Name Date Period Score /

Intro to Magnetism Questions

Show given information, equation(s)and algebra prior to substitution for full credit. Don't forget significant figures or units. Neatly box the final answer. Raise your hand if you have any questions.

1. Have magnetic monopoles been found? What happens if you break a magnet in half?

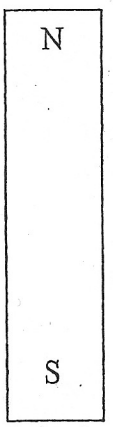
2. Do stationary electric charges produce magnetic fields? Explain.

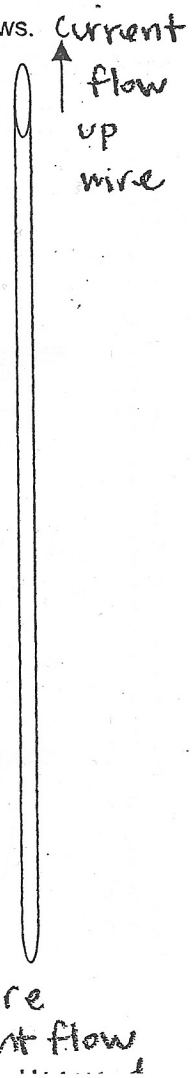
3. In iron and some other magnetic materials there are areas called _____.

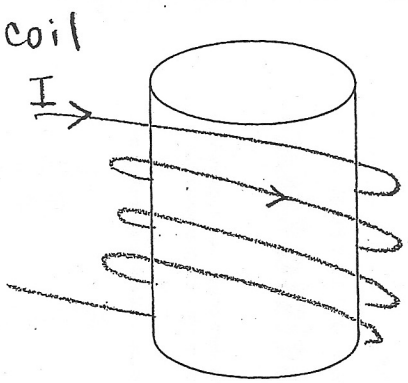
4. Magnetic fields have the symbol _____ and are measured in units of _____.

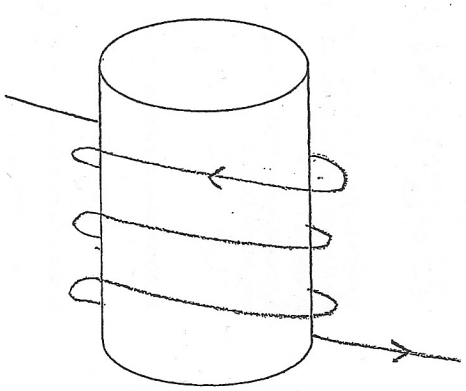
5. Electric charges moving through a magnetic field experience a _____. This is a maximum if they move _____ to the field and zero if they move _____ to the field.

6. Draw the magnetic fields with direction arrows.









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Name

Magnetism Practice Problems

Magnetic Forces & Fields

1. A proton speeding through a synchrotron at 3.0×10^7 m/s experiences a magnetic field of 4.0 T that is produced by the steering magnets indie the synchrotron. What is the magnetic force pulling on the proton? $(1.9 \times 10^{-11} N)$

2. A 10.0 m long high tension power line carries a current of 20.0 A perpendicular to the earth's magnetic field of 5.5×10^{-5}T. What is the magnetic force experienced by the power line? (.011 N)

3. A wasp accumulates 1.0x10-12 C of charge while flying perpendicular to the earth's magnetic field of 5.0x10-5 T. How fast is the wasp flying if the magnetic force acting on it is 6.0×10^{-16}N? (12 m/s)

Electromagnetic Induction

Flux: The number of magnetic field lines passing through a given area.
Flux Unit: weber(Wb), which equals one tesla meter squared (Tm^2)
Lenz's Law: An induced voltage always produces a magnetic field that opposes the field that originally produced it
Transformer: A device that produces a change in voltage in an alternating current circuit

4. Tyrone is pedaling his bike down the street perpendicular to the earth's magnetic field of 5.5×10^{-5}T. What is the flux through the metal rim of his bicycle wheel, if the wheel has an area of $1.13 m^2$? $(6.2 \times 10^{-5} Wb)$

5. A medical process called nuclear magnetic resonance imaging(MRI) replaces X-rays in some instances where pictures are required to study internal organs. Eleanor is undergoing an MRI procedure and is placed inside a chamber housing the coil of a large electromagnet that has a radius of 25.0 cm. A flux of 0.290 Wb passes through the coil opening. What is the magnetic field inside the coil? (1.48 T)

