Lecture 7:
Magnets and Magnetism

Continuation of Practice Problems

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- Work out problems 3 and 4

Magnets

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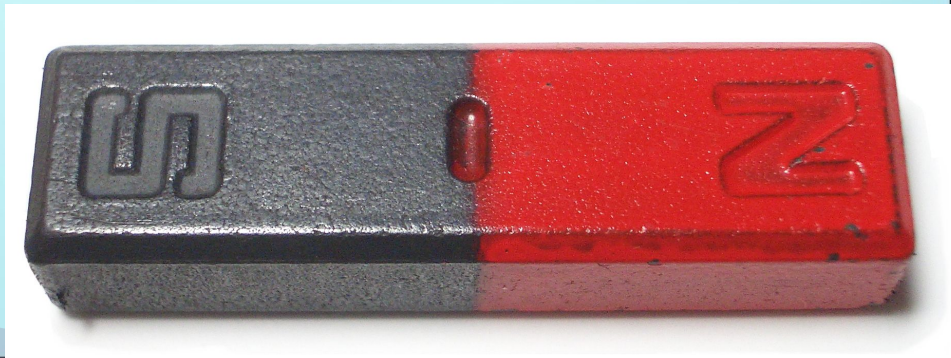
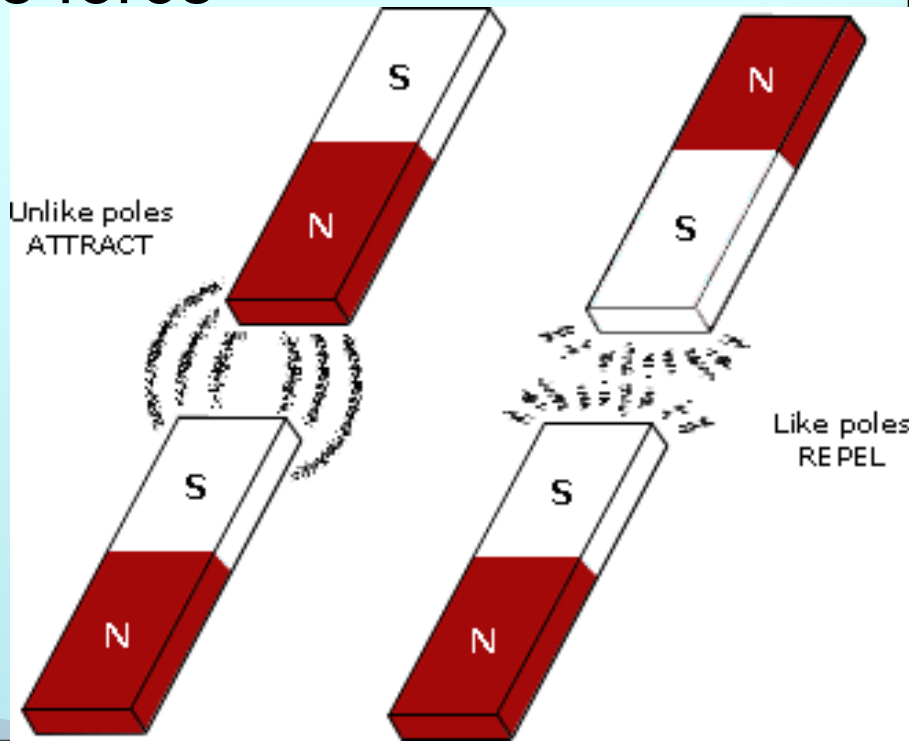
- Materials that attract other metals
- Three classes: natural, artificial and electromagnets
- Permanent or Temporary
- CRITICAL to electric systems:
  - Generation of electricity
  - Operation of motors
  - Operation of relays



Magnets

- Laws of magnetic attraction and repulsion
  - Like magnetic poles repel each other
  - Unlike magnetic poles attract each other
  - Closer together, greater the force



