Sit in Seat Number _____ Name _____

Rec. Sec. _____

PH2100 **Answer Sheet - Exam I** **Fall 2000**

Multiple Choice
(Circle your answer)

1. A B C D E

2. A B C D E

3. A B C D E

4. A B C D E

5. A B C D E

6. A B C D E

7. A B C D E F G

8. A B C D E

9. A B C D E

10. A B C D

Sub Total _____

Worked Problems

11. A) _____

B) _____

C) _____

D) _____

12. A) _____

B) _____

C) _____

13. _____

14. A) _____

B) _____

15. A) _____

B) _____

16. _____

Sub Total _____

Total _____ - Sum of 3 Lowest _____ = Score _____

PH2100 EXAM 1 Instructions

1. Put your name and recitation section number on your answer sheet.

2. An equation sheet is provided. You should *not* use one of your own and you should not use equations stored in your calculator.

3. If you need extra paper, pencils, or a calculator, contact your exam proctor.

4. Answers which are illegible or ambiguous will be graded as zero.

5. For numerical answers, supply your answer to three significant figures even if the data given has a different number of significant figures unless you are explicitly told to use a different number of significant figures.

6. There are 23 answers each worth 5 points. Your three lowest scores for individual answers will be dropped, giving a total possible on the exam of 100.

7. When you leave, turn in ONLY YOUR ANSWER SHEET. Keep the rest of the exam for reference and for review for the final.

Recitation Sections

Sect	Meets	Instructor
1	8 am	Leckenby
2	9 am	Leckenby
3	10 am	Daavettila
4	11 am	Agin
5	noon	Leckenby
6	1 pm	Agin
7	2 pm	Daavettila

Multiple Choice
Circle the letter corresponding to your answer on the answer sheet.

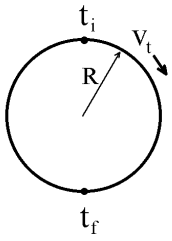
1. At a time t_i an object is at position $\mathbf{r}_i$. At a later time t_f the object is at $\mathbf{r}_f$. If you are given values for t_i, t_f, $\mathbf{r}_i$, and $\mathbf{r}_f$, which one of the following can be computed from this information alone?

A) The total distance the object travels.
B) The average velocity of the object.
C) The speed of the object.
D) The average acceleration of the object.
E) None of the above.

2. A ball is tossed straight up from the ground with an initial speed v_i. The ball will travel upwards and then will fall back down. What is the acceleration of the ball when it is at its peak height, h? Use coordinates where the y-direction is up and the x-direction is horizontal.

A) 0 B) 9.80 m/s^2 **j** C) -9.80 m/s^2 **j** D) -9.80 m/s^2 **i** E) v_i^2/h **j**

3. A car travels around a circle of radius R at a constant speed, v_t . It takes the car a time $\Delta t = t_f - t_i$, to go half-way around the circle. What is the *magnitude* of the car's *average acceleration* for this time interval?



A) 0
B) $2v_t^2/R$
C) $2v_t/\Delta t$
D) $2[(v_t^2/R)^2 + (v_t/\Delta t)^2\ ]^{1/2}$
E) $\frac{1}{2}\ [(v_t^2/R)^2 + (v_t/\Delta t)^2\ ]^{1/2}$

4. The x-component describing the position of an object of mass M, moving in the x-y plane as a function of time, t, is given by the equation: $x = 3t^4 - 2t$, where x is in meters and t is in seconds. The y-component is not known. Which one of the following is an ***incorrect*** statement about this object's motion?

A) The velocity of the object at t = 0 may be zero.
B) The acceleration cannot be constant.
C) The x-component of the velocity is given by $v_x = 12\ t^3 - 2$ (in m/s when t is in seconds).
D) The object may be traveling on a circular arc at t = 0.
E) The x-component of the net force on the object is zero at t = 0.

5. A baseball is thrown up over level ground with an initial velocity of (v_x **i** + v_y **j**) where the y-direction is up and the x-direction is horizontal**.** When the ball is at the peak of its trajectory, what is the velocity of the ball?

A) 0 B) v_x **i** C) v_y **j** D) v_x **i** + v_y **j** E) None of these.

