College of Arts and Science
Department of Mathematics, Statistics and Physics
Physics program

General Physics for Engineering I PHYS191
General Physics I Phys 101
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EXAM 1 24th March 2014

Instructors
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Students name: _____

Students ID: _____

Section number:_____

Please read those instructions carefully:

- Make sure you have 6 pages after the cover page, including 2 parts A and B. Part A consist of 12 multiple choice questions where you select only one of the proposed answers. Part B consist of 3 problems that you have to solve.
- Calculators are permitted, but no electronic dictionaries and mobile phones are strictly forbidden.
- All work must be done on exam paper, no loose paper are allowed.
- This is a timed exam (120 minutes). Manage your time and do not spend too much time on any particular question.

Useful formulas

Constant acceleration in 2D:

x Component (horizontal)		*y* Component (vertical)
$v_x = v_{x0} + a_x t$	(Eq. 2–12a)	$v_y = v_{y0} + a_y t$
$x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$	(Eq. 2–12b)	$y = y_0 + v_{y0} t + \frac{1}{2} a_y t^2$
$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$	(Eq. 2–12c)	$v_y^2 = v_{y0}^2 + 2a_y(y - y_0)$

Quadratic equation:

If $ax^2 + bx + c = 0$

then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Part A. MULTIPLE CHOICE
Choose one answer that best completes the statement or answers the question.
Indicate your choice using pen in the space provided.

Choose only ONE answer. You don't need to give justification.
More than one answer will result in loosing all the marks of that question.
Each question is 1 point.

1) What is 56 + (32.00)/(1.2465 + 3.45) written with the correct number of significant figures?
A) 62.81
B) 62.812
C) 62.8123846
D) 62.8
E) 63

2) What is the conversion factor between km/h and m/s?
A) 2.78×10^{-1} (m/s)/(km/h)
B) 3.60 (m/s)/(km/h)
C) 16.7 (m/s)/(km/h)
D) 7.72×10^{-5} (m/s)/(km/h)
E) 1.30×10^{4} (m/s)/(km/h)

3) Power is defined as the rate of work per time, power = work/time. If the dimensions of power are $[ML^2T^{-3}]$, what are the dimensions of work?
A) $[ML^2T^{-2}]$ B) $[ML^2T^{-4}]$ C) $[MLT^{-3}]$ D) $[ML^3T^{-3}]$ E) $[ML^2T^{-1}]$

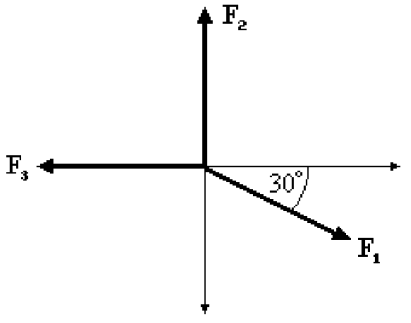
4) A rock is dropped from a vertical cliff. The rock takes 7.00 s to reach the ground below the cliff. What is the height of the cliff?
A) 100 m B) 80.1 m C) 481 m D) 26.2 m E) 240 m

5) Two objects are thrown from the top of a tall building. One is thrown up, and the other is thrown down, both with the same initial speed. What are their speeds when they hit the street?
A) The one thrown down is traveling faster.
B) They are traveling at the same speed.
C) The one thrown up is traveling faster.
D) It is impossible to tell because the height of the building is not given.
E) It is impossible to tell because a numerical value for the initial speed is not given.

6) Vector $\vec{C} = \vec{A} + \vec{B}$. Under what condition is $|\vec{C}|^2 = |\vec{A}|^2 + |\vec{B}|^2$?
A) Vectors $\vec{A}$ and $\vec{B}$ are in perpendicular directions.
B) The statement is always true.
C) The statement is never true.
D) Vectors $\vec{A}$ and $\vec{B}$ are in opposite directions.
E) Vectors $\vec{A}$ and $\vec{B}$ are in the same direction.

7) A pilot drops a bomb from a plane flying horizontally at a constant speed. Neglecting air resistance, when the bomb hits the ground the horizontal location of the plane will
A) be over the bomb.
B) be in front of the bomb.
C) depend of the mass of the bomb when it was released.
D) be behind the bomb.
E) depend of the speed of the plane when the bomb was released.

FIGURE 1



8) Refer to Figure 1 The magnitudes of the forces as shown in the figure are: F_1 = 80.0 N, F_2 = 60.0 N, and F_3 = 40.0 N. The resultant force acting on the particle O is given by
A) 60.0 N at an angle 90.0° with respect to +*x*-axis.
B) 180 N at an angle 60.0° with respect to +*x*-axis.
C) 20.0 N at an angle 34.3° with respect to +*x*-axis.
D) 40.0 N at an angle 60.0° with respect to +*x*-axis.
E) 35.5 N at an angle 34.3° with respect to +*x*-axis.