Magnetic Fields and Forces

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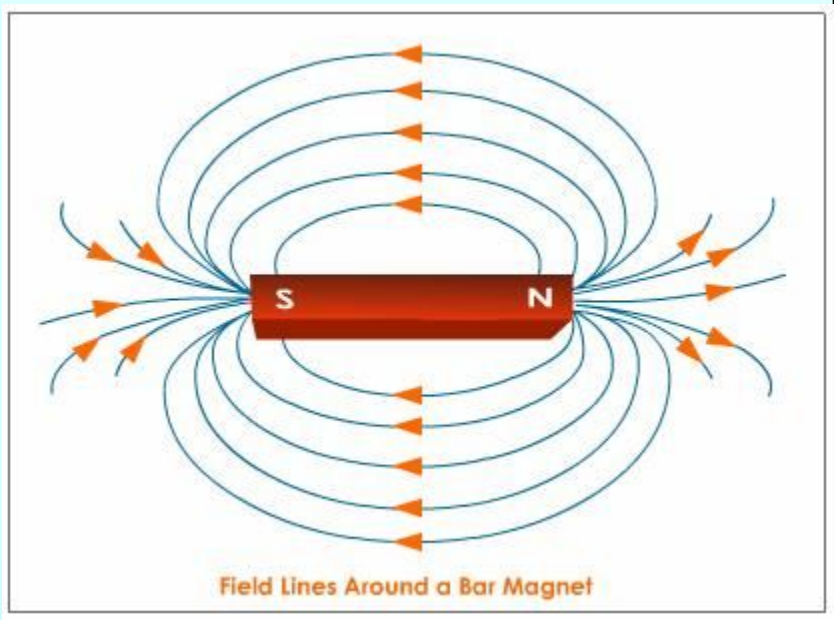
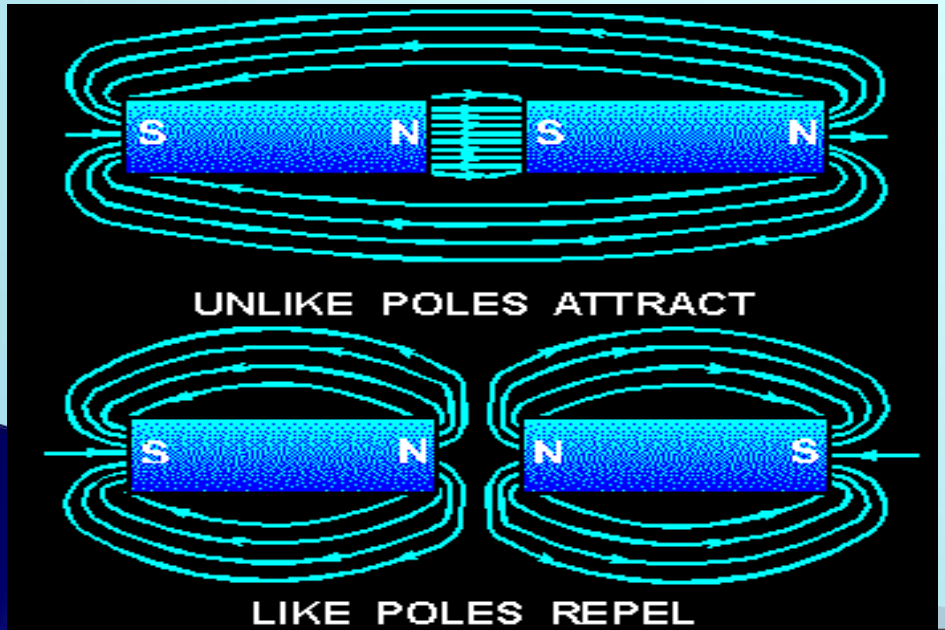
- Magnetic lines of force
  - Lines indicating magnetic field
  - Direction from N to S
  - Density indicates strength
- Magnetic field is region where force exists



