***FORMULA SHEET PHYS 1401 (rev June 2024)***

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| Ch-1: Introduction | | |
| *Coordinate Systems*      *Vectors*  *The formula reads: vector(A) = vector(A)_x + vector(A)_y* | *Vector Addition:* | |
| Ch-2 Motion in One-Dimension | | |
|  | *For constant acceleration:* | |
| Ch-3: Two-Dimensional Motion | | |
| *Equations in x-direction* | *Equations in y-direction*  *Projectile Motion:*    *Relative Velocity* | |
| Ch-4: Laws of Motion | | |
| *Second Law:*  *Third Law:*  Equilibrium: |  | |
| Ch-5: Energy | | |
| *For Constant Force*  *Restoring Force (spring):*  *Kinetic Energy: KE =*  *PE (gravitational):*  *PE (spring*):  *Isolated System with no non-conservative forces:* | *Work -Kinetic Energy theorem*  *Work (Gravitational PE):*  *Work (Spring):*  *Work (Friction):*  *Work (External)* | |
| Ch-6: Momentum and Collisions ++start++ | | |
| *Linear Momentum*    *Impulse*  *Rocket Propulsion:*  *Thrust:*  *Elastic Collisions:* | *Conservation of Linear Momentum*    *Head-on Elastic Collision:* | |
| Ch-7: Rotational Motion and the Law of Gravity | | |
| *Banked curve:*  *Newtonian Gravitation:*  *Kepler’s Laws:* | *Relationship between angular and tangential variables*  *Centripetal Acceleration:*  *Centripetal Force:* | |
| Ch-8: Rotational Equilibrium and Rotational Dynamics | | |
| *Torque:*  *Conditions of Equilibrium:*    *Moment of inertia (point mass)*  *Moment of inertia (Disc or Cylinder)*  *Moment of inertia (Solid Sphere)* | | Eqn118      *Rotational Kinetic Energy*  *Angular Momentum* |
| Ch-9: Solids and Fluids | | |
| *Density:*  *Pressure:*  *P(absolute) = P(gauge) + P(atmosphere)*  *Pascal’s Principle:*  *Buoyancy:*  *Floating Object:*  *Continuity Equation:*  *Bernoulli Equation:* | *Surface Tension:*  *Poiseuille’s Law, Rate of Flow:*  *Reynold’s Number:*  *Stokes Law:*  *Stress = Modulus x Strain*  Tensile:  Shear:  Bulk:  *Surface tension*: | |
| Ch-10 Thermal Physics | | |
| *Ideal Gas Equation:* | *Thermal Expansion:*  *Linear*  *Area:*  *Volume:*  *Root Mean Sq. Speed:*  *Average Speed:*  *Most Probable Speed:* | |
| Ch-11 Energy in Thermal Processes | | |
|  | *Thermal conduction:*  *Thermal Radiation:* | |
| Ch-12: Laws of Thermodynamics | | |
| *First Law:*    *Monoatomic Gas:*    *Entropy change:*  *Power:* | *Isobaric:*  *Adiabatic:*  *Isothermal:*  *Carnot cycle efficiency:*  COPcooling = |Qc| / W COPheating= |Qh| / W | |

**CONSTANTS**

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| Avogadro’s Number | NA | 6.02x1023 particles/mole |
| Boltzmann’s Constant | kB | 1.38 x 10-23 J/K |
| Stefan’s Constant | σ | 5.669 x 10-8 J/s.m2.K4 |
| Elementary Charge | e | 1.60x10-19 C |
| Gas Constant | R | 8.314 J/mol.K = 0.0821 L.atm/mol.K |
| Gravitational Constant | G | 6.674 x 10-11 Nm2/kg2 |
| Speed of Light | c | 2.997 x 108 m/s ≈ 3 x 108 m/s |
| Atomic Mass Unit | u | 1.66x10-27 kg |
| Mass of proton |  | 1.007276 u = 931 MeV/c2 |
| Mass of Electron |  | 9.1 x 10-31 kg = 0.511 MeV/c2 |
| Atmospheric Pressure | Po | 1.013 x 105 N/m2 =14.7 psi = 76 cm Hg |
| Acceleration due to Gravity | g | 9.8 m/s2 |

**Prefix / suffix**: n = nano = 10-9 µ = micro = 10-6 m = milli = 10-3 c = centi =10-2

G = giga = 109 M = mega = 106 K = kilo = 103

2.205 pound = 1 kilogram 1 psi = 6895 Pa I inch = 2.54 cm