Fall 2014 RED barcode here
Physics 105, sections 1 and 3
Exam 1
Colton

Please write your CID_____
so that you can get your exam back

No time limit. A handwritten 3" x 5" note card is allowed. No books. Student calculators allowed. All problems equal weight.

Constants/Materials parameters:

$g = 9.8$ m/s^2
$G = 6.67 \times 10^{-11}$ N·m^2/kg^2
$k_B = 1.381 \times 10^{-23}$ J/K
$N_A = 6.022 \times 10^{23}$
$R = k_B \cdot N_A = 8.314$ J/mol·K
$\sigma = 5.67 \times 10^{-8}$ W/m^2·K^4
Mass of Sun = 1.991×10^{30} kg
Mass of Earth = 5.98×10^{24} kg
Radius of Earth = 6.38×10^6 m
Radius of Earth's orbit = 1.496×10^{11} m
Density of water: 1000 kg/m^3
Density of air: 1.29 kg/m^3
Linear exp. coeff. of copper: 17×10^{-6} /°C
Linear exp. coeff. of steel: 11×10^{-6} /°C
Specific heat of water: 4186 J/kg·°C
Specific heat of ice: 2090 J/kg·°C
Specific heat of steam: 2010 J/kg·°C
Specific heat of alum.: 900 J/kg·°C
Latent heat of melting (water): 3.33×10^5 J/kg
Latent heat of boiling (water): 2.26×10^6 J/kg
Thermal conduct. of alum.: 238 J/s·m·°C
$v_{sound} = 343$ m/s at 20°C

Conversion factors

1 inch = 2.54 cm
1 foot = 0.3048 m
1 mile = 1.609 km
1 mi/hr = 1 mph = 0.44704 m/s
1 m^3 = 1000 L
1 gallon = 3.785 L = 3785 cm^3
1 atm = 1.013×10^5 Pa = 14.7 psi

$$T_F = \tfrac{9}{5} T_C + 32$$
$$T_K = T_C + 273.15$$

Instructions:

- Write your CID at the top of the page, otherwise you may not get this exam booklet back.
- Circle your answers in this booklet if you wish to record them, but be sure to **mark your answers on the bubble sheet**. (You will not get the bubble sheet back.)
- Unless otherwise specified, **ignore air resistance** in all problems.
- Use g = 9.8 m/s^2.

Some notes on the answer ranges:

If a set of answers is given like this

a. Less than 30 N
b. 30 – 40
c. 40 – 50
d. 50 – 60
e. More than 60 N

you can generally consider choice (a) to mean "20 – 30 N", and choice (e) to mean "60 – 70 N". I often write them like that so that if I've made a mistake when making up the answer ranges, and the answer is really less than 20 N, or larger than 70 N, then there is still an answer that is correct.

I randomize the answer choices, so the first and last choices should receive their statistical fair share of answers.

Any units and/or exponents given in the first and last answer choices also apply to the middle choices.