UNIVERSITY OF SASKATCHEWAN
Department of Physics and Engineering Physics

Physics 111.6
MIDTERM TEST #1

October 9, 2003 | Time: 90 minutes

NAME: ____ STUDENT NO.: ____________
(Last) **Please Print** (Given)

LECTURE SECTION (please circle):

01	Dr. A. Robinson
02	B. Zulkoskey
03	Dr. A. Manson
C15	F. Dean

INSTRUCTIONS:

1. You should have a test paper, a formula sheet, and an OMR sheet. The test paper consists of 9 pages. **It is the responsibility of the student to check that the test paper is complete**.
2. Enter your name and STUDENT NUMBER on the OMR sheet.
3. The test paper, the formula sheet and the OMR sheet must all be submitted.
4. The test paper will be returned. The formula sheet and the OMR sheet will NOT be returned.

PLEASE DO NOT WRITE ANYTHING ON THIS TABLE

QUESTION NO.	MAXIMUM MARKS	MARKS OBTAINED
Part A	10	
Part B	10	
C1	5	
C2	5	
C3	5	
TOTAL	35	

continued on page 2 ...

PART A

FOR EACH OF THE FOLLOWING QUESTIONS IN PART A, ENTER THE MOST APPROPRIATE RESPONSE ON THE OMR SHEET.

A1. Which one of the following is the longest length?
(A) 10^0 m (B) 10^2 cm (C) 10^4 mm (D) 10^5 μm (E) 10^7 nm

A2. Given the dimensions of the symbols as shown in the table, which one of the following equations is **not** dimensionally correct?

x	[L]
a	[L]/[T]^2
t	[T]
F	[M][L]/[T]^2
m	[M]
v	[L]/[T]

(A) $x = \frac{1}{2}at^2$ (B) $F = ma$ (C) $v = \sqrt{\dfrac{Fx}{m}}$

(D) $v = at^3$ (E) $x = \dfrac{v^2}{a}$

A3. An object moving along a straight line is decelerating. Which one of the following statements concerning the object's acceleration **must** be true?
(A) The value of the acceleration is positive.
(B) The direction of the acceleration is in the same direction as the displacement.
(C) An object that is decelerating has a negative acceleration.
(D) The direction of the acceleration is in the direction opposite to that of the velocity.
(E) The acceleration changes as the object moves along the line.

A4. Starting from rest, a particle which is confined to move along a straight line is accelerated at a rate of 5.0 m/s^2. Which statement concerning the slope of the **position** versus time graph for this particle is correct?
(A) The slope has a constant value of 5.0 m/s.
(B) The slope has a constant value of 5.0 m/s^2.
(C) The slope is both constant and negative.
(D) The slope is not constant and increases with increasing time.
(E) The slope is not constant and decreases with increasing time.

A5. A baseball is hit so that it travels along a parabolic arc before it strikes the ground. Which one of the following statements **must** be true? Ignore any effects due to air resistance.
(A) The acceleration of the ball decreases as the ball moves upward.
(B) The velocity of the ball is zero when the ball is at the highest point in the arc.
(C) The acceleration of the ball is zero when the ball is at the highest point in the arc.
(D) The horizontal component of the velocity of the ball is the same throughout the ball's flight.
(E) The velocity of the ball is a maximum when the ball is at the highest point in the arc.