WS 2

Name _____ Date _____

CONCEPTUAL Physics PRACTICE PAGE

Hewitt
Chapter 24 Electromagnetic Induction

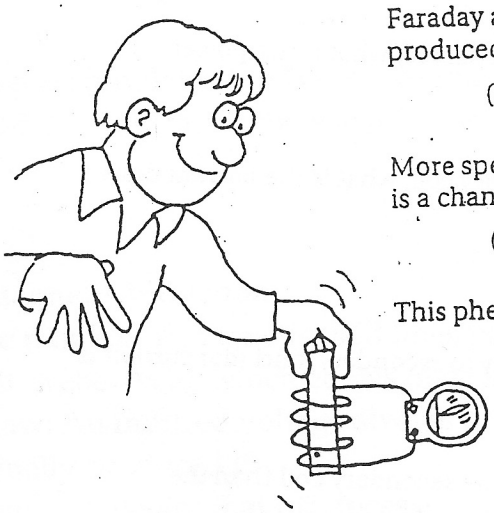
Faraday's Law

1. Hans Christian Oersted discovered that magnetism and electricity are

   (related) (independent of each other).

   Magnetism is produced by

   (batteries) (the motion of electric charges).



Faraday and Henry discovered that electric current can be produced by

(batteries) (motion of a magnet).

More specifically, voltage is induced in a loop of wire if there is a change in the

(batteries) (magnetic field in the loop).

This phenomenon is called

(electromagnetism) (electromagnetic induction).

2. When a magnet is plunged in and out of a coil of wire, voltage is induced in the coil. If the rate of the in-and-out motion of the magnet is doubled, the induced voltage

   (doubles) (halves) (remains the same).

   If instead the number of loops in the coil is doubled, the induced voltage

   (doubles) (halves) (remains the same).

3. A rapidly changing magnetic field in any region of space induces a rapidly changing

   (electric field) (magnetic field) (gravitational field)

   which in turn induces a rapidly changing

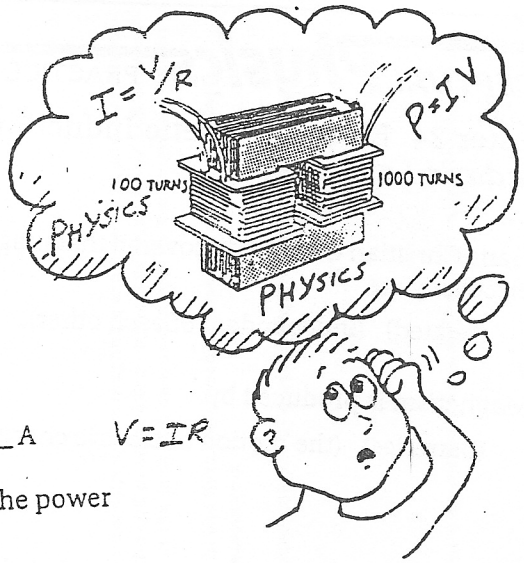
   (magnetic field) (electric field) (baseball field).

   This generation and regeneration of electric and magnetic fields makes up

   (electromagnetic waves) (sound waves) (both of these).

Hewitt Drew it!

Transformers

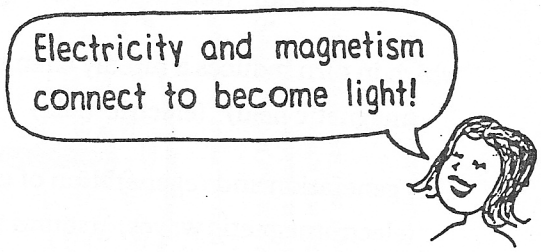


Consider a simple transformer that has a 100-turn primary coil and a 1000-turn secondary coil. The primary is connected to a 120-V AC source and the secondary is connected to an electrical device with a resistance of 1000 ohms.

1. What will be the voltage output of the secondary?
   _____ V
2. What current flows in the secondary circuit? _____ A
3. Now that you know the voltage and the current, what is the power in the secondary coil? _____ W
4. Neglecting small heating losses, and knowing that energy is conserved, what is the power in the primary coil? _____ W
5. Now that you know the power and the voltage across the primary coil, what is the current drawn by the primary coil? _____ A

Circle the correct answers:

6. The results show voltage is stepped (up) (down) from primary to secondary, and that current is correspondingly stepped (up) (down).
7. For a step-up transformer, there are (more) (fewer) turns in the secondary coil than the primary: For such a transformer, there is (more) (less) current in the secondary than in the primary.
8. A transformer can step up (voltage) (energy and power), but in no way can it step up (voltage) (energy and power).
9. If 120 V is used to power a toy electric train that operates on 6 V, then a (step up) (step down) transformer should be used that has a primary to secondary turns ratio of (1/20) (20/1).
10. A transformer operates on (dc) (ac) because the magnetic field within the iron core must (continually change) (remain steady).



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Hewitt Drew It!