PHYSICS 201 Equations Sheet	Translational Motion	Rotational Motion
	LINEAR	ANGULAR
Time	t	t
Displacement	x; $(x = r\theta)$	θ
Velocity	$v = \Delta x/\Delta t$; $(v = r\omega)$	$\omega = \Delta\theta/\Delta t$
Acceleration	$a = \Delta v/\Delta t$; $(a = r\alpha)$	$\alpha = \Delta\omega/\Delta t$ $(a_c = r\omega^2 = \frac{v^2}{r})$
Kinematic Equations	$v = v_0 + at$	$\omega = \omega_0 + \alpha t$
	$x = ½(v + v_0)t$	$\theta = ½(\omega + \omega_0)t$
	$x = v_0t + ½ at^2$	$\theta = \omega_0 t + ½ \alpha t^2$
	$v^2 = v_0^2 + 2ax$	$\omega^2 = \omega_0^2 + 2\alpha\theta$
Inertia	m = mass	I = Rotational inertia; $I = \sum m_i r_i^2$
To create	force = F	torque = τ = LA· F
Newton's second law of motion	$\Sigma\mathbf{F} = m\mathbf{a}$	$\Sigma\boldsymbol{\tau} = I\boldsymbol{\alpha}$
	$\Sigma\mathbf{F} = \Delta\mathbf{p}/\Delta t$	$\Sigma\boldsymbol{\tau} = \Delta\mathbf{L}/\Delta t$
Work	$F\cdot x$	$\tau\cdot\theta$
Kinetic Energy	Translational Kinetic Energy = TKE = $½ mv^2$	Rotational Kinetic Energy = RKE = $½ I\omega^2$
Momentum	$\mathbf{p} = m\cdot\mathbf{V}$	$\mathbf{L} = I\cdot\boldsymbol{\omega}$
Conservation of momentum	$\Sigma m_i v_i = \Sigma m_f v_f$	$\Sigma I_i\omega_i = \Sigma I_f\omega_f$

Pressure = Force/Area $P_{abs} = P_{atm} + P_G$ Density = Mass/Volume

Pressure (P) due to depth h of fluid of density ρ; $P = \rho gh$.

1 atm = 1.013×10^5 N/m^2 = 76 cm.Hg = 760 mm.Hg

The density of the air is 1.29 kg/m^3; Density of water = 1000 kg/m^3 = 1 g/cm^3;
Acceleration due to gravity = g = 9.8 m/s^2.

Area of a circle of radius r, $A_{circle} = \pi r^2$ .Area of a rectangle of length l, and width w, A_{rec}=l x w; Area of a triangle, $A_{triangle}$= 0.5 x base x height.

Volume of a cylinder of radius r and height h; $V= \pi r^2h$; Volume of a sphere = $(4/3) \pi r^3$.

Hooke's law: $\vec{F} = -k\vec{x}$ Elastic PE = EPE = $\frac{1}{2}kx^2$ KE = $\frac{1}{2}mv^2$ $GPE = mgh$

PHYS 201 Fall 2014 Test #3 Name:___________________________

I. For the following multiple choice questions, write your answer in the line next to the question number.

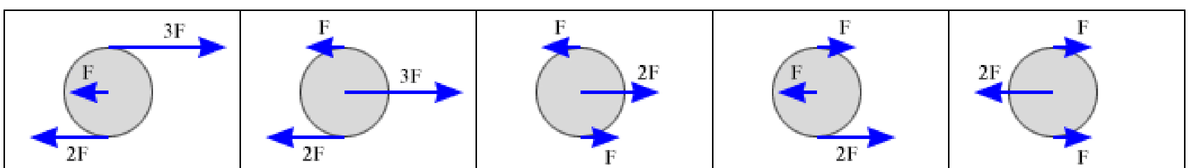
____1. Express the diastolic pressure 85 mm.Hg in Pa.
a. 0.638 b. 1.13×10^4 c. 1.13×10^5 d. 1.013×10^4 e. 1.013×10^5

____2. What is the angular speed in rad/s of the hour hand of an analog watch?
a. 1.75×10^{-3} b. 0.105 c. 8.33×10^{-3} d. 8.73×10^{-3} e. 1.45×10^{-4}

____3. During a spin dry cycle of a washing machine, the motor speeds from 30 rad/s to 95 rad/s while turning the drum through an angle of 402 radians. How long it took to spin this angle?
a. 6.43 s b. 3.21 s c. 4.23 s d. 13.4 s e. 62.5 s

