# TEST 2 OBJECTIVES

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| Given initial and final angular displacement and time interval for circular motion, find the average angular velocity. | $\bar{\omega} = \frac{\Delta\theta}{\Delta t}$ |
| Given initial and final angular velocities and the time interval for circular motion, find the average angular acceleration. | $\bar{\alpha} = \frac{\Delta\omega}{\Delta t}$ |
| Given information about radius, angular velocity, and angular acceleration for circular motion, calculate the (linear) tangential velocity and acceleration for this motion. | $\upsilon_t = r\omega \quad a_t = r\alpha$ |
| Given information about the radius of rotation, and the linear and angular velocity for motion in a circle, calculate the centripetal acceleration and the total acceleration for this motion. | $a_c = \frac{\upsilon^2}{r} = \omega^2 r = 4\pi^2 r f^2 = \frac{4\pi^2 r}{T^2} \quad F_c = ma_c$ |
| Solve problems which apply the formulas relating linear and angular displacement and velocity, uniform circular acceleration, and time of travel for motion along a circular path. | <u>If $\alpha$ = constant</u>: $\theta_f - \theta_i = \omega_i t + \frac{1}{2}\alpha t^2$<br>$\omega_f = \omega_i + \alpha t \quad \omega_f^2 = \omega_i^2 + 2\alpha\theta \quad \omega_{\text{av}} = \frac{\omega_f + \omega_i}{2}$ |
| For a body moving in a circular path, use appropriate formulas for this kind of motion to relate the following quantities to one another:<br>a) linear velocity of the object,<br>b) radius vector of the circular path,<br>c) period and frequency of revolution,<br>d) centripetal acceleration of the object,<br>e) forces (including centripetal) which act on the object. | |
| Given a distributed mass or a set of distributed masses acted on by non-concurrent forces, apply the first and second conditions for equilibrium to determine any unknown forces, directions or lines of action. | $\tau = rF\sin\theta$<br>Equilibrium: $\sum F_x = 0 \quad \sum F_y = 0 \quad \sum \tau = 0$ |
| Relate the angular acceleration of an object of constant moment of inertia to the net torque exerted on the object.<br>Relate the angular acceleration of an object acted on by a constant torque to the moment of inertia of the object.<br>Use the rotational form of Newton's second law of motion to relate torque, moment of inertia and angular acceleration for motion in a circle.<br>Relate the rotational kinetic energy of a rotating object to its moment of inertia and its angular velocity. | $\sum \tau = I\alpha \quad KE_{rotational} = \frac{1}{2} I\omega^2 \quad L = I\omega$<br>If $\sum \tau_{external} = 0,\ \sum I_i\omega_i = \sum I_f\omega_f$ |
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| Relate the change in an object's angular momentum to the magnitude of an applied torque and the specific time over which the force acts, i.e., to the angular impulse of the force.<br>Use the law of conservation of angular momentum to solve problems involving the interaction of two bodies in circular motion. | |
| Relate the density of a substance to its mass and volume. | $\rho = \frac{M}{V}$ |
| Calculate average pressure in a fluid as a function of force and surface area. | $P = \rho g y$ |
| Apply Archimedes' principle to problems involving buoyant forces | $B = \rho_f g V$ |
| Apply the equation of continuity and Bernoulli's equation to problems involving laminar (non-turbulent) flow in a fluid. | Continuity: $A_1\upsilon_1 = A_2\upsilon_2$<br>$P_1 + \frac{1}{2}\rho\upsilon_1^2 + \rho g y_1 = P_2 + \frac{1}{2}\rho\upsilon_2^2 + \rho g y_2$ |
| Apply Torricelli's equation to problems of fluid flow from an opening. | $\upsilon = \sqrt{2gh}$ |