

Physics 1320: Magnetism  
Young and Freedman, Chapters 27 - 29

Partial Shopping List for Exam 3

25. Why does a compass needle point towards the north pole (of the earth)? About how strong is the earth's magnetic field (on the surface of the earth)?
26. What is Coulomb's law for magnetism? What is the force between two "point" magnetization charges  $q_{m1}$  and  $q_{m2}$ , displaced from one another by  $\vec{r}$ ?
27. What is the magnetic field  $\vec{B}$  between two parallel-plate pole faces, one north and the other south, each having uniform magnetization charge density  $\sigma$ ?
28. What is the magnetic dipole moment of a cylindrical bar magnet having length  $d$  and magnetization charge  $q_m$  and  $-q_m$  at its two pole faces?
29. What is the force  $\vec{F}$  on the north pole of a bar magnet with magnetic charge  $q_m$  when it is placed in a magnetic field  $\vec{B}$ ?
30. What is the magnetic force on a particle with electrical charge  $q$  moving at a velocity  $\vec{v}$  in a uniform magnetic field  $\vec{B}$ ?
31. What is the right hand rule?
32. Does a magnetic dipole consist of positive and negative magnetic charges  $q_m$  and  $-q_m$  displaced from one another by a distance  $d$ , so that  $\vec{\mathfrak{M}} = q_m \vec{d}$ , or does it consist of electrical current  $I$  traveling in a closed loop with area  $A$ , so that  $\vec{\mathfrak{M}} = I\vec{A}$ ?
34. What is the trajectory of a charged particle in a uniform magnetic field? What is the cyclotron frequency?
36. What is the magnitude of the Earth's magnetic field?
37. What is the force on straight wire segment carrying a current  $I$  in the presence of a uniform magnetic field  $\vec{B}$ ?
38. What is the torque on a current loop having area  $A$  and current  $I$ ?
39. Describe the operation of a dc motor.
41. What is the magnetic dipole moment of a current loop of area  $A$  and current  $I$ ? Bohr magneton?
42. What did Oersted discover? What is the law of Biot and Savart?
43. What is the magnetic field due to a long straight wire?
44. What is the magnetic field due to a circular wire carrying a current  $I$ , along the axis of symmetry perpendicular to the circle?
45. What is the force between two parallel current carrying wires?
46. What is Ampere's law?
47. What is the "law of no magnetic monopoles"?
48. Use Ampere's law to find the magnetic field due to a long solenoid.
49. Use Ampere's law to find the magnetic field due to a toroid.
50. Use Ampere's law to find the magnetic field from a long straight wire.
51. Use Ampere's law to find the magnetic field due to a sheet of current.
52. Describe paramagnetism, diamagnetism, and ferromagnetism.
53. What is the magnetic susceptibility?

54. What is the magnetic permeability?
55. What is the relative magnetic permeability?
56. What is magnetization  $\vec{M}$ ? What is the magnetic intensity  $\vec{H}$  in a long solenoid?
57. Sketch a graph of  $M$  versus  $H$  for a ferromagnetic material, showing the hysteresis loop expected for  $T$  below the critical temperature
60. What is Faraday's Law?
61. How do you make an electrical generator?
62. What is "Lenz's Law"?
63. What is a slide-wire generator?
64. Explain the operation of a ballistic galvanometer? What is a search coil?