NAME ___________________________

HONORS PHYSICS -- FIRST SEMESTER
"FINAL" EXAM

There are two parts to this test, Part A and Part B.

Part A, which will be worth 25 points, is comprised of a series of single-situation, single question, short answer, multiple choice and/or true/false questions. There may also be a vibratory or wave motion problem in this section. Everyone must do Part A. There will be partial credit on the vibratory motion/wave motion problem(s), but NO partial credit on any of the questions in the rest of the section.

Part B is comprised of four long-answer questions, each of which has four to six parts. You get to choose which three you will do. You cannot do bits and pieces in this section. I will only grade the three full problems *you choose* (you must cross out on the test the one you don't want graded). If you do not comply, I will grade the first three problems I come to. In other words, this is not a *do them all and let Mr. Fletcher pick the best three* kind of thing. Also, point totals for each section are provided to help you decide which problems you'll want graded. Each problem will be worth a total of 25 points.

Finally, there are 20 *multiple choice* problems from which you can make up to 15 extra credit points at the end of the test (that's right--20 chances to make 15 points). These are for extra credit. To compensate for blind guessing, I should take one-quarter point off for every incorrect response. I don't want to do that, so the alternative is that you simply agree not to blind guess. That is, if you can eliminate a few of the options making your guess somewhat educated, fine. Otherwise, leave the answer blank (I am depending upon your acting honorably about this).

Strategy: DON'T SIT ON A PROBLEM. Go through and write out the governing equations in algebraic form, fitted to the problems, for the sections you can do quickly. For the stuff you aren't sure about, use the REVERSE side of the test pages to scrawl, then when you think you have an answer, transfer it to the test proper. In other words, I want what I'm grading to be fairly sparse and clear, versus jumbled and chaotic.

If a problem has numbers involved in it, *present* and/or *derive* the needed expressions *algebraically first* (<u>BOX THESE FINAL, FITTED, GOVERNING ALGEBRAIC EXPRESSIONS</u>) before putting in the numbers (<u>BOX THE NUMERICAL ANSWERS, UNITS INCLUDED</u>). I can't give partial credit if I can't figure out what you have done. Include units with answers, be orderly, include any supplementary work needed to solve each problem (i.e., show well labeled free-body diagrams when applicable, etc.), and use blurbs when appropriate.

YOU MAY ASSUME YOU KNOW THE ANSWERS TO ALL PRECEEDING SECTIONS.

You may unstaple this test, but re-staple it before leaving.

My parting shot: Although there are easy problems, some problems are designed to be stinkers. Don't be thrown if you run into something you've never seen before. As obtuse as a problem may seem at first glance, it is constructed so as to test your understanding of the *principles* and *analysis techniques* (N.S.L., energy considerations, etc.) you have learned throughout the year. In other words, don't let the setups cross your wires. Read them through, think about what's being given and what is being asked for, then use what you know to untangle them.

Be aware that in some cases more information is given than needed,

Each section is a unit unto itself. In other words, don't fall into the trap of believing that because, say, *section a* is doable using *conservation of energy*, the rest of the sections are energy related.

You will have ALMOST three hours to complete the test. Although a few may finish in half that time, most people will do all they can do easily in the first half of the session, then sit and stare at the undone material for the last half of the session. In an attempt to nudge your brain out of the rut you may well be in halfway through the test, I will provide a brief "half-time show" approximately halfway through the test. It will take five to ten minutes. This is not my attempt to hone my American Idol act in front of you, a captured audience. There really is benefit in stepping away from problems you are stumped on and temporarily making your brain think about something else. In any case, you may assume that you will have two hours and fifty minutes to complete a test that at least a few of you may well complete in half that time. (You cannot leave the test until after *the half-time show*. The show is part of the experience!)

The single most useful thing you can do the night before the test is to get a good night sleep. I assume that by this point in time, you know how to use Newton's Second Law, or the conservation of energy approach. To do well on the test, what you will need beyond that will be a clear, nimble mind. That won't happen if you are tired.

Finally, when it comes to doing the problems, BE BOLD. Cheating is out, but aside from that this is a *no-holds-barred* test.

Good luck, and remember: the better you do, the easier it is for me to grade ... (a little pre-test levity).

Here are the equations I promised you:

$x_2 = x_1 + v_{1,x}\Delta t + \frac{1}{2}a_x(\Delta t^2)$ $\quad$ $v_{2,x}{}^2 = v_{1,x}{}^2 + 2a_x\Delta x$ $\quad$ $v_{2,x} = v_{1,x} + a_x\Delta t$ $\quad$ $F_{net,x} = ma_x$

$\mathbf{F}_{grav} = -mg(\mathbf{j})$ $\quad$ $\mathbf{F}_{spring} = -kx(\mathbf{i})$ $\quad$ $f_{kin} = \mu_k N$ $\quad$ $f_{static} = \mu_s N$ $\quad$ $a_{cent} = \frac{v^2}{r}$

$W_F = F \bullet d$ $\quad$ $KE_{translational} = \frac{1}{2}mv^2$ $\quad$ $W_{net} = \Delta KE$ $\quad$ $U_{spring} = \frac{1}{2}kx^2$ $\quad$ $U_{grav\ near\ earth} = mgy$

$\Sigma KE_1 + \Sigma U_1 + \Sigma W_{extraneous} = \Sigma KE_2 + \Sigma U_2$ $\quad$ $W_{cons.force} = -\Delta U$ $\quad$ $p_x = mv_x$ $\quad$ $F_x\Delta t = \Delta p_x$

$\Sigma p_{1,x} + \Sigma F_{external,x}\Delta t = \Sigma p_{2,x}$ $\quad$ $\theta_2 = \theta_1 + \omega_1\Delta t + \frac{1}{2}\alpha(\Delta t^2)$ $\quad$ $\omega_2{}^2 = \omega_1{}^2 + 2\alpha\Delta\theta$

$\omega_2 = \omega_1 + \alpha\Delta t$ $\quad$ $a = r\alpha$ $\quad$ $v = r\omega$ $\quad$ $\Gamma_{net} = I\alpha$ $\quad$ $\Gamma_F = rxF$ $\quad$ $I_{pt.mass} = mr^2$ $\quad$ $I_p = I_{cm} + md^2$

$W_\Gamma = \Gamma \bullet \Delta\theta$ $\quad$ $KE_{rot} = \frac{1}{2}I\omega^2$ $\quad$ $L = I\omega$ $\quad$ $L = \mathbf{r}x\mathbf{p}$ $\quad$ $\Gamma\Delta t = \Delta L$ $\quad$ $\Sigma L_1 + \Sigma\Gamma_{external}\Delta t = \Sigma L_2$

$T = \frac{1}{\nu}$ $\quad$ $\omega = 2\pi\nu$ $\quad$ $v_{max} = \omega A$ $\quad$ $a_{max} = \omega^2 A$ $\quad$ $x(t) = A\sin(\omega t + \phi)$ $\quad$ $\omega_{spring} = \sqrt{k/m}$ $\quad$ $v_{wave} = \lambda\nu$