Ver.№ 1

University of Ottawa
PHY1331 Fall 2017
Test 2 Nov 11
Dr. Czajkowski

STUDENT NAME_____ **STUDENT NUMBER:**_____

Closed Book Test **Duration: 100min**

PART I IN THE SCANTRON SHEETS ENTER THE ANSWERS TO THE FOLLOWING 7 QUESTIONS. (6 BEST ANSWERS COUNT FOR THE 60% OF THIS TEST MARK)

1. A bullet is fired through a board, 14.0 cm thick, with its line of motion perpendicular to the face of the board. If it enters with a speed of 450 m/s and emerges with a speed of 220 m/s, what is the bullet's acceleration as it passes through the board?

a) –500 km/s^2 **b)** –550 km/s^2 **c)** –360 km/s^2 **d)** –520 km/s^2 **e)** –275 km/s^2

2. A 0.20-km wide river has a uniform flow speed of 3.0 m/s toward the east. A boat with a speed of 8.0 m/s relative to the water leaves the south bank and heads in such a way that it crosses to a point directly north of its departure point. How long does it take the boat to cross the river?

a) 32 s **b)** 23 s **c)** 25 s **d)** 27 s **e)** 17 s

3. A race car moving with a constant speed of 60 m/s completes one lap around a circular track in 50 s. What is the magnitude of the acceleration of the race car?

a) 8.8 m/s^2 **b)** 7.5 m/s^2 **c)** 9.6 m/s^2 **d)** 6.3 m/s^2 **e)** 5.3 m/s^2

4. A ball is thrown horizontally from the top of a building 100m high. The ball strikes the ground at a point 65 m horizontally away from and below the point of release. What is the magnitude of velocity of the ball just before it strikes the ground?

a) 47 m/s **b)** 44 m/s **c)** 39 m/s **d)** 36 m/s **e)** 14 m/s

5. A 7.0-kg object is suspended by a string from the ceiling of an elevator that is accelerating downward at a rate of 2.4 m/s^2. What is the tension in the string?

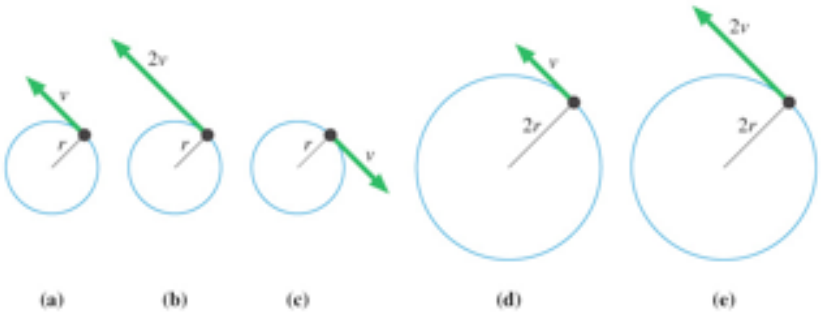
a) 49 N b) 36 N c)62 N d) 13 N e) 52 N

6 If the only forces acting on a 1.0-kg mass are F_1 = (3i – 8j) N and F_2 = (5i + 3j) N, what is the magnitude of the acceleration of the particle?

a) 1.5 m/s^2 b) 6.5 m/s^2 c) 4.7 m/s^2 d) 9.4 m/s^2 e) 7.2 m/s^2

7 In each case below same mass m is spinning on the piece of string.
Rank in order, from largest to smallest, the magnitude of the Tensions (T)a to (T)e of particles a to e.

A) Tb > Te > Ta > Td > Tc
B) Tb > Te > Ta = Tc > Td
C) Tb > Ta = Tc =Te >Td
D) Tb = Te > Ta =Tc > Td
E) None of the above



PART II: OPEN ENDED PROBLEMS

IN THE EXAMINATION BOOKLETS ENTER THE FULL SOLUTIONS TO 4 OUT OF 5 PROBLEMS BELOW.

(INDICATE CLEARLY WHICH 4 PROBLEMS ARE TO BE MARKED BY TA) THIS PART OF THE TEST WILL CONSTITUTE 52 OF THE WEIGHT OF THE TEST)

1 A ball is tossed from an upper-story window of a building. The ball is given an initial velocity of 8.00 m/s at an angle of 20.0° below the horizontal. It strikes the ground 3.00 s later.
(a) How far horizontally from the base of the building does the ball strike the ground? (4P)
(b) Find the height from which the ball was thrown. (4P)
(c) What is the velocity of the ball when it strikes the ground? (5P)

2 A motorist drives along a straight road at a constant speed of 15.0 m/s. Just as she passes a parked motorcycle police officer, the officer starts to accelerate at 2.00 m/s^2 to overtake her. Assuming the officer maintains this acceleration,
a) determine the time it takes the police officer to reach the motorist. (4P)
b) Find the speed of the officer as he overtakes the motorist (4P)
c) Find the total displacement of the officer as he overtakes the motorist. (5P)

3 An automobile is moving at speed of 2.00 m/s along a circular road of radius 20 m.
A) Find the time it takes to make one full circle when the car is still moving at constant speed. (3P)
B) Find the car radial acceleration during this time. (3P)

Then its speed starts increasing at a rate of 0.600 m/s^2 while it stays on the same road. When the instantaneous speed of the automobile is 4.00 m/s, find

(C) the tangential acceleration component (2P)
(D) the radial acceleration component, and (2P)
(E) the magnitude and direction of the total acceleration with respect to the radius (3P)

4 The largest-caliber antiaircraft gun operated by the German air force during World War II was the 12.8-cm Flak 40. This weapon fired a 25.8-kg shell with a muzzle speed of 880 m/s. What propulsive force was necessary to attain the muzzle speed within the 5.00-m barrel? (The shell moves horizontally with constant acceleration and negligible friction.) (Muzzle speed = exit speed) (13P)

5 Two objects are connected by a light string that passes over a frictionless pulley, as in Figure. Draw free-body diagrams of both objects. The incline is frictionless and if m1 = 2.00 kg, m2 = 6.00 kg, and Ø= 57.0°.
a) draw clear and neat free body diagrams for both masses (3P)
b) write the Newton's Laws in proper form for the components of the forces acting on the body (3P)
c) find the accelerations of the objects, (2P)
d) find the tension in the string, (3P)
e) find the speed of each object 2.00 s after being released from rest. (2P)