

**Answers to exams given by Professor Mallinckrodt
Physics 132—Spring 2000**

First Midterm

1. 276 kg
2. a) 78.5 rad/s b) 1.30 cm c) 1.02 m/s d) 26.0 mJ
3. a) $\frac{4}{3}\pi r^3 \rho$ b) $\frac{4}{3}\pi G \rho r$ c) $-\frac{2}{3}\pi G \rho^2 R_e^2$ d) 5.60×10^4 atm
 e) p is larger at center
4. a) 4.23×10^7 m b) 4.23×10^7 m d) 2.45×10^7 m e) 5.29 h

Second Midterm

1. 10.5 kJ
2. a) 4.52 W b) 20 nW c) 100 dB
3. a) 686 Hz b) $x = 6.0$ m c) 5
4. b) 591 J c) 5.32 kJ d) 1.00 atm
5. a) $4\pi k R^2 (\Delta T)_o / d$ b) $\rho c d R / 3k$ c) 38.8 min d) it would take less time
 e) it wouldn't change f) smaller temp diff g) $\Delta T = (\Delta T)_o e^{-3kt / \rho c d R}$, 152 min

Final Exam

1. -32.1 kPa
2. a) 6.28 m/s, 1.97×10^4 m/s² b) 1.11 g/m
3. a) 2.05×10^{28} N b) 8.66×10^{10} m c) 0.579 y
4. a) +, -, - b) A low, B high c) $Q_{in} = \frac{7}{2} p_A V_A (r-1)$,
 $W = p_A V_A (r-1 - \ln r)$,
 $Q_{out} = p_A V_A \left[\frac{5}{2}(r-1) - \ln r \right]$
 d) 0.171 e) 0.800
5. a) 102 J/K b) 46.1 °C c) 32.6 kJ d) 1.66 km