6. A book is at rest on a poorly constructed table where the table top is not quite horizontal. Careful measurements show that the table top is tilted by about 5^o from the horizontal. Which of the following is a correct statement for this situation?

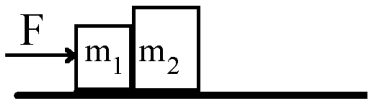
A) Since the book is at rest, there are no forces acting on the book.
B) The direction of the normal force is straight up.
C) The coefficient of static friction must be negative.
D) The acceleration of the book is 9.80 m/s^2 down.
E) None of the above.

7. A cube exactly 10 cm on a side has a volume of 1 liter (1L). How many mL is 1 m^3 ?

A) 10^0 B) 10^1 C) 10^2 D) 10^3 E) 10^4 F) 10^5 G) 10^6

8. Two masses are being pushed together along a horizontal surface as shown. The surface has a coefficient of kinetic friction, $\mu_k \neq 0$ for these masses. How many distinct forces are acting on the second mass, m_2 ? (i.e. for a complete free-body diagram showing the forces on m_2, how many forces would be shown?)

A) 0
B) 1
C) 2
D) 3
E) 4

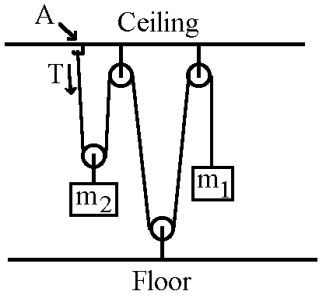


9. Two masses, m_1 and m_2, are connected by a (massless) rope which is wound through four (massless, frictionless) pulleys as shown. When m_1 is released from rest, it is found that it remains at rest. What is the magnitude of the force, T, on the ceiling hook labeled "A" ?

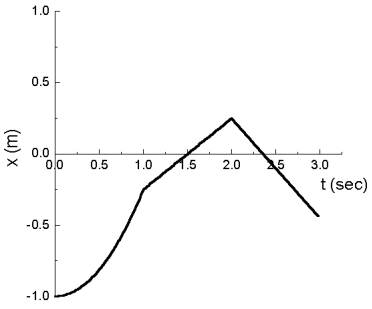
A) m_1 g B) (m_1 + m_2) g

C) m_2 g D) 5 m_1 g

E) None of the above.

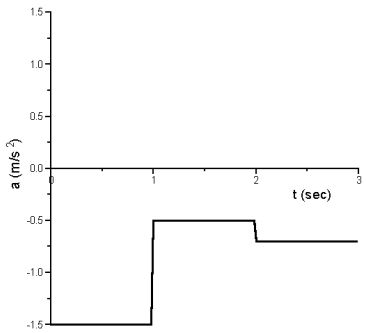


10. Below is a figure showing the position of an object undergoing one dimensional motion along the x-axis as a function of time, t.

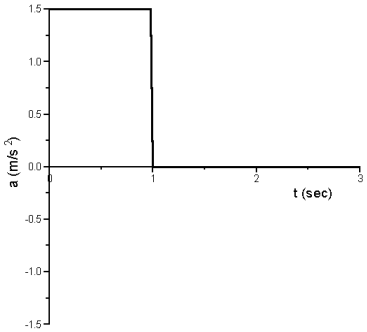


Which figure below most accurately shows the acceleration of this object as a function of time?

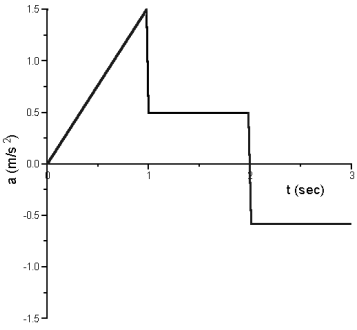
(A)



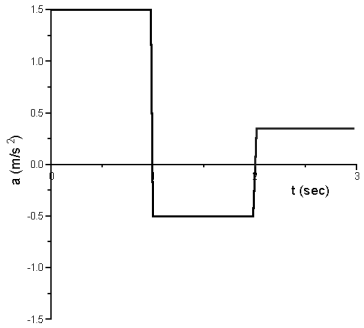
(B)



