

8. What is a scalar? Magnitude with out a direction

9. Which of the following is/are not vector quantities?

(Speed), Acceleration, Velocity, (Temperature), (Time), Distance in X

The terms that you have identified as non-vectors are called Scalars.

10. Motion in x is Independent of motion in Y.

DIRECTIONS: Solve the following problems. Show Work on separate pages. Failure to show work will result in major loss of points.

11. $s = 100\text{ mi} = 1.609 \times 10^5\text{ m}$

$x_i = 0$

$v_i = 22.3\text{ m/s}$

$v_f = 22.3\text{ m/s}$

$a = 0\text{ m/s}^2$

t

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

$1.609 \times 10^5 = 0 + 22.3t + \frac{1}{2}0t^2$

$t = 7215.24\text{ sec} = 2.004\text{ hr}$

12. $s = 105.09\text{ m}$

$x_i = 0$

$v_i = 1$

$v_f = 27$

$a = \frac{v_f - v_i}{t} = \frac{27-1}{7.5} = 3.47$

$t = 7.5$

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

$s = 0 + 1(7.5) + \frac{1}{2}(3.47)(7.5)^2$

$s = 105.09\text{ m}$

13. s

$x_i = 0$

$v_i = 0$

$v_f =$

$a = -9.8$

$t = 30$

$v_f = v_i + at$

$0 + -9.8(30) = -294$

$294\ \frac{m}{s}$ towards the ground

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

$0 + 0t + \frac{1}{2}-9.8(30)^2$

$= -4,410\text{ m}$

Needle has fallen 4,410m.

22.

Mag	θ	θ_Z	i	j	k
30	246	0	-12.20	-27.40	0
15	80	0	2.60	14.77	0
5	303.0		2.72	-4.14	0
4	66.75		.42	.95	3.86
			-6.46 +	-15.87 +	3.86

11.56 Km at 22.14° W of S at an 82.14° angle of 12.7°

Observer	Mag	θ	θ2	i	j	k
7	195	20		-6.35	-1.70	2.39

$-6.46\,i + -15.67\,j + 3.86\,k$

$-(-6.35\,i + -1.70\,j + 2.39k)$

$-.11i + -14.11j + 1.47k$

14.24 km at .49° W of S at an azimuth of 5.92°

c) $\frac{-6.46}{17.56} + \frac{-15.87}{17.56} + \frac{3.86}{17.56}$

$-.36i + -.90j + .22k$

14 $S_{pog} = S_{mole}$

$0 + 2.6t + \frac{1}{2}0t^2 = 40 + 1.4t + \frac{1}{2}0t^2$

$2.6t = 40 + 1.4t$

$1.2t = 40$

$t = 33.3$ sec at a Distance of 86.58 M

15. $S_{CAR\,A} = S_{car\,B}$

$0 + 15t + \frac{1}{2}0t^2 = 0 + 0t + \frac{1}{2}2t^2$

$\frac{15t}{t} = \frac{t^2}{t}$

$t = 15$

$S = 225$ M

16. 1st Inertia
2nd F=ma
3rd Action Reaction

17. Friction is a force caused by two surfaces rubbing against each other. ONLY the nature of the materials matter.

18 $\tan\theta = \mu_k$
$\mu_k = \tan 35^\circ = .70$

19.

1.15
-1.715

$s =$
$x_i =$
$v_i =$
$v_f =$
$a = 75.91$
$t =$
$F = 1.5 + -1.715 = 13.285$
$m = .175$
a

$F = ma$
$13.285 = .175a$
$a = 75.91 \ m/s^2$

20.

.92 m

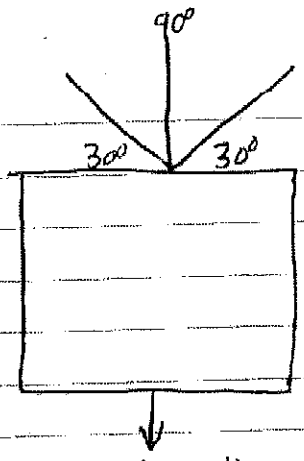
$2.36 = 0t + \frac{1}{2}(.43)$
$V_i = 5.48$

s	2.36	0
x_i	0	.92
v_i	5.48	0
v_f	v_i	-4.21
a	0	-9.8
t	.43	.43

$5.48i + -4.2j$
6.91 m/s at 37.5° with ground

$0 = .92 + 0t + -4.9t^2$
$t = .43$

21.



