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| PHYSICS 201  Equations Sheet | Translational Motion | Rotational Motion |
| LINEAR | ANGULAR |
| Time | t | t |
| Displacement | x; (x = rθ) | θ |
| Velocity | v = Δx/Δt; (v = rω) | ω = Δθ/Δt |
| Acceleration | a = Δv/Δt; (a = rα) | α = Δω/Δt |
| Kinematic Equations | v = v0 + at | ω = ω0 + αt |
| x = ½(v + v0)t | θ = ½(ω + ω0)t |
| x = v0t + ½ at2 | θ = ω0t + ½ αt2 |
| v2 = v02 + 2ax | ω2 = ω02 + 2αθ |
| Inertia | *m* = mass | *I* = Rotational inertia; |
| To create | force = F | torque = τ = LA·F |
| Newton's second law of motion | Σ**F** = m**a** | Σ**τ** = I**α** |
| Σ**F** = Δ**p**/Δt | Σ**τ** = Δ**L**/Δt |
| Work | *F·x* | *τ·θ* |
| Kinetic Energy | Translational Kinetic Energy = TKE = ½ mv2 | Rotational Kinetic  Energy = RKE = ½ Iω2 |
| Momentum | **p** = m·**V** | **L** = I·**ω** |
| Conservation of momentum | Σmivi = Σmfvf | ΣIiωi = ΣIfωf |

Frictional force = *Ffr=μkFN* Centripetal force =

Hooke’s law: Elastic PE = EPE =

Pressure = Force/Area Pabs = Patm + PG Density = Mass/Volume

Pressure (P) due to depth h of fluid of density ρ; P = ρgh.

1 atm = 1.013 x 105 N/m2 = 76 cm.Hg = 760 mm.Hg

The density of the air is 1.29 kg/m3; Density of water = 1000 kg/m3 = 1 g/cm3; Acceleration due to gravity = g = 9.8 m/s2.

Areas: Acircle = π r2 Asphere = 4π r2 Arec=length x width; Atriangle= 0.5 x base x height.  
  
Volumes: Vrec=length x width x height Vcyl. = π r2h; Vsphere = (4/3) π r3.

Study Guide for Final

Study the Materials from T1 & T2.

Chapter-8: Rotational Kinetics

1. Angular displacement, angular velocity, and angular acceleration.
2. Solving rotational motion problems using kinematic equations.
3. Relating linear quantities with angular quantities using radius.

Chapter-9: Rotational Dynamics

1. Torque, center of gravity, moment of inertia, rotational work, rotational kinetic energy, and angular momentum.
2. Solving problems involving objects in equilibrium using the conditions for equilibrium.
3. Applying Newton’s second law for rotational motion.
4. Conservation of angular momentum.

Chapter-10: Simple Harmonic Motion and Elasticity

1. Hooke’s law, period, frequency, and amplitude.
2. Elastic potential energy.
3. Pendulum and resonance.
4. Oscillating mass on a spring.

Chapter 11: Fluids

Density, pressure, pressure at depth h, barometer, atmospheric pressure, gauge pressure, absolute pressure, and Pascal’s principle.

1. Distinguishing absolute pressure from gauge pressure.
2. Measuring the atmospheric pressure.
3. Calculating pressure due to depth of fluid.

Chapter 16 & 17: Waves and Sound  
  
1. Waves: Define and give examples for transverse wave, longitudinal wave, and both.  
2. Periodic wave:   
a. Define periodic wave, period (T), frequency (f), wavelength (λ), and wave speed.  

b. Show a periodic wave as a function of time and distance.

3. Speed of a wave on a string: The **speed of a wave** depends on the properties of the medium in which the wave travels. For a transverse wave on a string that has a tension *FT* and a mass per length *m*/*L*, the wave speed is, (which will be given):

 (given)

4. The nature of sound waves in air: Type, frequency, intensity, and wave form.

, I0 = 10-12 W/m2. (given)

5. Doppler effect: The **Doppler effect** is the change in frequency detected by an observer because the sound source and the observer have different velocities with respect to the medium of sound propagation. If the observer and source move with speeds *v*o and *v*s, respectively, and if the medium is stationary, the frequency *f*o detected by the observer is,

 (given)

6. Problem solving with transverse and longitudinal standing waves.