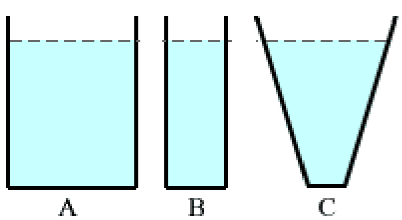
____4. A ball of radius 0.200 m is given an initial angular velocity of 15 rad/s. The ball rolls along a straight line for 5 seconds until it comes to rest. How far the ball travels during this time?
a. 7.5 m b. 37.5 m c. 3 m d. 75 m e. 15 m f. 1.0 m

5-6) Five hockey pucks are sliding across frictionless ice. The drawing shows a top view of the pucks and the three forces that act on each one. The forces can have different magnitudes (*F*, 2*F*, or 3*F*), and can be applied at different points on the puck. The radius of the puck is *R*.
____5. Which one of the five pucks is in Equilibrium?
____6. Which one of the five pucks has a net torque of 5*FR*?



a.	b.	c.	d.	e.

7-8) The drawing shows three containers of circular cross-section, filled to the same height with the same fluid.
____7. In which container, is the pressure at the bottom the greatest?
____8. In which container, is the force at the bottom the greatest?

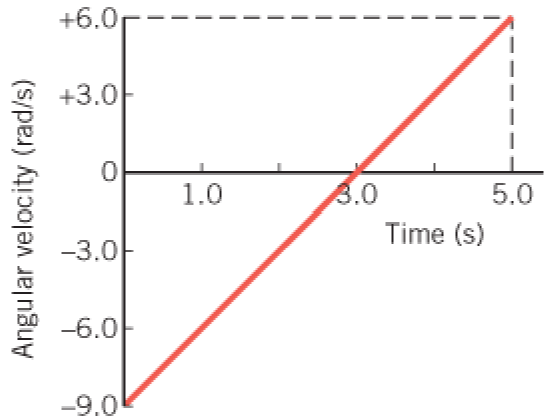


Answers for
a. Container A b. Container B c. Container C
d. All three containers experience the same

_____9. Sit-ups are more difficult to do with your hands placed behind your head instead of on your stomach. This is because,
a. The mass is greater when the hands are placed behind the head instead on the stomach.
b. The mass is smaller when the hands are placed behind the head instead on the stomach.
c. The moment of inertia is greater when the hands are placed behind the head instead on the stomach.
d. The moment of inertia is smaller when the hands are placed behind the head instead on the stomach.

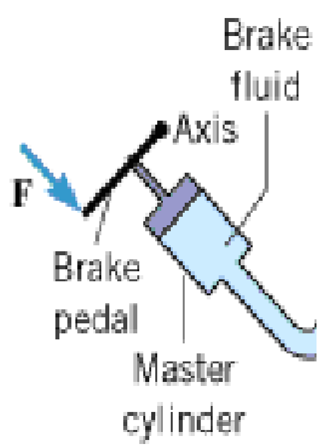
____10. For the motion graphed below, what are the instantaneous angular velocity and angular acceleration at 1 second?

a. 6 rad/s, 6 rad/s^2
b. -6 rad/s, 6 rad/s^2
c. 6 rad/s, 3 rad/s^2
d. -6 rad/s, 3 rad/s^2
e. -6 rad/s, 1.2 rad/s^2

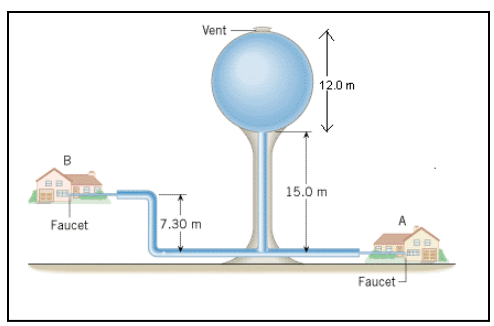


_____11. A force, F = 12-N is applied to a brake pedal as shown below. The length of the brake pedal is 12-cm and the master-cylinder piston is attached 3-cm from the axis, to the brake pedal. Calculate the force exerted to the master cylinder.

