Dr. Allan Pringle
(1948 – 2017)

Dr. Pringle is the voice of the online lectures and was the main developer of PHYS 2135, as it is today.

Information about Dr. Pringle may be found on the course web site.

- Worked at Oak Ridge National Lab
- Researched neutron scattering
- Renowned for work in science education
- Highly respected by colleagues at S&T and beyond

Announcements

PLC

There will be PLC Wednesday, May 2 as long as students attend. Instructors and PLA's may leave after all students have left.

Teaching evaluations

http://teacheval.mst.edu   http://teachevalm.mst.edu

Please let us know what you think of the class.

Must be completed by Sunday, May 6.

PHYS 2135 Spring Final Exam
and End Material Test
Monday, May 7
12:30 – 2:30 pm

Instructor	Section(s)	Room
Madison	E, G	HSS G5
Parris	J	Physics 104
	L	McNutt 204
Upshaw	B, H, K, N	St. Pats Ballroom
Vojta	A, D	BCH 120
Wilemski	F, M	BCH 125

End Material Test

- 9 multiple choice questions for 6 points each.
- 1 Free multiple choice question for 8 points.

(Attendance not necessary to receive the free 8 points.)

Final Exam

- All problems
- 40 points from 1st exam material*
- 40 points from 2nd exam material*
- 40 points from 3rd exam material*
- 80 points from end material

(*Material includes anything that could have been on exams.)

Physics 2135 Topics

Part 1:

Coulomb's Law
electric fields
electric fields from charge distributions
motion of a charged particle in an electric field
Gauss' Law
electric potentials and electric potential energy

Final exam problems may come from topics not covered on test preparation homework or during the final lecture.

Physics 2135 Topics

Part 2:

capacitance, dielectrics, energy storage in capacitors,
capacitors in series and parallel
current density and drift speed
Ohm's law, resistors in series and parallel
electric power
emf, Kirchoff's Rules
rc circuits, electrical instruments

Final exam problems may come from topics not covered on test preparation homework or during the final lecture.

Physics 2135 Topics

Part 3:

- magnetic forces on moving charged particles
- wires carrying currents
- solenoids, magnetic fields from current-carrying wires
- calculation of magnetic field using Biot-Savart Law
- Faraday’s Law, induction, motional emf
- electric field produced by changing flux
- motors, generators, transformers
- electromagnetic waves

Final exam problems may come from topics not covered on test preparation homework or during the final lecture.

Physics 2135 Topics

Part 4:

- Snell's Law, total internal reflection, fiber optics
- mirrors
- lenses
- interference (double slits, thin films)
- diffraction

Final exam problems may come from topics not covered on test preparation homework or during the final lecture.