Field Lines Around a Bar Magnet



Magnetic Theories

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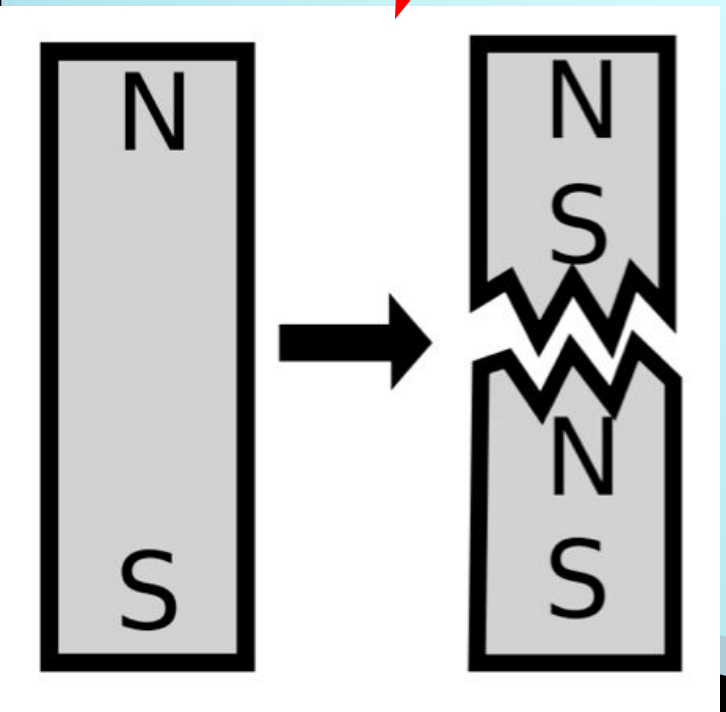
Molecular theory of magnetism

Magnets can be split into two magnets



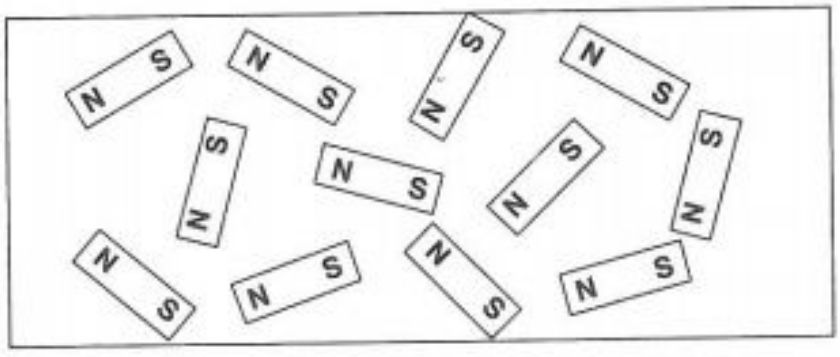


FIGURE 6–6 Unmagnetized material.

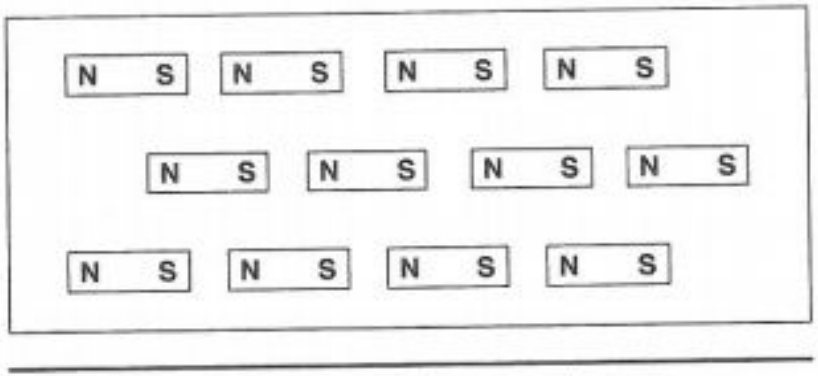


FIGURE 6–5 Magnetized material.

