As soon as possible you want to be able to take practice exams in a meaningful way, and that means doing a preliminary review of all undergrad physics. By the end of the 3rd week of September you should be able to do the basic problems in all the sections below. Ideally you would have already begun studying.

To do this, I recommend you review all of your old textbooks on the below subjects. Work through your book, write down key equations and notes, and write up a "cheat sheet" for that text as if you were taking the final exam for the course. For a concise review, I highly recommend buying "Schaum's Outlines Physics For Engineering and Science," which can be bought cheap at the Rutgers Bookstore. This book reviews almost all the material that is on the exam with practice problems, but unfortunately has a lot of typos (tend to be obvious). Another book to get is "Schaum's Outlines of College Physics," which doesn't cover the advanced material as much, but has less typos and again a lot of good practice problems. Remember, the first goal is to get a basic grasp of the material so that when you take your first practice exam you have at least some idea on most of the questions.

If you buy the Schaum’s Outline book, you should have read through the whole thing and have worked through a couple practice problems in every chapter by the 3rd week of September.

Studying for this exam will require a lot of time and focus on your part. Given that the exam is in about 2 months you should expect to study 2-3 hours a day to ensure a good score. Hopefully by meeting weekly we can all help to encourage and motivate each other towards our goals.

*Review Tip* -> Remember that you have 1.7 minutes per question and there are 100 questions total. Again, look over the 86 exam at:
(and check your answers at www.grephysics.net ) while you review the material and you will see that each question on their own is fairly easy and should only take about a minute to do. Understand the fundamental concepts and don't waste time working through long derivations and lots of theory. Get a good feel for how the key problems look like and what their answers are.

The following is a summary of the key concepts and types of problems on the GRE exam, based upon past practice exams and my own experiences. If you have any questions as to what degree you should review a certain topic please contact me.

1. CLASSICAL MECHANICS: 20%
   1. Kinematics - basic vector addition, projectiles
   2. Newton's Laws - Force Analysis, masses on pulleys, tensions in cables, Projectiles with air resistance
   4. Collisions - Elastic and Inelastic, Rocket Equation
   5. Oscillatory Motion - Circular Motion, Masses swinging on ropes, Simple Harmonic pendulums & springs, Damped systems
   6. Rotating Bodies - Moment of Inertia, Balancing Torques, Angular Momentum Conservation
   7. Central Forces & Celestial Mechanics - Grav Force Energy & Field, Grav Field profile for a solid sphere (from the center to infinity), Kepler's Laws, Virial Theorem, Classification of orbits (in regards to energy of orbiting body)
   8. Other Topics - Lagrangian and Hamiltonian Formalism, Nonintertial Reference Frames (Coriolis force..), elementary Fluid dynamics

2. ELECTROMAGNETISM: 18%
   1. Electrostatics -> Coulomb's Law, Gauss Law, Electric field from a collection of charges/spheres/planes. Nature of Electric Field, Energy/Potential of a configuration of


4. Electromagnetic Waves -> traveling in free space. Wave incident on conductors and passing through different medium.

5. Other -> Electromagnetic Radiation, Relativistic Electrodynamics

3. OPTICS AND WAVE PHENOMENA: 9%


2. Light in medium and Refraction-> Snell's Law, Total internal reflection, Thin films for max/min reflection.

3. Diffraction -> single slit, double slit, diffraction gratting, bragg difraction. Aperture Formula


4. THERMODYNAMICS AND STATISTICAL MECHANICS: 10%


2. Heat Engines and the Carnot Cycle


7. Heat Transfer and thermal expansion

(such as the laws of thermodynamics, thermodynamic processes, equations of state, ideal gases, kinetic theory, ensembles, statistical concepts and calculation of thermodynamic quantities, thermal expansion and heat transfer)

5. QUANTUM MECHANICS: 12%


4. Spin & Angular Momentum -> L and L_z operators and relation to quantum number l and m. Spin matrices and their eigenstates and eigenvalues. Spin mixing, specifically two spin systems and the resulting singlet and triplet states.

5. Elementary Perturbation Theory

(such as fundamental concepts, solutions of the Schrödinger equation (including square wells, harmonic oscillators, and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory)

6. ATOMIC PHYSICS: 10%

1. Modern Physics experiments - Photoelectric Effect, Blackbody Radiation, Compton Effect, Bremsstrahlung, Pair Production and Annihilation


7. SPECIAL RELATIVITY: 6%
   1. Basic Concepts, time dilation & length contraction, Lorentz transformation and Velocity Addition. Simultaneity: Work through the "man with the pole running into the barn problem." Radioactive decay and half life of relativistic moving particles.
   2. Energy & Momentum relations. Relativistic Collisions, momentum and energy conservation.
   3. Four Vectors, space time intervals. Relativistic Doppler

8. LABORATORY METHODS: 6%
   1. Data and Error Analysis: Systematic Errors, Standard Deviation, Propagation of Error (What is the fractional error of \( x = y \times z \) given fractional error in \( y \) and \( z \)?). Gaussian Distribution. Poisson distribution and counting statistics. Reading log-log and semilog plots and knowing when they are to be used.
   2. Circuits: Basic Capacitor, Resistor and Battery circuits, elements in series and parallel. Ohms Law, Energy stored in capacitors. RC circuits and the discharge of a capacitor into a resistor (How much time for a capacitor to discharge half of it's charge?). LC circuits modeled as harmonic oscillator. RLC circuit as damped oscillator. RLC circuit connected to AC power source as driven damped oscillator & Resonance. Complex impedances of capacitors and inductors and impedance matching.

9. SPECIALIZED TOPICS: 9%
   1. (Don't worry about this stuff for your initial review.. but if you want to see what is ahead.. here is the official ETS description:) Nuclear and Particle physics (e.g., nuclear properties, radioactive decay and fusion, reactions, fundamental properties of elementary particles), Condensed Matter (e.g., crystal structure, x-ray diffraction, thermal properties, electron theory of metals, semiconductors, superconductors), Miscellaneous (e.g., astrophysics, mathematical methods, computer applications)