Final Exam

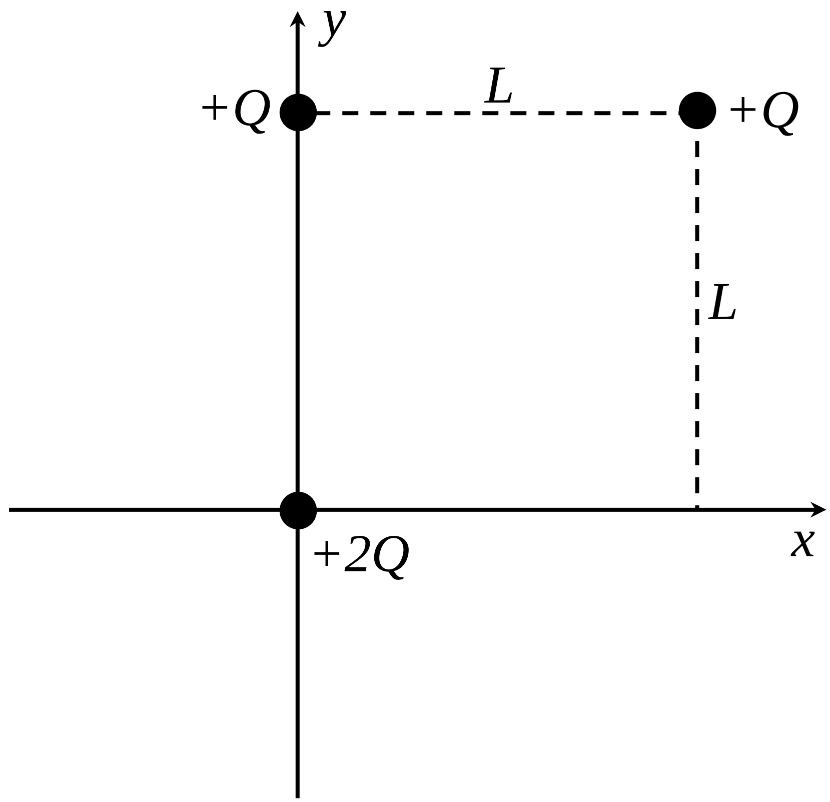
Review

The problems in this lecture are the standard "exam review lecture" problems and are not a guarantee of the exam content, nor are they intended to "tell" you what to study for. Expect final exam questions from material not covered in today's lecture!

Please Look at Prior Tests!

Two identical point charges $+Q$ are located on corners of a square of side L, as shown in the diagram. A point charge of $+2Q$ is located at the origin.

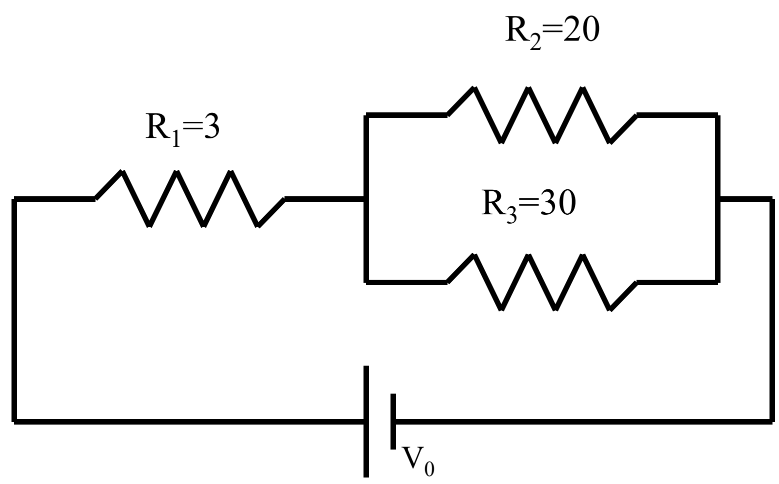
Find the Coulomb force on the point charge at the origin.



For the resistor system shown, R_1 = 3 Ω, R_2 = 20 Ω, and R_3 = 30 Ω.

(a) Find the equivalent resistance.

(b) The power dissipated by R_3 is 480 W. Find V_0.



A proton is accelerated from rest through a potential difference of ΔV. The proton then enters a uniform magnetic field that is perpendicular to its velocity. In the magnetic field, the proton follows a circular path with a radius R.

(a) Determine the speed, v, of the proton when it enters the magnetic field.

(b) Determine the magnitude of the magnetic field and the period, T, of the proton's motion in the magnetic field.

(c) Suppose the proton exits the magnetic field region after it has completed a half-circular path. What is the proton's speed when it exits the magnetic field region?

A small generator consists of a flat, square coil of 120 turns and sides of length 1.60 cm. The coil rotates in a magnetic field of 0.75 mT.

(a) Derive an expression for the time dependence of the magnetic flux Φ_B through each turn.

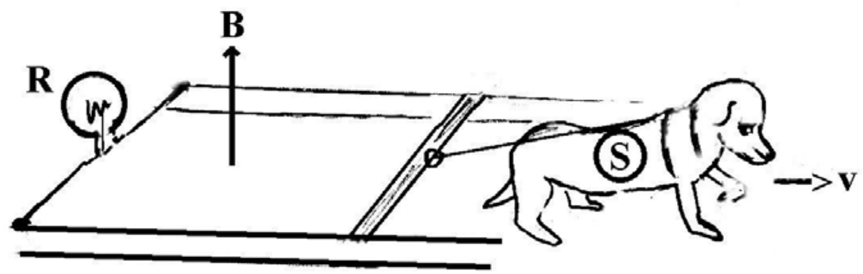
(b) What is the angular speed of the coil if the maximum emf produced is 24.0 mV?

(c) What is the orientation of the coil when the emf is a maximum?

