Instructor(s): *S. Obukhov*

PHYSICS DEPARTMENT

PHY 2004 Midterm Exam 3 March 30, 2016

Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

Specific heat of water: $c = 1\text{cal/g}\cdot^\circ\text{C}$	$g = 9.81\ \text{m/s}^2$
Density of water: $\rho_w = 1\ \text{g/cm}^3$	Density of air $1.20\ \text{kg/m}^3$
Universal gas constant: $R = 8.314\ \text{J/mole K}$	$1\ \text{atm} = 10^5\ \text{Pa}$
Heat of fusion for water: $H_f = 80\ \text{cal/g}$	Heat of vaporization for water: $H_v = 539\ \text{cal/g}$

1. A 20 m^3 tank of propane gas has an absolute pressure of 200 kPa at a temperature of 27°C. What is the mass of gas in the tank if 1 kmole of propane weighs 44 kg? $R = 8314\ \text{J/kmole K}$.

   (1) 70.6 kg (2) 642 kg (3) 192 kg (4) 24.2 kg (5) 8.65 kg

2. The weight of a piece of metal in air is 24 N. If the weight of the same piece when fully immersed in oil (of density 800 kg/m^3) is 18 N, what is the density of the metal?

   (1) 3200 kg/m^3 (2) 4640 kg/m^3 (3) 1250 kg/m^3 (4) 6440 kg/m^3 (5) 5240 kg/m^3

3. A 5 m length of strong steel with a cross-sectional area of 20 cm^2 is compressed with a force of 20,000 N. If the Young's modulus for this steel is 200 GPa, what is the change in length of the steel?

   (1) 0.25 mm (2) 25 mm (3) 0.11 cm (4) 12.5 mm (5) 5.5 mm

4. An object has a moment of inertia of 5.0 kg m^2 about point P. Calculate the torque needed to accelerate the rotational motion of the object about P from rest to 5 rev/s in 60 seconds.

   (1) 2.62 N m (2) 0.42 N m (3) 1.34 N m (4) 5.14 N m (5) 0.13 N m

5. What will be the final water temperature when 3 kg of ice at 0°C and 6 kg of water at 20°C are mixed together (in °C)?

   (1) 0 (2) 10 (3) 13.4 (4) 20 (5) Not enough information given to answer.

6. A space satellite circles the earth at a height of 130 km, that is, in a circular path with $r = 6500$ km. It takes 86 minutes to go around the earth. Find centripetal acceleration (in m/s^2).

   (1) 9.6 (2) 9.8 (3) 9.4 (4) 10.0 (5) 3.0

7. 200 g of water is heated up to the boiling point. After that, 300 calories of heat is added. What amount of water evaporated (in grams)?

   (1) 0.55 (2) 30 (3) 3 (4) 14 (5) 200