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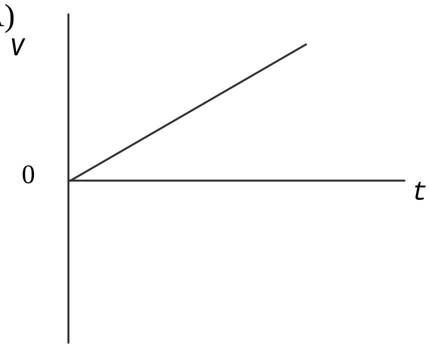
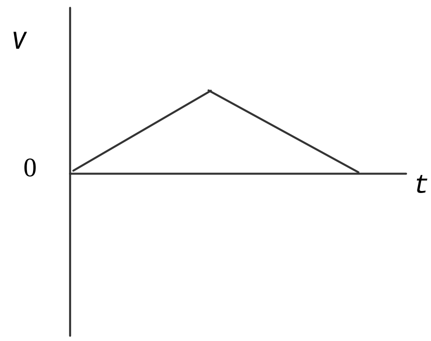
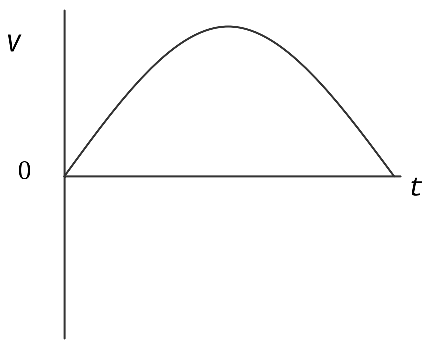
A6. A spring-loaded gun is aimed horizontally and is used to launch identical balls with different initial speeds. The gun is at a fixed position above the floor. The balls are fired one at a time. If the speed of the second projectile is twice the speed of the first projectile fired, how is the horizontal range affected? Ignore any effects due to air resistance.

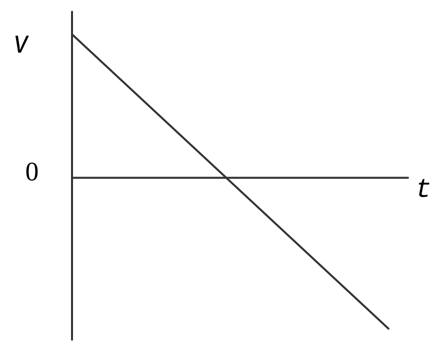
(A) The range for both projectiles will be the same.
(B) The range of the second projectile will be half as much as that of the first projectile.
(C) The range of the second projectile will be twice as large as that of the first projectile.
(D) The range of the second projectile is about 1.4 times larger than that of the first projectile.
(E) The range of the second projectile will be smaller than that of the first projectile by a factor of 1.4.

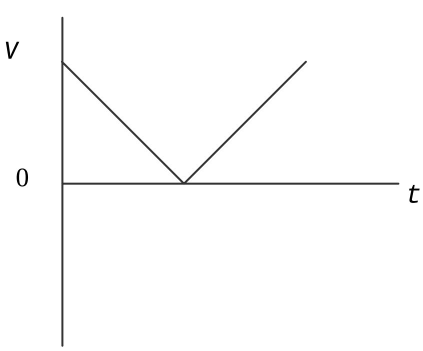
A7. Which of the following velocity versus time plots best represents an object thrown vertically upward, from the time it is released until it returns to the ground? (*UP* has been chosen as the positive direction. Ignore any effects due to air resistance.)

(A)


(B)


(C)


(D)


(E)


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A8. An elevator car moves downward at constant speed. Which one of the following statements is true concerning the tension in the elevator cable if air resistance is ignored?
(A) The tension is zero.
(B) The tension is directed downward.
(C) The magnitude of the tension is equal to the magnitude of the weight of the rock.
(D) The magnitude of the tension is less than the magnitude of the weight of the rock.
(E) The magnitude of the tension is greater than the magnitude of the weight of the rock.

A9. Two satellites of different masses are in the same circular orbit around the earth. Which one of the following statements is true concerning the magnitude of the gravitational force that acts on each of them?
(A) The magnitude of the gravitational force is zero for both satellites.
(B) The magnitude of the gravitational force is the same for both satellites, but not zero.
(C) The magnitude of the gravitational force is zero for one, but not for the other.
(D) The magnitude of the gravitational force depends on their masses.
(E) The magnitude of the gravitational force varies from point to point in their orbits.