(C)



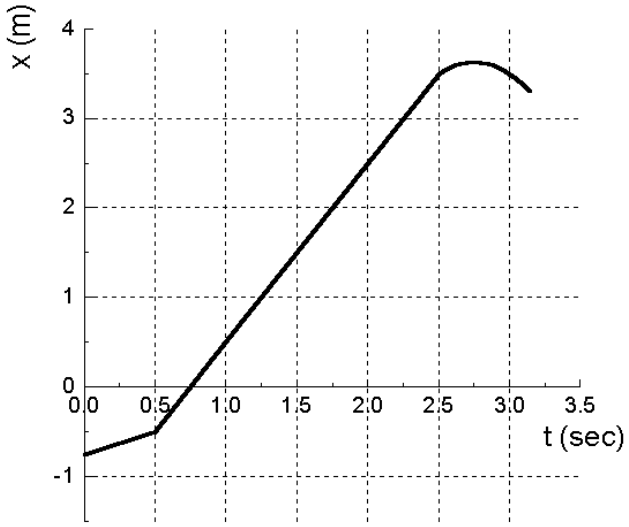
(D)



Problems

Write your answer in the appropriate space on the answer sheet. Include units, directions for vector quantities, and use three significant figures for numerical answers unless specified otherwise (e.g. for problem 11 only 2 significant figures).

11. Below is a plot showing one-dimensional motion of an object along the x-axis.



(For this problem, answers should be to two (2) significant figures only)

A) What is the displacement for the time interval from t = 1.00 s to t = 3.00 s ?

B) What is the average velocity for the time interval from t = 0 to t = 1.00 s ?

C) What is the object's velocity at t = 1.50 s ?

D) At what time(s) is the object's velocity zero? (If none, write "none")

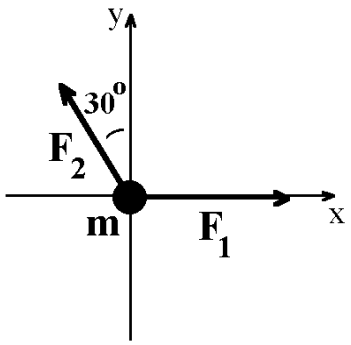
12. A ball is shot out of a canon with an initial velocity (131 **i** + 173 **j**) m/s where the x-axis is horizontal and the y-axis is vertical. Assume the ground is flat and horizontal.

A) What is the magnitude of the object's initial velocity?

B) At what angle, measured up from the horizontal, was this ball shot at?

C) What is the maximum height of this ball during its flight?

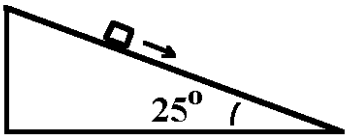
13. Two forces, $\mathbf{F}_1$ and $\mathbf{F}_2$, act on an object with mass m = 3.25 kg as shown. The magnitudes of the two forces are F_1 = 12.0 N and F_2 = 10.0 N . What is the acceleration of the object?



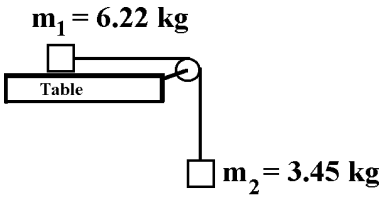
14. A block slides down an incline having an inclination of 25.0° .

A) What is the magnitude of the acceleration of the block if the incline is frictionless?

B) If the incline has a small coefficient of kinetic friction of 0.035, what will be the direction of the force of friction on the block when the block is ½ -way down ?



15. Two masses are connected by a (massless) string over a (massless, frictionless) pulley, as shown below, with one mass on a horizontal table and the other hanging vertically. Initially the masses are at rest.



A) Assuming the masses start to move and the coefficient of kinetic friction is 0.243, what is the tension in the string?

B) If the coefficient of static friction is large enough, then the masses will stay at rest and will never move. What is the smallest value the coefficient of static friction can have so that the masses stay at rest?

16. Two masses, m_1 = 3.00 kg and m_2 = 2.00 kg, are being pushed together along a frictionless surface by a force F = 2.35 N as shown. What is the net force on the second mass, m_2 ?