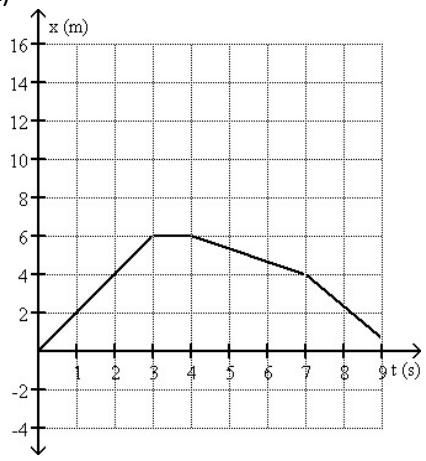
9) An object is moving with constant velocity in a straight line. Which of the following statements is true?
A) There are no forces acting on the object.
B) A constant force is being applied in the direction of motion.
C) There is no frictional force acting on the object.
D) The net force on the object is zero.
E) A constant force is being applied in the direction opposite of motion.

10) Two objects push away each other. The first object has a mass 30.0 kg and it accelerates at 2.00 m/s^2 toward the east. The second object has a mass 7.00 kg. If no other forces are acting on the objects, what is the acceleration of the second object?
A) 4.67 m/s^2 west
B) 4.67 m/s^2 east
C) 1.14 m/s^2 east
D) 8.57 m/s^2 west
E) 2.00 m/s^2 west

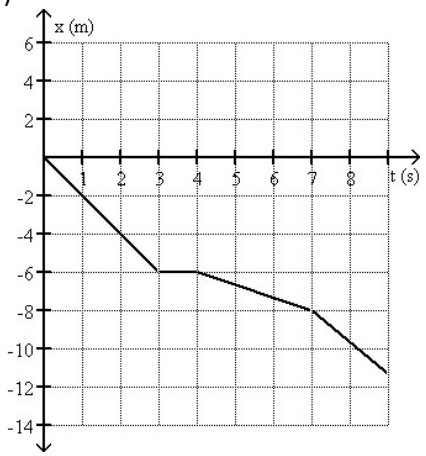
11) Starting from rest, a 4.0-kg body reaches a speed of 8.0 m/s in 2.0 s. What is the net force acting on the body?
A) 4.0 N B) 2.0 N C) 16 N D) 8.0 N E) 32 N

12) Which graph below could represent the motion of the object described in the following sentences? The object that starts its motion with a constant velocity of 2.0 m/s east. After 3.0 s, the object stops for 1.0 s. The object then moves toward the west a distance of 2.0 m in 3.0 s. The object continues travelling in the same direction, but increases its speed by 1.0 m/s for the next 2.0 s.

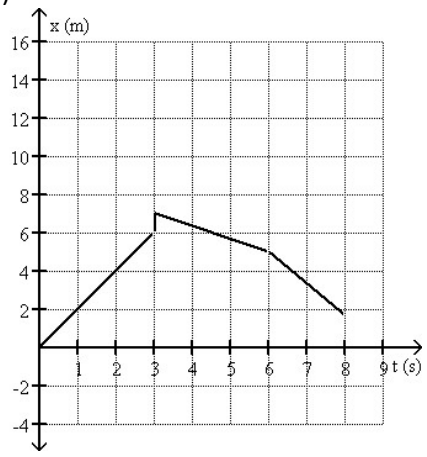
A)



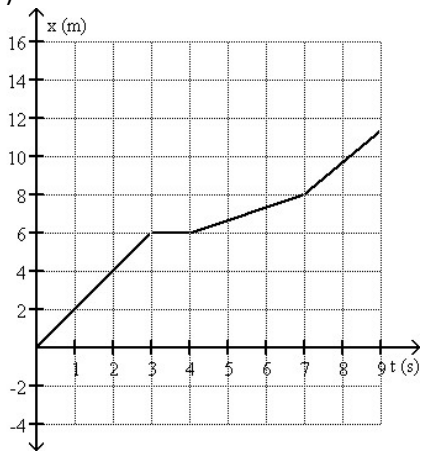
B)



C)



D)



E) None of the above graphs could represent the motion described

Part B. Problems

Instructions: Solve the problems given**. Present a clear work**. Solve symbolically first draw a box around your symbolic answer. Do the numerical application afterwards and draw a box around your numerical answer. You must give the unit of your numerical answer.

Problem 1. (3pts)

A sphere has mass M = 913 g and a radius of R = 124.3 mm.
The relation between the volume V and the radius R of a sphere is: $V = \frac{4}{3}\pi R^3$
The density is given by $\frac{M}{V}$.

Applying the rules for significant figures,

a) calculate the volume of the sphere in mm^3
b) calculate the density of the sphere in units of g/mm^3.
c) express this density in the standard SI units using scientific notation.

Problem 2. (5pts)

A ball is hit straight up into the air with a speed of 30.0 m/s from ground level.

a) Calculate the time the ball is in the air.
b) Calculate the height that the ball reached after 3.06s.
c) Determine the time at which the ball passes 25.0 m above the ground level.
d) Explain why there are two answers to part c.

Problem 3. (5pts)

A projectile is fired from ground level with an initial speed v_0 = 72.3 m/s at an angle θ =69.2° above the horizontal.

(a) Calculate the time necessary for the projectile to reach its maximum height.
(b) Calculate the maximum height *h* reached by the projectile.
(c) Calculate the horizontal and vertical components of the velocity vector at the maximum height.
(d) Calculate horizontal distance D travelled by projectile, if the landing point is 20 m below the starting ground level.
(e) Calculate the magnitude of the velocity at that landing point, and the angle it makes with the horizontal.