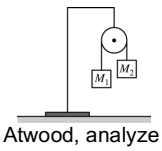
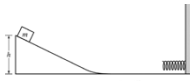
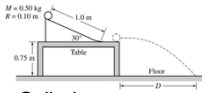
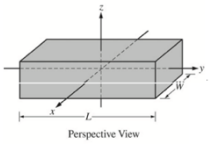
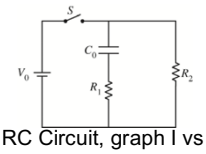
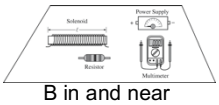
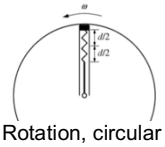
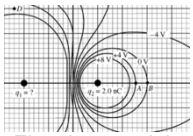
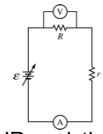
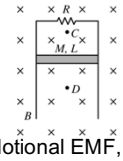
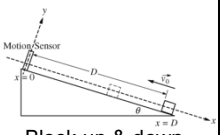
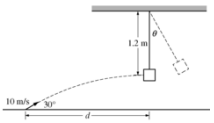
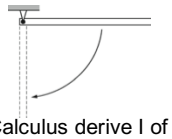
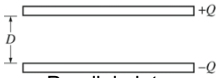
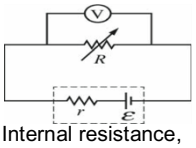
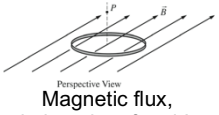
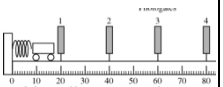
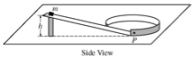
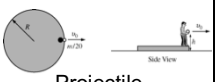
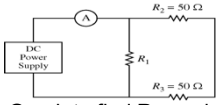
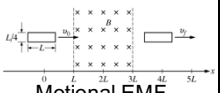
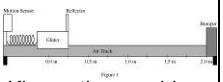
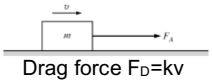
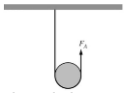
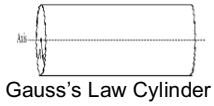
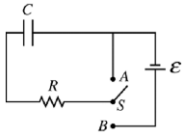
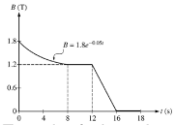
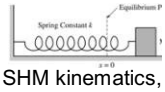
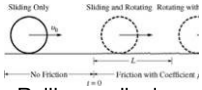
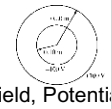
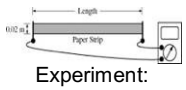
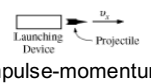
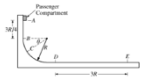
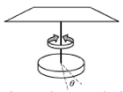
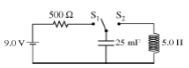
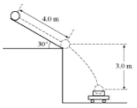
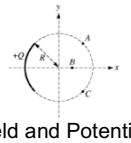
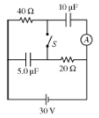
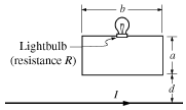
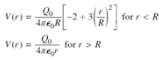
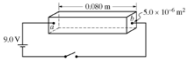
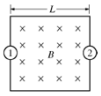
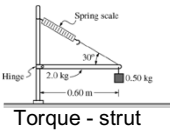
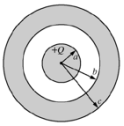
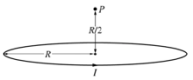
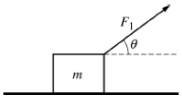
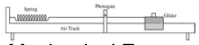
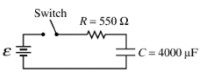
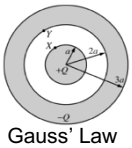
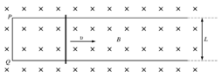
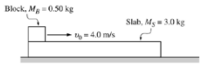
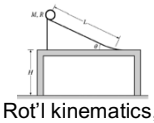
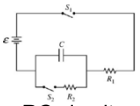
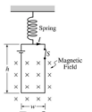
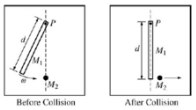
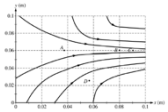
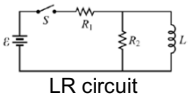
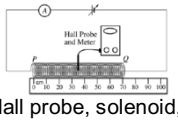
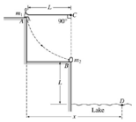
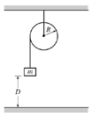
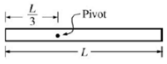
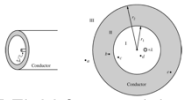
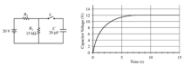
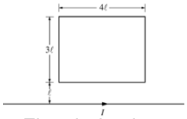
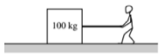
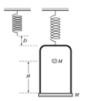
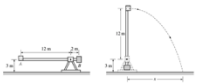
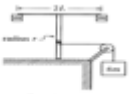
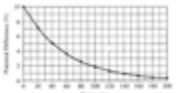
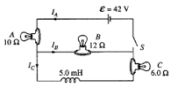
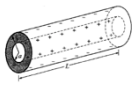
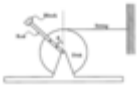
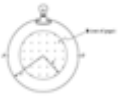
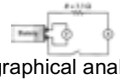
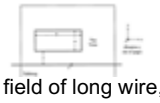
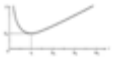
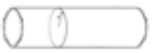
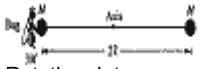
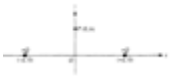
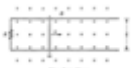
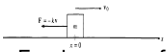
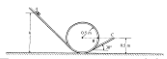
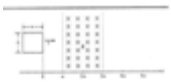
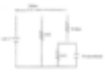
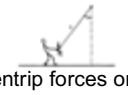
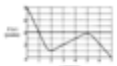
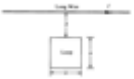
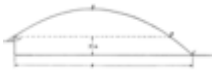
AP Physics C Free-Response Index—started by G. Friedlander