A10. The SI unit of force, expressed in SI base units, is:
(A) kg/m (B) kg/s (C) kg.m/s (D) $kg/m/s^2$ (E) $kg.m/s^2$

PART B

FOR EACH OF THE FOLLOWING PROBLEMS, WORK OUT THE SOLUTION IN THE SPACE PROVIDED AND ENTER YOUR ANSWERS ON PAGE 6.

ONLY THE ANSWERS WILL BE MARKED. THE SOLUTIONS WILL NOT BE MARKED.

B1. Cables are attached to a pole and to the ground so that the pole is held vertically. One of the cables has a length of 15.0 m and is attached to the pole at a height of 10.0 m above the level ground. Calculate the distance of the ground attachment point from the pole. (Assume the cable is taut.)

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B2. A baseball pitcher throws the ball such that it has a velocity of 43.0 m/s to the south when it reaches the batter. The batter hits the ball and gives it a velocity of 51.0 m/s to the north. Calculate the magnitude of the average acceleration of the ball during the 1.20 ms (1.20×10^{-3} s) when it was in contact with the bat.

B3. A car travels due east at a speed of 20.0 m/s. It turns due south and continues at a speed of 24.0 m/s. Calculate the change in velocity of the car (Specify the direction of the change in velocity as an angle measured relative to west).

B4. An arrow is shot horizontally from a height of 1.50 m above the level ground. The initial speed of the arrow is 45.0 m/s. Calculate the time after firing when the arrow hits the ground. Ignore any frictional effects.

continued on page 6 ...

B5. A sled is initially travelling with a velocity of 2.00 m/s along a horizontal stretch of snow. The coefficient of kinetic friction between the sled and the snow is 0.150. Calculate the magnitude of the acceleration of the sled.

ANSWERS FOR PART B

ENTER THE ANSWERS FOR THE PART B PROBLEMS IN THE BOXES BELOW.

THE ANSWERS MUST CONTAIN THREE SIGNIFICANT FIGURES AND THE UNITS MUST BE GIVEN.

ONLY THE ANSWERS WILL BE MARKED. THE SOLUTIONS WILL NOT BE MARKED.

B1	
B2	
B3	@
B4	
B5	

continued on page 7 ...

PART C

IN EACH OF THE FOLLOWING QUESTIONS, GIVE THE COMPLETE SOLUTION AND ENTER THE FINAL ANSWER IN THE BOX PROVIDED.

THE ANSWERS MUST CONTAIN THREE SIGNIFICANT FIGURES AND THE UNITS MUST BE GIVEN.

NO CREDIT WILL BE GIVEN FOR ANSWERS ONLY. EQUATIONS NOT PROVIDED ON THE FORMULA SHEET MUST BE DERIVED.

C1. While sitting on a tree branch 10.0 m above the ground, you drop (from rest) a chestnut. When the chestnut has fallen 2.50 m, you throw a second chestnut straight down. Ignore any effects due to air resistance.

(a) Calculate the time for the first chestnut to fall 2.50 m from the branch.

(b) Calculate the time for the first chestnut to fall the 10.0 m to the ground.

(c) Calculate the required initial speed of the second chestnut so that both chestnuts reach the ground at the same time.

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C2. A football is kicked such that it has an initial speed of 18.0 m/s at an angle of 65.0° above the horizontal when it leaves the kicker's foot. How far does the football travel horizontally before it hits the ground. Ignore any effects due to air resistance.

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C3. The space probe DS-1 has a mass of 474 kg and an ion drive engine producing a constant thrust of 5.60×10^{-3} N in the $+x$ direction. At the same time, a maneuvering engine is producing a constant thrust of 1.25×10^{-3} N in the $+y$ direction. Both engines operate for 1.00×10^{3} days. Calculate the displacement of the probe (distance and direction relative to the $+x$ axis) from its starting position at the end of the 1.00×10^{3} days. Assume that the mass of the probe remains constant and that it starts from rest.

distance (in m):	
direction:	

END OF EXAMINATION