PHY132H1F Introduction to Physics II
Class 24 – **Last Class!**

- Final Exam
- Thursday, Dec. 16 2:00-5:00pm
- EX100 (255 McCaul St.)
- 18 multiple choice questions worth 72 points
- 4 free-form questions worth 28 points
- Total out of 100.

Chapter 37 In-class discussion question.

A physical activity that takes place at a definite point in space and time is called

A. a gala.
B. a sport.
C. an event.
D. a happening.
E. a locale.

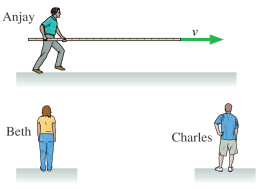
Chapter 37 In-class discussion question.

A carpenter is working on a house two blocks away. You notice a slight delay between seeing the carpenter's hammer hit the nail and hearing the blow. At what time does the event "hammer hits nail" occur?

A. Very slightly after you see the hammer hit.
B. Very slightly after you hear the hammer hit.
C. Very slightly before you see the hammer hit.
D. At the instant you hear the blow.
E. At the instant you see the hammer hit.

Chapter 37 In-class discussion question.

Beth and Charles are at rest relative to each other. Anjay runs past at velocity *v* while holding a long pole parallel to his motion. Anjay, Beth, and Charles each measure the length of the pole at the instant Anjay passes Beth. Rank in order, from largest to smallest, the three lengths L_A, L_B, and L_C.



A. $L_A = L_B = L_C$
B. $L_B = L_C > L_A$
C. $L_A > L_B = L_C$
D. $L_A > L_B > L_C$
E. $L_B > L_C > L_A$

Suggested End-Of-Chapter Problem 37.15

You are flying your personal rocket craft at $0.9c$ from Star A toward Star B.
The distance between the stars, in the stars' reference frame, is 1.0 ly. [Where 1 ly = 1 light-year = the distance that light travels in one year = 9.36×10^{15} m.]
Both stars happen to explode simultaneously in your reference frame at the instant you are exactly halfway between them.
Do you see the flashes simultaneously? If not, which do you see first and what is the time difference between the two?

Suggested End-Of-Chapter Problem 37.25

A cube has a density of 2000 kg/m^3 while at rest in the laboratory.
What is the cube's density as measured by an experimenter in the laboratory as the cube moves through the laboratory at 90% of the speed of light in a direction perpendicular to one of its faces?

Suggested End-Of-Chapter Problem 37.35

A 1.0 g particle has momentum 400,000 kg m/s.
What is the particle's speed?

Suggested End-Of-Chapter Problem 37.59

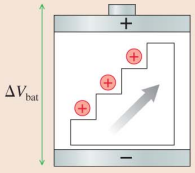
Through what potential difference must an electron be accelerated, starting from rest, to acquire a speed of $0.99c$?

Ch. 30 review

A **battery** is a source of potential.
The charge escalator in a battery uses chemical reactions to move charges from the negative terminal to the positive terminal:

$$\Delta V_{bat} = \mathcal{E}$$

where the emf $\mathcal{E}$ is the work per charge done by the charge escalator.



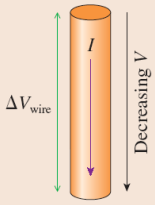
Ch. 31 review

The electric field causes a current

$$I = \frac{\Delta V_{\text{wire}}}{R}$$

where $R = \dfrac{\rho L}{A}$ is the wire's **resistance.**

This is **Ohm's law.**

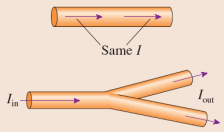


Conservation of Current

The current is the same at any two points in a wire.
At a junction,

$$\sum I_{\text{in}} = \sum I_{\text{out}}$$

This is **Kirchhoff's junction law.**

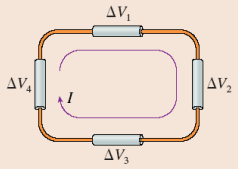


Ch. 32 review

Kirchhoff's loop law

For a closed loop:

- Assign a direction to the current I.
- $\sum_i (\Delta V)_i = 0$

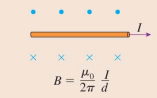


In class discussion question

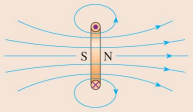
- The digital multimeters you used in practicals should be connected in
  - A. series to measure voltage, in *voltmeter* mode, or parallel to measure current, in *ammeter* mode.
  - B. parallel to measure voltage, in *voltmeter* mode, or series to measure current, in *ammeter* mode.
  - C. series to measure voltage, in *voltmeter* mode, or series to measure current, in *ammeter* mode.
  - D. Parallel to measure voltage, in *voltmeter* mode, or parallel to measure current, in *ammeter* mode.
  - E. series to measure voltage, in *voltmeter* mode, but you cannot use the multimeter to measure current.

Ch. 33 review

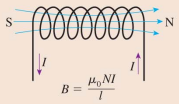
Wire



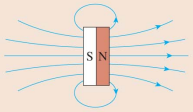
Loop



Solenoid



Flat magnet



Right-hand rule

Point your right thumb in the direction of I. Your fingers curl in the direction of $\vec{B}$. For a dipole, $\vec{B}$ emerges from the side that is the north pole.

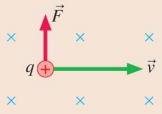
Ch. 33 review

Magnetic Forces

The magnetic force on a moving charge is

$$\vec{F} = q\vec{v} \times \vec{B}$$

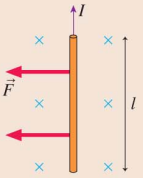
The force is perpendicular to $\vec{v}$ and $\vec{B}$.



The magnetic force on a current-carrying wire is

$$\vec{F} = I\vec{l} \times \vec{B}$$

$\vec{F} = \vec{0}$ for a charge or current moving parallel to $\vec{B}$.



In class discussion question

- An electric power line carries a steady current of 150 A toward the North. At a distance of 5 m below the wire, a golf-ball flies by, traveling directly North. The golf ball has a net negative charge on it. What is the direction of the magnetic force on the ball due to the current in the wire?

A. North
B. South
C. up
D. down
E. the wire produces zero magnetic force on the ball

Goodbye!! Keep in touch!

- Final Exam
- Thursday, Dec. 16 2:00-5:00pm
- EX100 (255 McCaul St.)
- **Aids allowed:**
  - A non-programmable calculator without text storage.
  - Up to two hand-written aid-sheets prepared by the student, no larger than 8.5”x11”, written on both sides.