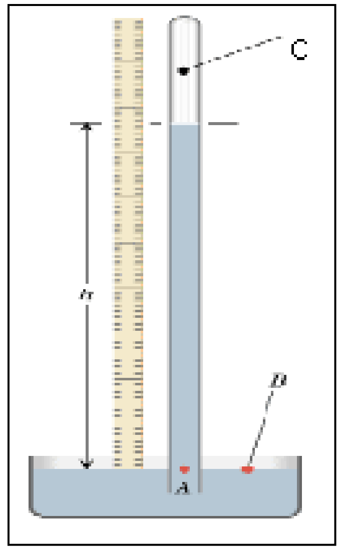
a. 3 N
b. 8 N
c. 12 N
d. 24 N
e. 48 N



___12. The purpose of a water tower is to provide storage capacity and to provide sufficient pressure in the pipes that deliver the water to customers. The drawing shows a spherical reservoir, which is vented to the atmosphere at the top and full. What height must be used to find the gauge pressure at the faucet in house B?
a. 15 m b. 27 m c. 7.3 m
d. 19.7 m e. 34.3 m



____13. A mercury barometer is used to measure the atmospheric pressure as shown in the figure to the right. What is the absolute pressure at point C shown in the diagram?

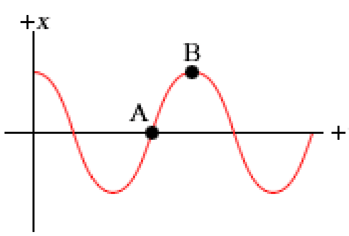


a. 0
b. 76 cm. Hg
c. 760 mm.Hg
d. 1 atm
e. 1.013×10^5 N/m^2

____14. Resonance occurs in harmonic motion when,

a. The system is over-damped.
b. The system is critically damped.
c. The energy in the system is a minimum.
d. The driving frequency is the same as the natural frequency of the system.
e. The energy in the system is proportional to the square of the motion's amplitude.

____15. The drawing shows a graph of displacement *x* versus time *t* for simple harmonic motion of an object on a horizontal spring. Which one of the following answers correctly gives the magnitude *v* of the velocity and the magnitude *a* of the acceleration at points **A** and **B** in the graph?



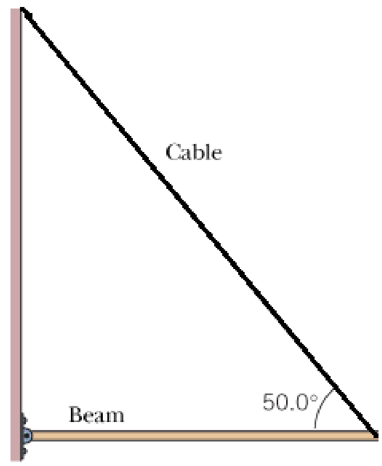
a. v_A = *maximum*, a_A = *maximum*, v_B = *0 m/s*, a_B = *0 m/s*^{2}
b. v_A = *maximum*, a_A = *0 m/s*^{2}, v_B = *0 m/s*, a_B = *maximum*
c. v_A = *0 m/s*, a_A = *0 m/s*^{2}, v_B = *maximum*, a_B = *maximum*
d. v_A = *0 m/s*, a_A = *maximum*, v_B = *maximum*, a_B = *0 m/s*^{2}
e. v_A = *maximum*, a_A = *maximum*, v_B = *0 m/s*, a_B = *maximum*

--end of MC questions.

II. State Pascal's principle and identify a practical application of the principle.

III. The spring loaded gun in a ballistic pendulum is compressed by 5.2 cm and released. The 54 gram steel ball leaves the gun with a velocity of 6.3 m/s. Calculate the spring constant of the spring.

IV. A 1250-N uniform horizontal beam is hinged to a vertical wall at one end and is supported by a cable at the other end as shown below. Draw a free-body diagram for the beam and find the tension in the cable.



V. The drawing shows a model for the motion of the human forearm in throwing a dart. Because of the force $\vec{M}$ applied by the triceps muscle, the forearm can rotate about an axis at the elbow joint. Assume that the forearm has the dimensions shown in the drawing and a moment of inertia of 0.065 kg.m^2 (including the effect of the dart) relative to the axis at the elbow. Assume also that the force $\vec{M}$ acts perpendicular to the forearm. Ignoring the effect of gravity and any frictional forces, determine the magnitude of the force $\vec{M}$ needed to give the dart a tangential speed of $5.0\ \mathrm{m/s}$ in 0.10 s, starting from rest.