Magnetic Theories

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Molecular theory of magnetism

Split down to molecular level

When unmagnetized, randomness, fields cancel

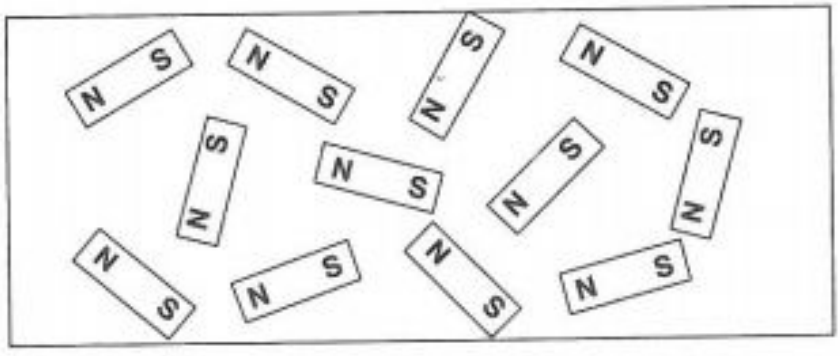

FIGURE 6–6 Unmagnetized material.

When magnetized, order, fields combine

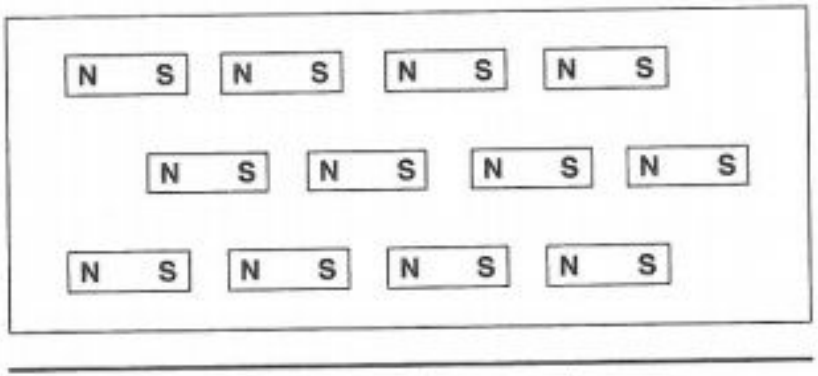

FIGURE 6–5 Magnetized material.

Magnetic Theories

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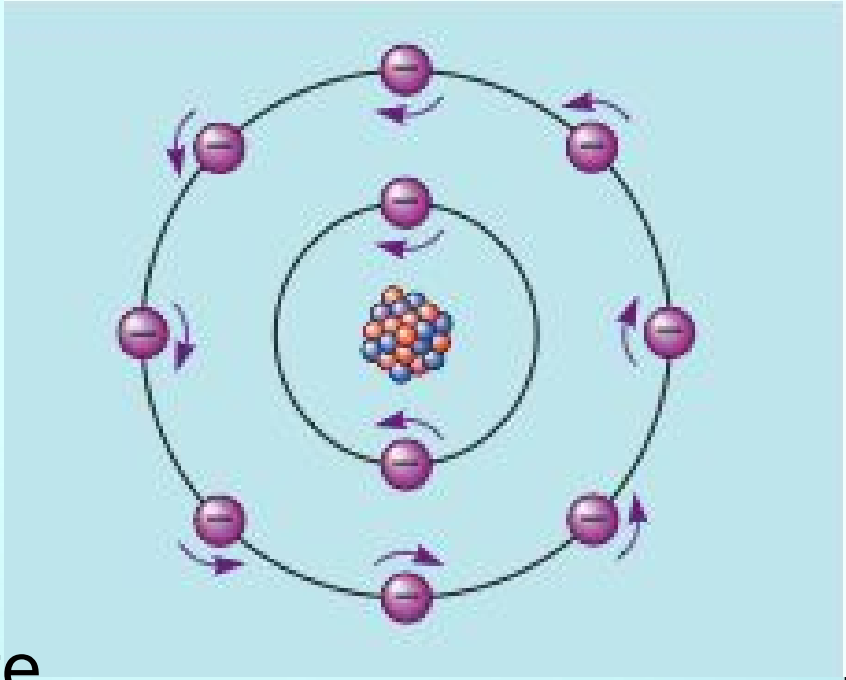
Electron theory of magnetism

