# Vapor-Compression Refrigeration Lab

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A graph with a number of dots

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**Figure 1a.** Refrigerant cycle state temperatures in Celsius on the y-axis versus refrigerant mass flow rate in kilograms per second on the x-axis. The solid blue circles represent average air temperature exiting the evaporator, the solid red squares represent average air temperature exiting the condenser, the open blue circles represent the refrigerant temperature at the condenser outlet & expansion valve inlet, the open red squares represent the refrigerant temperature at the expansion valve outlet & evaporator inlet, and the dashed black line represents the ambient temperature.

A white background with black text

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**Figure 1b.** Specific energy terms in kilojoules per kilogram on the y-axis versus refrigerant mass flow rate in kilograms per second on the x-axis. The red square markers represent the heat per unit mass rejected from the refrigerant in the condenser, the blue circles represent the heat per unit mass transferred to the refrigerant in the evaporator, the green x’s represent heat loss to the surroundings per unit mass, and the black diamonds represent the work to the refrigerant per unit mass.

**Figure 1c.** [insert caption here]

**Figure 1d.** [insert caption here]

A diagram of a boat

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**Figure 1e.** P-h diagram for R134a with experimental refrigeration cycle process for the highest refrigerant mass flow rate of 0.0147 kilograms per second. The red circles represent state points that are annotated with their state numbers. The experimental process states are connected by red process path lines. At states 1, 2 and 5, the refrigerant is in a super-heated vapor state. At state 3 the refrigerant is a subcooled liquid. At state 4, the refrigerant is in a saturated liquid-vapor mixture.

Short-Answer Questions

**2a.** *List and explain the observed differences in the P -h diagrams between an ideal cycle (as depicted in Figure 2 of the Handout) and that obtained from your actual measurements. [4–6 sentences]*

[insert your response here]

**2b.** *Based on your results and your engineering judgment, at what flow rate should the refrigerator be run. Justify your answer. [3–4 sentences]*

[insert your response here]

**2c.** *Perform a brief literature search of vapor-compression refrigeration systems to deter- mine how one can improve the coefficient of performance of an actual system. Describe at least one means of increasing COPR and explain how it works in terms of the equation: . Include one or more references from your literature search. [3–6 sentences]*

[insert your response here]