$M_4g \sin 30 + M_4g \sin 90 + M_4g \sin 150 = 5000$

$M_4g (.5 + 1 + .5) = 5000$

$\frac{2.0\, M_4 g}{2.0} = \frac{5000}{2.0}$

$M_4 g = 2,500\ N$

23

$-9.8(2.06)$

-20.18

$S = 350$

$X_i = 0$

$V_i = 0$

$V_F =$

$a = 2.18$

$t = 17.9$

$F =$

$m = 2.06$

$350 = 0 + 0t + \frac{1}{2} a (17.9)^2$

$350 = 166.205\, a$

$a = 2.18$

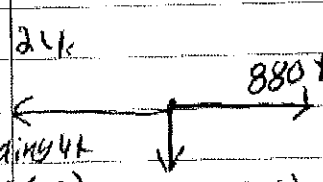
$F = ma$

$(2.06)(2.18)$

$F_{Net} = 4.50$

$F_{net} = X + -20.18$

$\boxed{X = 24.68\ N}$



S
$x_i = 0$
$v_i = 84$
v_f
$a = 4.73$
$t = 7$
$F = 880 + -548.8 = 331.2$
$m = 70$

$F = ma$
$331.2 = 70a$
$a = 4.73$
$S = x_i + v_i t + \frac{1}{2}at^2$
$0 + 0t + \frac{1}{2}(4.73)(7)^2$
$S = 143.85$

25. Vector: A quanity with both Mag and Direction

26. Component: Mag on a give Axis I, J, or K

27. Eqilibrant: Force that caucels out all of the other forces

28

Mag	θ	θ2
8	35	0
4	270	0
11	103	0

i	j	k
6.55	4.59	0
0.00	-4.00	0
-2.47	10.71	0
4.08	11.3	0

12.01 km at 19.85° E of N

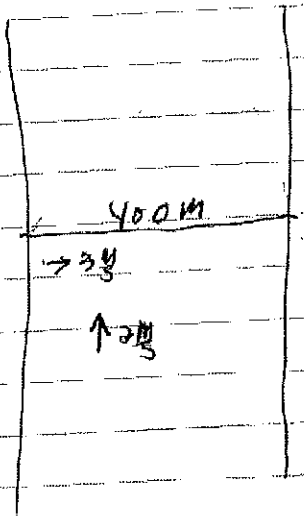
29

Mag	θ	θ2	i	j	k
60	15	0	57.95	15.52	0
50	67	0	19.53	46.02	0
			77.48	61.54	0

98.94 N
~~S 1.54 E~~ at 38.45° N of E

Equivalent ~~S 1.54~~ N at 38.45° S of W
98.94

30



	x	y
s	400	266.66
x_i	0	0
v_i	3	2
v_f	3	2
a	0	0
t	= 133.33	133.2

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

$400 = 0 + 3t + \frac{1}{2} 0 t^2$

$t = 133.3$ sec

$s = 0 + 2(133.3) + \frac{1}{2} 0 t^2$

Boat will be at $400i + 266.6j$

486.70 m at 33.68° N of E

31

Mag	θ	θ2	i	j	k
17.4	9	-6.7	~~2.70~~	~~27.54~~	~~16~~
			17.06	2.70	-2.03

32.

Mag	θ	θ2	i	j	k
800	84	23	76.98	732.36	312.58
60	68	30	19.46	48.17	30.00
			96.44	780.53	342.58

857.83 km at 7.04° E of N at 94 azimuth of 23.53°

33

	x	y
s	2212	0
x_i	0	600
v_i	200	0
v_f	200	
a	0	-9.8
t = 11.06	⇒	11.06

$0 = 600 + 0t + -4.9t^2$

$t = 11.06$

$s = 0 + 200(11.06) + \frac{1}{2}0t^2$

2212 M

34

	x	y
s	254.38 m	0
x_i	0	0
v_i	$= 50 \cos 47$	$50 \sin 47 = 36.57$
$v_f = v_i =$		
a	0	-9.8
t	7.46	⇒ 7.46

c) $KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}(36.57)^2 = 9.8h$

$h = 68.23$ M

35.

	x	y
s	75.18m	0
x_i	0	0
$v_i = 96\cos 25 + 4.8 = 91.8$		$96 \sin 25 = 40.57$
$v_f = 91.8$		
$a = 0$		-9.8
t	8.27	8.27

36

s	40	22.55m
x_i	0	0
v_i	21.21	21.21
v_f	21.21	$v_f =$
a	0	$a = -9.8$
t	1.88	$t = 1.88$

37.

s

$x_i = 0$

$v_i = 2.1$ m/s

v_f 22.6 m/s

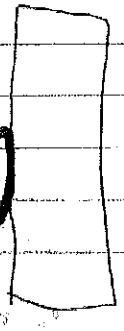
$a = \frac{v_f - v_i}{t} = 4.88 \frac{m}{s^2}$

$t = 4.2$

$F = ma$

$F = (5000/9.8)\ 4.88 =$ 2,489 N

38.



