

X1.14a

PHYS-107(14) (Kaldon-14959)

WMU - Summer I 2003

Exam 1 - 100,000 points

107

Name _____

Book Title _____

Rev. 05/18/02 Su.6-r1

State Any Assumptions You Need To Make – Show All Work – Circle Any Final Answers
Use Your Time Wisely – Work on What You Can – Be Sure to Write Down Equations
Short Answers Should Be Short! – Feel Free to Ask Any Questions

EXAM 1 [FORM - A] PHYS-107 (KALDON-14) SUMMER I 2003 WMU



Monster Trucks · Bigfoot

Now Pay Attention – You Can Do This (30,000 points) Multiple-Guess-Fill-In-The-Bubbles

- | mph | sec | |
|-----|-------|--|
| 25 | 144.0 | 1.)(a) Rocko drives his car for 2.00 miles at 30.0 mph. How many minutes does it take to travel this distance? <i>The handy chart at left may be useful.</i>
A = 1.00 min B = 2.00 min C = 3.00 min D = 4.00 min
E = 5.00 min F = None of these |
| 30 | 120.0 | |
| 35 | 102.9 | |
| 40 | 90.0 | |
| 45 | 80.0 | (b) Robin drives her car for 2.00 miles accelerating from rest to 120. mph. How many minutes does it take to travel this distance?
A = 1.00 min B = 2.00 min C = 3.00 min D = 4.00 min
E = 5.00 min F = None of these |
| 50 | 72.0 | |
| 55 | 65.5 | |
| 60 | 60.0 | |
| 65 | 55.4 | |
| 70 | 51.4 | |
| 75 | 48.0 | (c) Roland drove 2.00 miles accelerating from rest to 120. mph and then 2.00 miles decelerating from 120. mph back down to zero. How many minutes does it take?
A = 1.00 min B = 2.00 min C = 3.00 min D = 4.00 min
E = 5.00 min F = None of these |
| 80 | 45.0 | |
| 85 | 42.4 | |
| 90 | 40.0 | |
| 95 | 37.9 | |
| 100 | 36.0 | (d) Ralph drives 0.500 mile at 30.0 mph, 0.500 mile at 45.0 mph, 0.500 mile at 60.0 mph and 0.500 mile at 120. mph How many minutes does it take?
A = 1.00 min B = 2.00 min C = 3.00 min D = 4.00 min
E = 5.00 min F = None of these |
| 105 | 34.3 | |
| 110 | 32.7 | |
| 115 | 31.3 | |
| 120 | 30.0 | |
| 125 | 28.8 | For each of the following, select the answer A-D that BEST represents the motion. |
| 130 | 27.7 | (e) John is climbing a tree, making a steady pace. This is an example of _____ Motion.
A = No B = Uniform C = Constant Acceleration
D = None of these |
| 135 | 26.7 | |
| 225 | 16.0 | |

- (f) John is falling out of the tree. This is an example of _____ Motion.
A = No B = Uniform C = Constant Acceleration
D = None of these
- (g) John is lying on the ground under the tree, resting. This is an example of _____ Motion.
A = No B = Uniform C = Constant Acceleration
D = None of these
- For each of the following, select the answer A-F that BEST represents the quantity.**
- (h) An object in free fall from rest is moving with a speed of _____ after 1.00 seconds.
A = +9.81 m B = -9.81 m C = +9.81 m/s
D = -9.81 m/s E = +9.81 m/s² F = -9.81 m/s²
- (i) The acceleration in the y-direction of an object in free-fall is _____.
A = +9.81 m B = -9.81 m C = +9.81 m/s
D = -9.81 m/s E = +9.81 m/s² F = -9.81 m/s²
- (j) An object moving with an acceleration in the x-direction of 2g will travel _____ after 1.00 seconds.
A = +9.81 m B = -9.81 m C = +9.81 m/s
D = -9.81 m/s E = +9.81 m/s² F = -9.81 m/s²

"Monster Trucks!" (35,000 points)

2.) Dr. Phil was, as usual, cruising the cable channels looking for inspiration for good test problems, when he found a program on the Bigfoot Monster Truck races. The course is 340. feet long (104 meters). The huge Ford hemi motors have up to 1500 horsepower and can get the trucks from 0 to 60 mph (26.8 m/s) in 3.00 seconds. (a) What is this acceleration?

(b) How far does the Bigfoot move in those 3.00 seconds? How much of the 104 meter course is there to go?

(c) If the Bigfoot finishes the race at its cruising speed of 60 mph (26.8 m/s), how much time does that take?

(d) This Bigfoot truck has jumped 18.0 feet (5.49 meters) in the air. What v_{0y} would allow any object to jump 5.49 m up in the air?



(e) If the jump has a $v_{0x} = 26.8$ m/s, find the velocity vector \vec{v}_0 in Standard Form. *If you did not get an answer to (d), use $v_{0y} = 13.4$ m/s.*

Soviet Space Secrets (35,000 points)

3.) (a) During a "normal" launch into space (as if *any* launch into space is "normal"!), the payload has to be accelerated from rest to an orbital speed of 7880 m/s (about 17,600 mph) in 8.00 minutes. Find the average acceleration of this launch.

(b) Find the distance that the rocket traveled, if it spent 8.00 minutes at this average acceleration. *If you did not get an answer to (a), use $a = 20.0$ m/s².*

(c) In 1983, the Soviet Soyuz T-10A was all set to be launched, when a fire broke out on the launch pad ten minutes before launch. An emergency escape rocket finally blasted the Soyuz and the cosmonauts on board two thousand feet into the air (610. meters) just six seconds before the main booster blew up. Ignoring air resistance and parachutes, as usual, find the time it takes to fall to the ground from rest at a height of 610. meters.

(d) At what speed would an object in free-fall from rest at 610. meters hit the ground? *This can be found even if you don't have the answer to (c).*

(e) On another mission, the booster rocket taking the Soyuz 18A capsule into space failed on the way up. Again the capsule was safely jettisoned in time, but the emergency maneuver had a peak deceleration at a brutal 20.6 *gee*'s. At this rate, how long (time) would it take for them to slow down from 8000 mph (3580 m/s) to where the parachutes can open at 340 mph (152 m/s)?