Name: **Student ID Number:**

Physics 12: Midterm Exam

May 6, 2013

Version A

- Be sure to write your name at the top of each page
- Multiple Choice problems are worth 2.5 points each for a total of 52.5 points
- True/False problems are worth 2.5 points each for a total of 17.5 points
- Short Answer Problems total 30 points
- Show your reasoning, write formulas where appropriate (short answer)
- You may use 10 m/s^2 in lieu of 9.8 m/s^2 in all calculations
- **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:

- $W = F \cdot d$
- $P.E. = mgh$
- $K.E. = \frac{1}{2}mv^2$
- $\Delta E = \Delta Q = c_p m \Delta T$
- $P = \Delta E / \Delta t$
- $E = mc^2$
- $F = \frac{P}{A} = \sigma T^4$; T in °K; T(°K) = T(°C) + 273; T(°C) = $(T(°\text{F}) - 32) \times \frac{5}{9}$
- $\varepsilon_{\max} = \frac{T_h - T_c}{T_h}$; T in °K
- COP $= \frac{T_h}{T_h - T_c}$; EER $= 3.4 \frac{T_c}{T_h - T_c}$

Factors of Ten

quadrillion: 10^{15}; Q

trillion/tera: 10^{12}; T

billion/giga: 10^{9}; G

million/mega: 10^{6}; M

thousand/kilo: 10^{3}; k

Complex Units:

- Newtons: N = kg·m/s^2
- Joules: J = N·m = kg·m^2/s^2
- Watts: W = J/s = kg·m^2/s^3; 1 horsepower = 746 W

Numerical and Conversion factors:

- 1 calorie = 4.184 J; 1 kiloalorie = 4,184 J; 1 Btu = 1055 J; 1 kWh = 3.6 MJ; 1 QBtu $\approx 10^{18}$ J
- density of water is 1 g/cm^3= 1 g/ml = 1 kg/l = 1000 kg/m^3; heat capacity is 4184 J/kg/°C
- density of air is 1.3 kg/m^3; heat capacity is $\sim$1000 J/kg/°C
- Stefan-Boltzman constant, $\sigma = 5.67 \times 10^{-8}$ W/m^2/°K^4