University of Virginia

Department of Physics

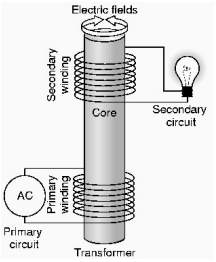
Physics 606: How Things Work II

Lecture #17 Slides:

Power Distribution II

Transformer

- *Alternating* current in one circuit induces an alternating current in a second circuit
- Transfers *power* between the two circuits
- Doesn't transfer *charge* between the two circuits

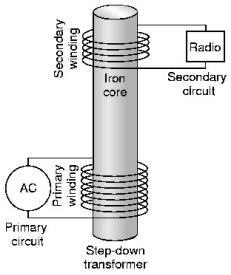


Current and Voltage

- Power arriving in the primary circuit must equal power leaving the secondary circuit
- Power is the product of voltage · current
- A transformer can change the voltage and current while keeping power unchanged!

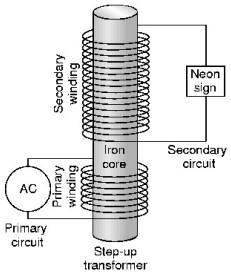
Step Down Transformer

- Fewer turns in secondary circuit so charge is pushed a shorter distance
- Smaller voltage rise
- A larger current at low voltage flows in the secondary circuit



Step Up Transformer

- More turns in secondary circuit so charge is pushed a longer distance
- Larger voltage rise
- A smaller current at high voltage flows in the secondary circuit



Question:

Electric power reaches the University via high voltage transmission lines. What fraction of the electric charges traveling on those transmission lines pass through this room?

1. About 1%
2. About 0.01%
3. Exactly 0.0%

Tape Recorders

Question:

Iron powder sticks to a permanent magnet. If you sprinkle iron powder on a strip of recorded audio tape, will the iron powder stick?

Observations About Recorders

- They put sound or sound information on tape
- They can reproduce the recorded sound
- A tape can hold several channels of sound
- The speed of the tape's motion matters
- Tapes are vulnerable to heat and magnetism
- A tape's leader can't record sound

Sound in Air

- Moving pressure fluctuations
- Created by compressing & rarifying the air
- Heard by detecting pressure fluctuations

Representing Sound with Current

- Microphone measures air pressure changes
- Produces current in a wire that is proportional to the air pressure shift, up or down
- This current isn't "sound," it *represents* sound
- It contains enough info to recreate the sound