.011+323

x=1323.011

s 15.1

x_i 0

$v_i = 0$

v_f

$a = .000084$

$t = 600$

$F = .001$

$m = 85$

$15.1 = \frac{1}{2} a (600)^2$

$a = .000084$

work = F·d

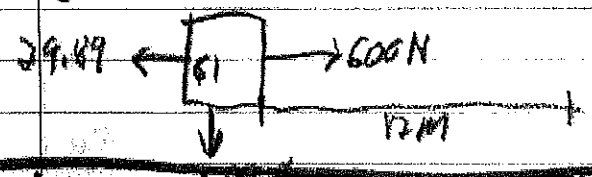
$= 1323.011 (15.1)$

$= 19971.57$ J

$P = \frac{W}{t} = \frac{19971.5}{600}$

33.29 W

39



A) Work = F·d = 600(12) = 7200 J

B) Work = F·d = 358.68 J

C) 14.97 m/s

D) 1.60 sec

E) P = Work / time = 7200 / 1.6

= 4,500 W

+2

S =

$X_i = 0$

$V_i = 0$

V_f =

$a = 9.35\ m/s^2$

t =

$F = 600 + 29.89 - 570.11$

$m = 61\ kg$

Work =

Power =

$6841.52 = \frac{1}{2}(61)V^2$ $\quad a = \frac{V_f - V_i}{t}$

$V = 14.97$ $\quad 9.3 < \frac{14.97}{t}$

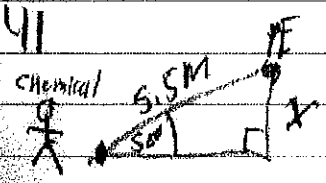
40

Work = F·d

$F = 55 \cos 75 = 14.235$

Work = 14.235(7.8) = 111.03 J

41



$\sin 50 = \frac{x}{5.5}$

$x = 4.21\ m$

S

X_i

V_i

V_f

a

$t = 50\ m/h = 3000\ sec$

F

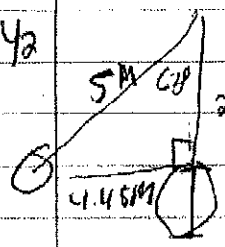
$m = (600/9.8) = 632.653\ kg$

MGH

$(632.653)(9.8)(4.21) = 26,102\ J$

$P = \frac{26,102}{3000} = 8.70\ W$

42



$\cos 63 = \frac{x}{5}$

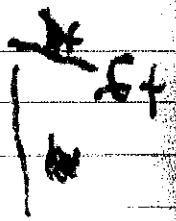
$x\ 2.26\text{m}$

Work = F · d

Work = mgh

(40)(9.8)(2.74)

= 1074.08 J

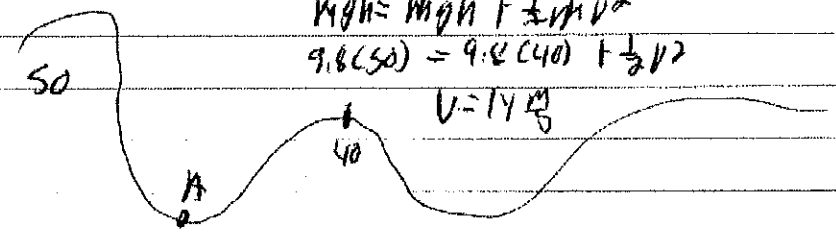


PE = KE

$1074.08 = \frac{1}{2}(40)v^2$

$v = 7.32$ m/s

43



$mgh = mgh + \frac{1}{2}mv^2$

$9.8(50) = 9.8(40) + \frac{1}{2}v^2$

$v = 14$ m/s

$mgh = \frac{1}{2}mv^2$

$9.8(50) = \frac{1}{2}v^2$

$v = 31.3$ m/s

44.

	x	y
s	245.17 m	0
x_i	0	0
v_i	$50\cos 37 = 39.93$	$50\sin 37 = 30.09$
v_f	39.93	
a	0	−9.8
t	6.14	6.14