

# PHYS-2010 Exam 4 Review Questions

## Dr. Luttermoser's Class

Note that your final exam is comprehensive. I consider half of the final as Exam 4 which covers material since Exam 3. For the final, study items from all 4 review sheets: **Exam 1 Review**, **Exam 2 Review**, **Exam 3 Review**, and **Exam 4 Review (this sheet)**.

1. State the following laws both in words and with equations: **Boyle**, **Charles & Gay-Lussac**, and **ideal gas**.
  2. What is meant by the **equation of state**? How does this relate to the **ideal gas law**? What assumptions are used in the ideal gas law?
  3. What is meant by a **state variable**?
  4. What is a **mole**? How is it related to **Avogadro's number**? List at least 3 different ways density can be measured and how do they relate to each other? What is an **atomic mass unit**? How is it defined?
  5. Discuss the kinetic theory of gases. What is meant by **degree of freedom**? What is meant by  $v_{\text{rms}}$ ? Define **internal energy**.
  6. What is meant by **hydrostatic equilibrium**?
  7. What is meant by particles following a **Maxwell-Boltzmann distribution**?
  8. Review all bold-faced terms in Chapter 10.
  9. Review the following example in the notes: XIII-1 (force-pressure calculation). Review the following examples in the textbook: 10.6 (ideal gas law), and 10.9 (kinetic theory of gases).
  10. Solve Example XIII-2 (SV 10.37: Boyle's law) and Example XIII-3 (SV 10.49: ideal gas law) from the notes.
  11. From CAPA Problem Set 4, go over Problems 1 (thermal energy), 2 (kinetic theory of gases), and 3 (ideal gas law). Go over Supplemental Homework Problems 4.1 (ideal gas law), 4.2 (kinetic theory of gas), and 4.4 (SV 10.58, ideal gas law).
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12. What are the differences between an **adiabatic**, an **isothermal**, and an **isochoric** process.
  13. Discuss the 0th, 1st, and 2nd laws of thermodynamics. What is meant by **thermal equilibrium**?
  14. Describe **entropy** both in terms of randomness and energy? What does this have to do with probability and statistics?

15. What is **thermal efficiency**? What's the difference between **reversible** and **irreversible** processes?
16. Describe a **Carnot Engine**.
17. What is meant by the **coefficient of performance**? What is difference between a **refrigerator** and a **heat pump**?
18. Review all bold-faced terms in Chapter 12.
19. Review the following examples in the textbook: 12.1 (work done by gas), 12.3, 12.4 (both on various processes of heat engines), 12.5 (1st law of thermodynamics), 12.14, and 12.15 (both on entropy and 2nd law of thermodynamics).
20. Solve Example XIV-1 (work done by gas), Example XIV-2 (SV 12.14: 1st law of thermodynamics), Example XIV-3 (efficiency of heat engine), and Example XIV-4 (SV 12.49: entropy and 2nd law of thermodynamics) from the notes.
21. Go over the following problems from CAPA Homework Problem Set 4: 5 (heat engines) and 6 (entropy). Go over Supplemental Homework Problems 4.5 (SV 12.15, work done by gas), 4.6 (SV 12.37, heat engines), 4.7 (SV 12.51, entropy, 2nd law of thermodynamics), and 4.8 (probability).