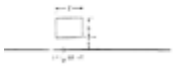
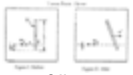
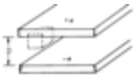
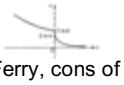
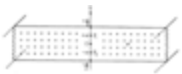
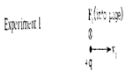
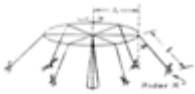
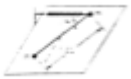
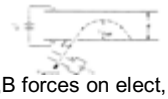
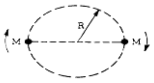
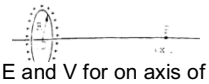
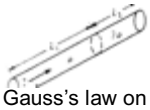
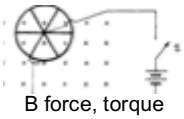
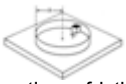
*BB=Black Box problems for Word 2007-8 in single-year files—use multiple-year files

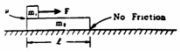
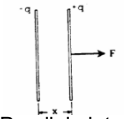
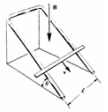
	M1	M2	M3	E1	E2	E3
2017	 Atwood, analyze experiments, modified Atwood	 Energy, time of compression, resistive force $F = \beta v^2$, diff.eq.	 Cylinder on ramp, energy and projectile, sphere vs. cylinder	 Nonconducting slab: Gauss, then between metal plates, E, ΔV	 RC Circuit, graph I vs t, time for 50%, energy	 B in and near solenoid, Ampere's Law, experimental results to find μ_0
2016	 Dynamics, friction, experiment, graphing,	 Momentum, nonlinear spring, energy, net force	 Rotation, circular motion, spring, Angular momentum, vector acceleration	 Electric potential, Electric field, and effects	 V=IR, resistivity, non-ideal meters	 Motional EMF, net field, v_T, power, diff.eq. for speed as a function of time
2015	 Block up & down ramp, kinematics, graphs, friction	 Projectile, momentum, energy, pendulum motion	 Calculus derive I of rod, energy, graph, experiment	 Parallel plate capacitor, Gauss' Law, non-uniform dielectric, potential, energy	 Internal resistance, graphing, finding emf and *r*, maximum I, voltmeters	 Magnetic flux, induced emf and I, energy, force and torque
2014	 Non-linear spring energy, graphing	 Energy, Circular motion F, a, v	 Projectile, momentum, kinematics, angular momentum	 Graph to find R_{eq} and R_1, RC circuit	 Motional EMF, current, diff.eq. for speed as a function of time	Charge density of atom, Gauss' Law, graph of E versus r
2013	 Kinematics graphing Spring energy, SHM	 Drag force F_D=kv	 Rotational dynamics, energy	 Gauss's Law Cylinder E, V	 RC circuit, graph,	 Faraday's Law in Loop
2012	 SHM kinematics, w/o and w friction	Design experiment of potential to kinetic energy. Experimental discrepancies.	 Rolling w slipping	 Field, Potential, charge	 Experiment: resistivity, RC circuit	Motional EMF
2011	 Impulse-momentum	 Freefall ride.	 Torsional pendulum	Gauss' Law – spheres and shells	 RC – LC circuits	 Ampere's Law