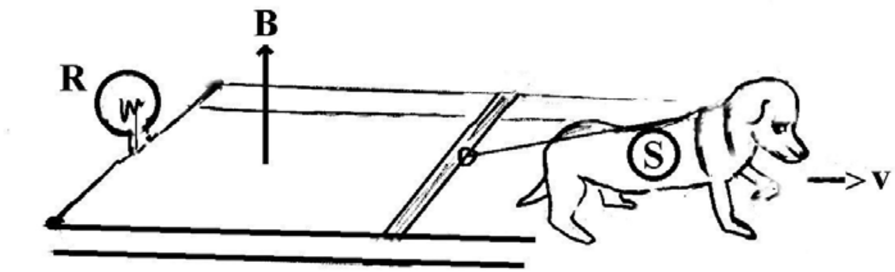
(d) What is the orientation of the coil when the magnetic flux through the coil is a maximum?

Muffi the Super Dog pulls a metal bar of length *L* with constant speed *v* along two parallel horizontal frictionless metal tracks, as shown in the diagram. Between the tracks there is a constant magnetic field of magnitude *B*, directed vertically upward. A light bulb of resistance *R* is attached across the two tracks as shown.

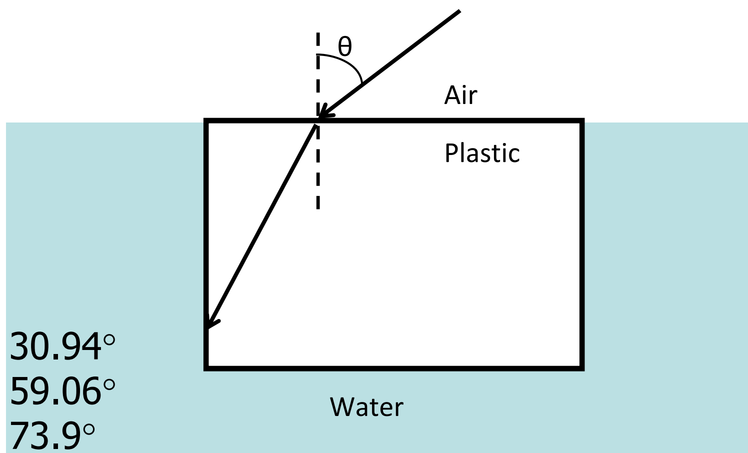
(a) What is the direction of the induced current through the wire connecting the light bulb to the tracks?



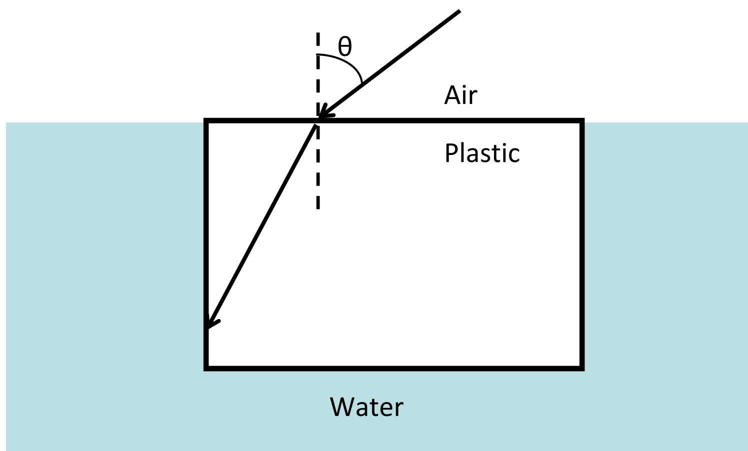
(b) Derive an algebraic expression for the speed v with which Muffi must run to generate power P_0 in the light bulb. Start the problem only with equations from the equation sheet. Express your answer in terms of the parameters B, L, and R.



A light beam is incident at an angle θ on the top surface of a block of plastic. The sides and bottom of the block are immersed in water. If $\theta=50^\circ$, find the angle the light makes with the normal to the plastic/water interface when it exits the block. ($n_{plastic}=1.49$, $n_{water}=1.33$).



A light beam is incident at an angle θ on the top surface of a block of plastic. Find the maximum value of θ for which the refracted light is totally reflected from the left face of the plastic block, if the block is immersed in water. ($n_{plastic}$=1.49, n_{water}=1.33).



63.20°
42.2°

"I regret to announce — this is The End. I am going now. I bid you all a very fond farewell. Goodbye."—Bilbo Baggins