PES 1000 –Physics in Everyday Life – At-Home Problem Set

UNIT 2: (Chapters 7 – 10) Momentum, Rotation, Fluids, Heat

(Griffith 'The Physics of Everyday Life' 8th.ed.)

Definitions

1. Which of the following is a statement of Pascal's Principle?
   A. "A change in the pressure of a fluid is transmitted uniformly in all directions throughout the fluid."
   B. "The buoyant force acting on an object fully or partially submerged in a fluid is equal to the weight of the fluid displaced by the object."
   C. "Fluids moving at relatively higher speeds exert lower pressure on the fluid around them."

- Momentum, impulse, conservation of momentum, elastic/inelastic/plastic collisions, coefficient of restitution
- Spin axis, angular velocity & acceleration, torque, rotational inertia, statement of Newton's 3 Laws of motion applied to rotational motion
- Pressure, volume, density, 'incompressible', Pascal's principle, Archimedes' principle, Bernoulli's principle, buoyancy
- Heat, temperature, specific heat capacity, state (or phase) change & latent heats of vaporization & fusion, ~~internal energy, 1st Law of Thermodynamics, heat engine, refrigerator,~~ heat flow (conduction, convection, radiation)

Units

2. The International Standard (SI), or metric system, units for pressure are:
   A. Calories (cal)
   B. Pounds-per-square-inch (psi)
   C. Pascals (Pa)

SI units: radians, radians/sec, radians/sec^2, Newton-meter, Pascal, Kelvin, Joule **Other metric units**: kPa, mm of mercury, atmospheres, g/cm^3, Celsius, calorie, Calorie **US Customary units**: foot-pounds, pounds per square inch (psi), Fahrenheit

Relationships

3. You exert a force on a lever to lift a rock. If your lever has been shorter, the torque you generated would have been:
   A. Greater
   B. Less

Angular speed, angular acceleration & time; **torque**, force, lever arm & angle; **Rotational inertia**, mass & distance from spin axis; **net torque**, rotational inertia & angular acceleration; **momentum**, mass & velocity; **pressure**, force & area; **pressure change**, density & depth; **pressure** & fluid velocity; **work** & heat; **heat flow**, mass, specific heat capacity & change in temperature;

Applications

4. Two isolated clay blobs collide & stick together with no mass loss. Which quantity is conserved during the collision?
   A. Energy
   B. Force
   C. Momentum

Bicycle wheel Spinning skater Downhill race and kinetic energy	Car vs. wall, head with helmet vs. floor Elastic/inelastic collisions between balls Rifle & bullet, rocket in space Hydraulic jack	Torricelli barometer, straws Helium and hot air balloons Boat/submarine in water

The following list of equations will be provided on the last page of the traditional multiple-choice exam.

• p=mv, impulse=F*Δt • τ=F*d, Στ=I*α, ω=ω_o+α*t • KE = KE_{linear} + $KE_{rotation}$ = 1/2*m*v^2 + 1/2*I*ω^2 • P=F/A, PV=constant (for constant temperature), ΔP=ρ*g*h • ~~$\Delta E_{int}=Q_{IN}+W_{ON}$,~~ Q=m*c*ΔT	p=momentum, m=mass, v=velocity,F=force, t=time, τ=torque, d=lever arm, I=rotational inertia, α=angular acceleration, ω=angular speed, θ=angle, P=pressure, V=volume, A=area, h=depth, ρ=density, Q=heat, T=temperature, c=specific heat capacity, W=work, KE=kinetic energy, ~~E_{INT}=internal (thermal) energy~~, Δ_=change in _