# WileyPLUS Assignment 5

Chapters 11, 12, 14

Due Wednesday, December 9 at 11 pm

# PHYS 1020 Final Exam

Friday, December 18, 1:30 - 4:30 pm

The whole course, 30 multiple choice questions

Formula sheet provided

## Seating:

**All in Frank Kennedy Brown Gym!!!**

# No lecture on Wednesday

Will be available in office



8.76/-: A car is driving at a constant speed around a circular track on level ground, completing each lap in 19.5 s. The distance between the tires on the left and right sides of the car is 1.60 m, and the radius of each wheel is 0.350 m.

What is the difference between the angular speeds of the wheels on the left and right sides of the car?

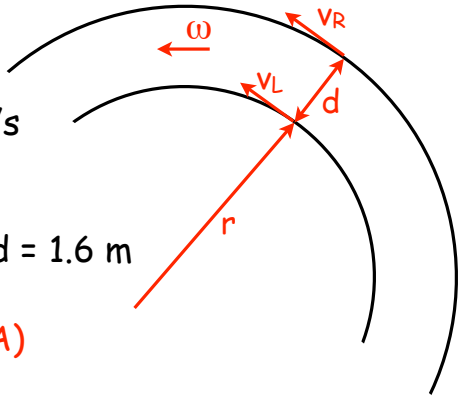
Around track:

$\omega = 2\pi/19.5$ rad/s

$v_L = r\omega$

$v_R = (r + d)\omega$ d = 1.6 m

$v_R - v_L = d\,\omega$ (A)

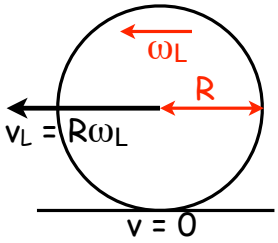



Rotating wheels:

$v_L = R\omega_L$

$v_R = R\omega_R$ R = 0.35 m

$v_R - v_L = R(\omega_R - \omega_L)$ (B)



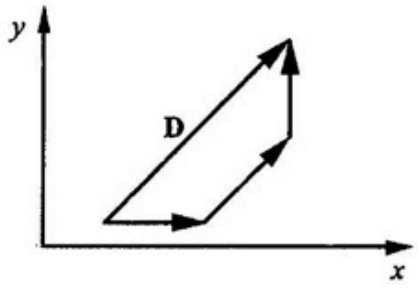

(A) and (B): $v_R - v_L = d\,\omega = R(\omega_R - \omega_L)$

## Q1, 2008 Final

Three vectors **A**, **B**, and **C** have the following $x$ and $y$ components:

$A_x = 1$ m, $A_y = 0$ m, $B_x = 1$ m, $B_y = 1$ m, $C_x = 0$ m, $C_y = -1$ m

According to the graph, how are **A**, **B**, and **C** combined to result in the vector **D**?




(a) $\mathbf{D} = \mathbf{A} - \mathbf{B} - \mathbf{C}$
(b) $\mathbf{D} = \mathbf{A} - \mathbf{B} + \mathbf{C}$
(c) $\mathbf{D} = \mathbf{A} + \mathbf{B} - \mathbf{C}$
(d) $\mathbf{D} = \mathbf{A} + \mathbf{B} + \mathbf{C}$
(e) $\mathbf{D} = -\mathbf{A} + \mathbf{B} + \mathbf{C}$



## Q3, 2008 Final

A projectile is thrown from the top of a building with an initial velocity of 30 m/s in the horizontal direction. If the top of the building is 30 m above the ground, with what speed will the projectile be moving just before it strikes the ground?

(a) 35 m/s (b) 39 m/s (c) 31 m/s (d) 43 m/s (e) 45 m/s

## Q5, 2008 Final

A crate rests on the flatbed of a truck that is initially traveling at 15 m/s on a level road. The driver applies the brakes, and the truck is brought to a halt in a distance of 38 m. If the deceleration of the truck is constant, what is the minimum coefficient of friction between the crate and the truck that is required to keep the crate from sliding?

(a) 0.20
(b) 0.39
(c) 0.59
(d) 0.30
(e) This cannot be determined without knowing the mass of the crate.



## Q7, 2008 Final

A 5-kg block is placed on top of a 15-kg block that rests on a frictionless table. The surface between the top and bottom blocks is roughened so that there is no slipping between the blocks. A 40-N horizontal force is applied to the top block. What is the minimum coefficient of static friction necessary to keep the top block from slipping on the bottom block?

(a) 0.1 (b) 0.2 (c) 0.4 (d) 0.6 (e) 0.8

## Q9, 2008 Final

A satellite is placed in a circular orbit around Mars to observe the surface of Mars from an altitude of 144 km. The equatorial radius of Mars is 3397 km. If the speed of the satellite is 3480 m/s, what is the magnitude of the centripetal acceleration of the satellite?