- Electrons spin as they orbit (similar to earth)
- Spin produces magnetic field
- Magnetic direction depends on direction of rotation
- Non-magnets → equal number of electrons spinning in opposite direction



- Magnets → more spin one way than other

Electromagnetism

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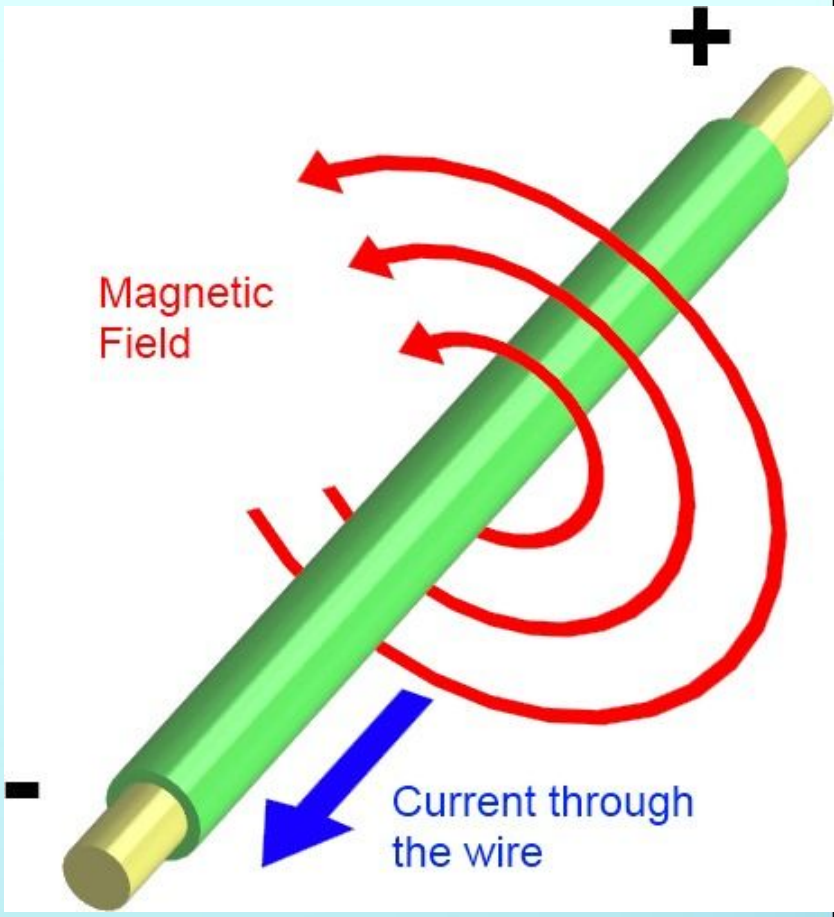
- Movement of electric charge induces magnetic field
- Strength of magnetic field increases as current increases and vice versa



