The Must Know

In preparation for the final exam and to perhaps earn 3% extra credit on the way there, make sure you understand/can do the following (This list will get longer for the final exam and for Exam #3):

1. Sources for magnetic field.

2. RHR for magnetic field direction.

3. Direction of magnetic force.

4. Ampere's Law.

5. Lenz's Law.

6. Faradey's Law.

7. Bio - Savart Law.

8. Sources for electric field/potential.

9. Know how to draw electric field diagram and force diagram (draw the electric field at a given point due to a given distribution of point charges.)

10. Know the difference between electric field and electric force. You need to know how they are related as well.

11. Coulomb's law (formula, and what does it apply to. You need to remember the formula. The values of constants I would provide)

12. Electric Potential energy, Electric potential. (make sure you differentiate between Electric potential energy of the system and Potential at a given point due to point charges).

13. The relation between Electric potential and Electric field ($\vec{E} = -\vec{\nabla}V$):
    Given Electric Field vectors, draw equipotential surfaces.
    Given equipotential surfaces, draw the electric filed vectors at given points.
    Given the electric potential, find the electric field. (Always keep in mind which one is a vector/scalar!)
    Given the electric field, find the electric potential. (Always keep in mind which one is a vector/scalar!)

14. How does charge move in a given electric field/electric potential.

15. Conservation of energy and charge.

16. Gauss's Law.

17. Find equivalent resistance.

18. Find equivalent capacitance.

19. What is the purpose of a capacitor.

20. What is the purpose of a resistor.

21. Time constant of an RC circuit.

22. What is the purpose of dielectrics? (How does it affect the electric field, the energy storage, the capacitance).

23. Kirchhoff's laws and Ohm's law - If I give you a simple circuit you should be able to apply these and analyze the circuit.

24. Explain polarization force.

25. Properties of charge, and properties of conductors and insulators.

26. Properties of Transverse Waves and Longitudinal Waves.

27. Explain diffraction.

28. Condition under which ray optics model applies.

29. Condition under which wave optics model applies.

30. What do the wave and the source have in common?

31. Phase difference between two sinusoidal waves (formula, what does it depend on.):
    1) If I give you the location of the sources, their individual phases at time t=0, and the wavelength, you should be able to calculate the phase difference between these two waves at a given point in space; and
    2) You should be able to tell whether these waves interfere constructively or destructively.

32. Snell's law (I may ask you to calculate angle of refraction).

33. Virtual vs. Real Images (explain the difference in terms of ray divergence).