	M1	M2	M3	E1	E2	E3
2010	 Coffee filter lab	 Rotation	 Mechanics	 Field and Potential	 RC circuit	 EM induction
2009	Potential energy function and graphs	 Physical pendulum	 Modified Atwood's machine	 Continuous charge distribution	 Circuit, Hall effect	 Faraday's Law - circuits
2008	 Inclined plane F=kv	 Torque - strut	 Hooke's Law – Force and Energy	 Gauss' Law	 Circuits – RC, LC, RR	 Biot-Savart Law
2007	 Linear dynamics	Orbital mechanics Mars Surveyor	 Mechanical Energy Conservation; spring	 RC circuit	 Gauss' Law	 Faraday's Law
2006 *BB	 Linear dynamics	Non-linear spring, data analysis, GRAPH, energy conservation	 Rot'l kinematics, projectile	 Electrostatics – field and potential	 RC circuit	 Spring, B force on a current loop, induction
2005 *BB	Motion w/ air resistance, GRAPH	Moons of Saturn: Data analysis, GRAPH	 Rotational dynamics	 Field diagram & potential	 LR circuit	 Hall probe, solenoid, experiment, GRAPH
2004 *BB	 Energy, inelastic collision, projectile	 Rot'l dynamics, experiment	 Physical pendulum	 E Field & potential – Gauss' Law	 RC Circuit	 Flux, induction
2003 *BB	 Work, energy & power	 Spring, SHM, inelastic collision	 Catapult, projectiles, experiment	E Field – Gauss' Law	RC circuit	Induction
2002 *BB	$v = \frac{8}{1+5t}$ Collision and calculus kinematics	Energy: grav., rot., spring	$U(x) = \frac{4.0}{2.0+x}$, Graphical U vs x, F=-dU/dx, exper.	E field, potential, F, energy	RC circuit, experiment	Flux and Induction, energy dissipated

	M1	M2	M3	E1	E2	E3
2001	 mass and force sensor - imp-momentum, acc	Gravity, satellite motion.	 angular motion, rot inertia	 fields, potential, thunder	 res of capacitors, dielect.	 mag field of wire, forces.
2000	Lab, pendulum, find g, elevator.	Ball falling thru resistive medium, $F = -bv^2$, energy	 F=ma, angular motion	 LR - RC circuits	 fields and potential	 Gauss and Ampere
1999	 Lab - ballistic pendulum	 Hole through earth - SHM	 Rotational Eq, Energy	 Spherical Capacitor	 Induction	 E field, potential, static ch
1998	 lab data for air track collision.	 inelastic coll, linear and ang mom. C of M motion.	 two body motion, friction, force diagrams	 Coulomb, F=qE, forces.	 Circuit, RC, LR	 Motional Emf, bar sliding down incline, term vel.
1997	 non-linear spring, lab question	 inelastic momentum - calculus treatment	 sphere on incline, acceleration, energy	 graphical analysis of circuit - experimental battery	 electric fields and forces – flux	 B field of long wire, flux, motional emf.
1996	 Lab question – vibrations - Gravitation	 forklift - eqns of motion, friction	 Mom of inertia of rod, hoop. Rota	 Concentric spheres - E field, V	RC Circuit	 Faraday's law, Solenoid
1995	 Impulse, momentum, projectile.	 Potential energy function	grav, orbits, ang momentum, moment of Inertia.	 Nonconductor field and potential	 Capacitors, RC Circuit	 Air track - Motional Emf, Lenz' Law
1994	 Cons of En and mom, spring	rolling w/o slipping, cons of energy on an incline.	orbits, cons of energy and ang mom.	E field, potential - ring and part of ring.	Motional Emf, energy conservation	Coaxial cable, Amperes law for B field.
1993	En in a spring, friction, cons of en.	resistive medium, equations of motion.	torque, angular acceleration.	non conductor - Gauss' law. conductor, Ampere's law	Faraday's law, magnetic forces, induced I.	Mass Spectrometer.