Right Hand Rule

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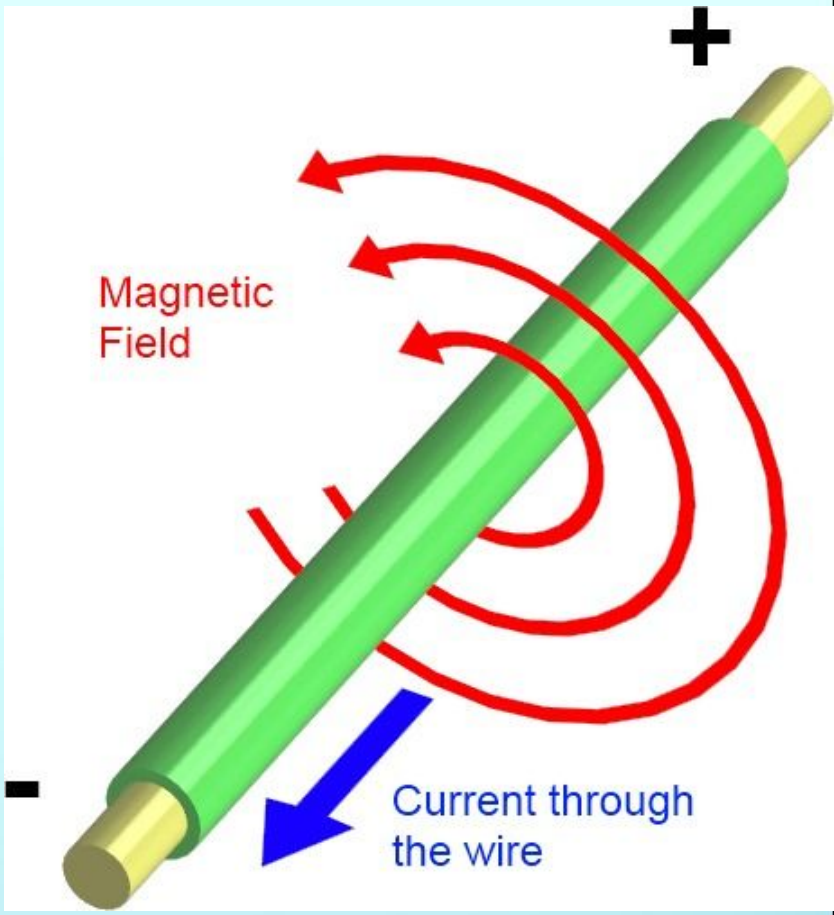
- Determines direction of magnetic field
- Imagine grasping conductor with right hand
- Thumb in direction of current flow (not electron flow)
- Fingers curl in the direction of magnetic field



DO NOT USE LEFT HAND RULE IN BOOK

Example

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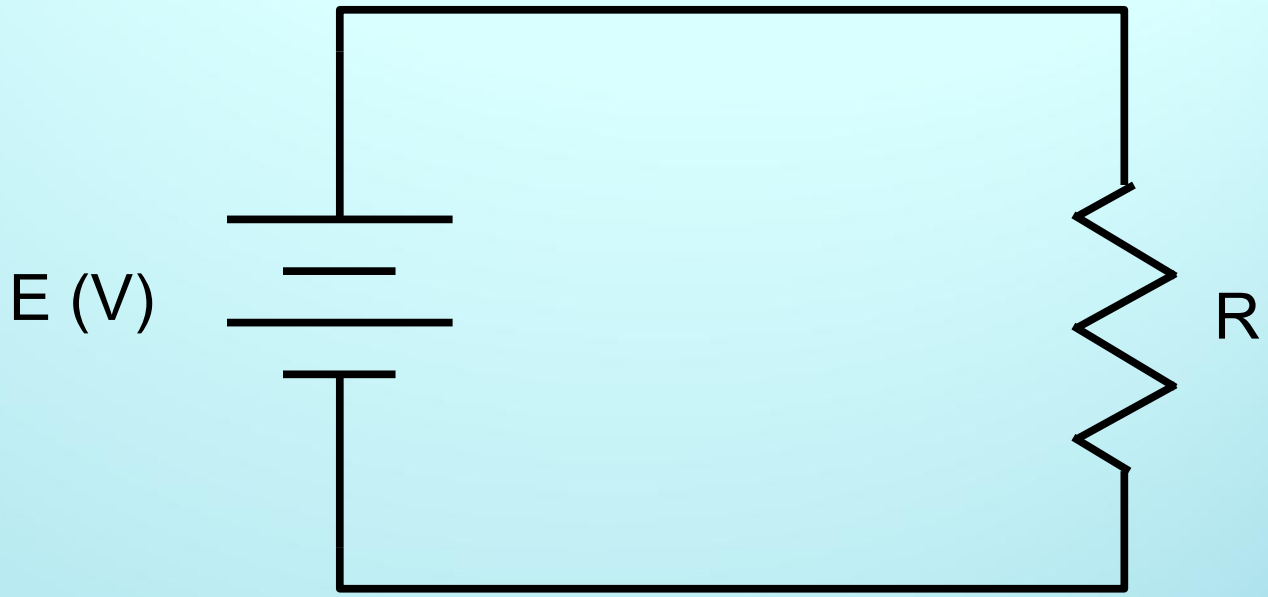
Draw magnetic field lines around conduction path