(a) 2.17 $m/s^2$
(b) 2.60 $m/s^2$
(c) 2.99 $m/s^2$
(d) 3.42 $m/s^2$
(e) 4.05 $m/s^2$



## Q11, 2008 Final

The mass and radius of the moon are $7.4 \times 10^{22}$ kg and $1.7 \times 10^{6}$ m, respectively. What is the weight of a 1.0-kg object on the surface of the moon?

(a) 1.0 N (b) 1.7 N (c) 3.7 N (d) 8.8 N (e) 9.8 N

## Q13, 2008 Final

A 1.0-kg ball on the end of a string is whirled at a constant speed of 2.0 m/s in a horizontal circle of radius 1.5 m. What is the work done by the centripetal force during one revolution?

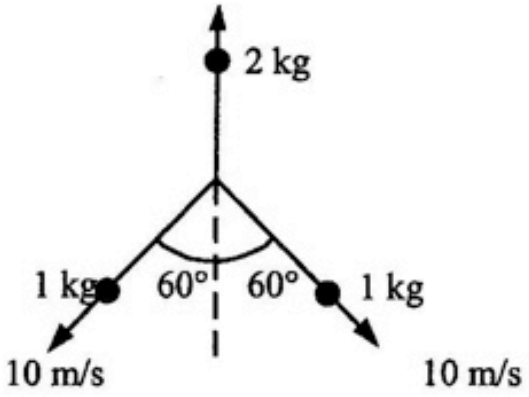
(a) zero Joules
(b) 2.7 J
(c) 6.0 J
(d) 25 J
(e) 33 J



## Q15, 2008 Final

A stationary 4-kg shell explodes into three pieces. Two of the fragments have a mass of 1 kg each and move along the paths shown with a speed of 10 m/s. The third fragment moves upward as shown. What is the speed of the third fragment?

(a) zero m/s
(b) 1 m/s
(c) 5 m/s
(d) 10 m/s
(e) 20 m/s



## Q17, 2008 Final

A fan rotating with an initial angular velocity of 1000 rev/min is switched off. In 2 seconds, the angular velocity decreases to 200 rev/min. Assuming the angular acceleration is constant, how many revolutions does the blade undergo during this time?

(a) 10 (b) 20 (c) 100 (d) 125 (e) 1200



## Q19, 2008 Final

A 60.0-kg skater begins a spin with an angular speed of 6.0 rad/s. By changing the position of her arms, the skater decreases her moment of inertia by 50 %. What is the skater's final angular speed?

(a) 3.0 rad/s
(b) 4.5 rad/s
(c) 9.0 rad/s
(d) 12 rad/s
(e) 18 rad/s

Q21, 2008 Final:

**The velocity of a certain simple harmonic oscillator is given by**

$$v = -(12\ \text{m/s}) \sin[(6.0\ \text{rad/s})\, t].$$

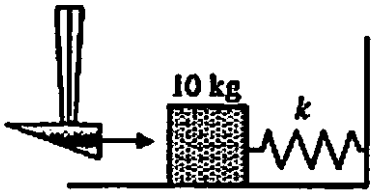
**What is the amplitude of the simple harmonic motion?**

**(a) 2.0 m (b) 4.0 m (c) 6.0 m (d) 8.0 m (e) 12 m**



Q23, 2008 Final:

**A 10-kg box is at rest at the end of an unstretched spring with constant k = 4000 N/m. The mass is struck with a hammer giving it a velocity of 6.0 m/s to the right across a frictionless surface. What is the amplitude of the resulting oscillation of this system?**




**(a) 0.3 m (b) 0.4 m (c) 0.5m (d) 0.6 m (e) 2 m**

Q25, 2008 Final: Modern railway track consists of continuous welded steel rails of 1 km length. If the linear expansion coefficient of steel is $11 \times 10^{-6}\ K^{-1}$, by how much does the length of each rail change between a winter day when the temperature is $-40^0C$ and a summer day when the temperature is $+40^0C$?



Q27, 2008 Final: Assume a liquid is flowing through a pipe of cross-sectional area A at pressure P and velocity v. If, at some point, the area decreases, then:

a) velocity v will increase, pressure P will remain the same
b) velocity v will increase, pressure P will decrease
c) velocity v will remain the same, pressure P will increase
d) velocity v will remain the same, pressure P will decrease
e) velocity v will increase, pressure P will increase

## Q2, 2008 Final:

An airplane is flying north at 160 m/s. It makes a gradual 180° turn at constant speed, changing its direction of travel from north to south. The process takes 40 s. The average acceleration of the plane for this turn is:

(a) 4.0 $m/s^2$, north
(b) 4.0 $m/s^2$, east
(c) 4.0 $m/s^2$, south
(d) 8.0 $m/s^2$, north
(e) 8.0 $m/s^2$, south