	M1	M2	M3	E1	E2	E3
1992	 Energy, cons of mom, inelastic	 Rotation, I, torque, energy	 Orbits, cons of En and ang mom.	Charge dist in a sphere, find total charge, field with Gauss' Law.	 RC circuit	 B field of wire, flux through loop, Faraday's law
1991	 Ballistic pend - cons of En and Mom - Vertical Circle	 Rotation, torque	 Spring, cons of mom and en, elastic collision	 field and potential of point charges	 LR circuit	 Faraday's law, resisting medium
1990	 F = -kv, eqns of motion.	 motion on incline, box and sphere. energy.	 vertical spring, oscillation, energy	 conc spheres, Gauss' Law, fields	 Mass spectrometer	 Falling through B field, induction, term velocity.
1989	 Energy cons, critical speed, vert circle	 several bodies, heavy pulley, acc	 vert spring, SHM.	 Two charges, E and potential	 Motional Emf, induced current	 RC circuit.
1988	 car on banked curve	 springs in parallel, work = area in F vs d	 Angular motion, torque, acceleration	 conc shells, Gauss' law, potential, Capacit.	 Circuit, with C. Energy dissipated.	 Solenoid, Amp law, flux induced Emf.
1987	 Centrip forces on a swing	 Potential Energy function. F = -dU/dr	 Cons of linear and ang momentum	Charge dist thru a sphere, Gauss' law, potential	 Flux, Faraday's law, induced I, energy dissipated	 LR Circuit.
1986	 platform acc upward. Power	 sphere on incline, I, acceleration.	- $F = -kx^3$. Non linear spring, SHM	 Equipotentials and fields, work	 Circuit, add C, add L.	 Long wire B, flux thru nearby loop, induced I
1985	 Projectile, cons of momentum	spring on an incline, energy cons	Atwoods mach, eqns of motion.	coax cylinders, Gauss' law, cylindrical capacitor	Circuits, RC	Faraday's law, induced Emf, E.
1984	Centripetal motion, force diagram	Orbits, mom cons, energy.	falling through a resisting medium, F = -kmv	E and B forces on moving charge.	Gauss' Law betw parallel plates.	motional Emf bar decelerates. Power

	M1	M2	M3	E1	E2	E3
1983	 proj motion in a plane	 rotation, acceleration	 skier on snowball	 conc shells, Gauss' Law, potential	 RC circuit	 Superimposed B fields from wires.
1982	 spring on incline, En cons	one dimensional motion of car with friction, slowing.	 torque, I, rotation equations	 point charge, field, potential, flux	 B for long wire, flux thru loop nearby	 R-L circuit
1981	 Incline, trans eq, friction	 Energy on a swing	 Cons of linear and ang momentum.	 Gauss' Law, spherical capac., dielectrics	 Elec and B field of a ring of charge	 Faradays Law, induced Emf, I, power
1980	 spring, SHM	 Momentum & En Conservation	 Rotation w/o slipping, eqns of motion	 E and V for thin, bent rod.	 Gauss' Law E between plates, Capacitance	 Faraday's Law, induced Emf and E
1979	 Projectile, en cons, mom cons.	 Ferry, cons of momentum, impulse	 torque, ang mom, SHM w spring during rotation	 conc shells, Gauss' law, E vs r, V vs r	 non-cond slab, E field, cond slab, B field.	 B fields and forces on particles. hand rules.
1978	 circular, work	 linear and ang mom	 torque, ang mom, SHM w spring	 E,B forces on elect, V and vector v	 Faraday's, Lenz's Law, energy	 Gauss E&V, C, U_c,
1977	F = -kv, work	Rotation, "walk the dog" yo-yo trick	 Binary stars M, 2M	 E and V for on axis of ring	 Gauss's law on resistor	 B force, torque
1976	 circ motion, , friction, tangential a, kinematics	rotation,	energy, momentu m	Gauss E and V	Induced emf	Mass spectrometer
1975	falling through a resisting medium F = -kv Graph drawing	Cons of L	Calculus, force, work done lifting chain	Coulomb U,F, Work	Equilibrium Capac.	Induction in square due to dI/dt in wire
1974	circ motion, energy, force, tangential a	rotation, change μ	energy, momentu m, SHM	Gauss E and V	Parallel plate capacitor, E, Q, C, copper insert	Biot-Savart, Induced emf

	M1	M2	M3	E1	E2	E3
1973	 Two block system w/ friction	Work-energy theorem	 Angular mechanics	 Parallel plate capacitor	Magnetic effects	 Motional emf