Magnetic Forces

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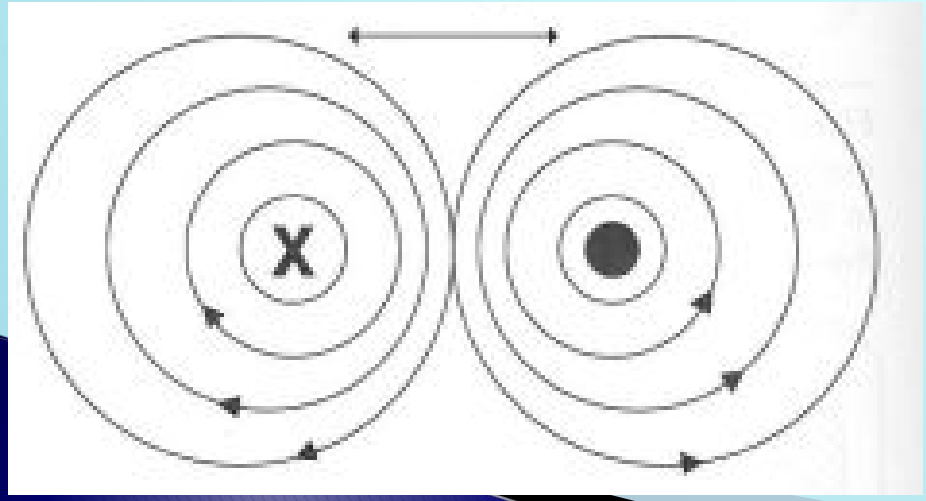
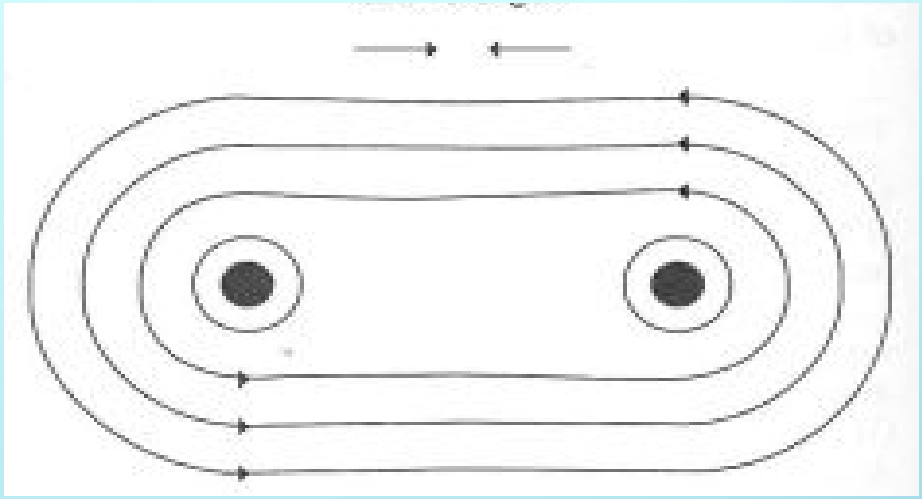
If two magnetic forces are within reach of each other, their fields will react according to laws of attraction and repulsion

Force Repels



Force Attracts



Homework 3

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Up on D2L – Read directions