Physics 10: Final Exam

June 13, 2008

Version A

- Be sure to write your name at the top of each page
- Multiple Choice and T/F problems are worth 1.5 points each for a total of 75 points
- Short Answer Problems total 25 points
- Show your reasoning, write formulas where appropriate (short answer)
- **Use units** in all short-answer numerical answers
- If you miss one part of the short answer, but need the number for the next part, make up a number and proceed

Formula List:

- $F = ma$
- $W = F \cdot d$
- $p = mv$
- $a_{\text{centripetal}} = \frac{v^2}{r}$
- $F_{grav} = \frac{Gm_1 m_2}{r^2}$; $G = 6.7 \times 10^{-11}$; m in kg, r in meters, F in Newtons
- $F_{elec} = \frac{kq_1 q_2}{r^2}$; $k = 9 \times 10^{10}$; q in Coulombs, r in meters, F in Newtons
- $F = qE$
- $v_{\text{rel}} = \frac{v_1 + v_2}{1 + \frac{v_1 v_2}{c^2}}$
- $c = \lambda \nu = \lambda f$
- $E = h\nu$; $h = 6.626 \times 10^{-34}$ J·s
- $E = mc^2$
- $\lambda = h/p$
- $R + G + B = W$; $R + G = W - B = Y$; $R + B = W - G = M$; $G + B = W - R = C$

Complex Units:

- Force in Newtons: N = kg·m/s^2
- Energy in Joules: J = N·m = kg·m^2/s^2
- Power in Watts: W = J/s = kg·m^2/s^3
- Charge in Coulombs: C; electron charge is -1.6×10^{-19} C
- Frequency in Hertz: Hz (1/s)