

# HVAC Refrigeration Fundamental Practice Test (Sample)

## Study Guide



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**SAMPLE**

## **Questions**

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- 1. Which components are common to both the compression cycle and the absorption cycle?**
  - A. Evaporator and compressor**
  - B. Evaporator and condenser**
  - C. Compressor and metering device**
  - D. Condenser and metering device**
- 2. Which of the following is commonly used to estimate the size of a room?**
  - A. Measuring the height of the walls**
  - B. Using drop ceilings**
  - C. Calculating the area in square feet**
  - D. Taking the length and breadth of furniture**
- 3. In mechanical applications, work is typically measured in which of the following units?**
  - A. Watts and ohms**
  - B. Amperes and joules**
  - C. Amperes and watts**
  - D. Foot-pounds and volts**
- 4. What is the primary role of the evaporator in a refrigeration system?**
  - A. To condense refrigerant**
  - B. To absorb heat**
  - C. To filter refrigerant**
  - D. To circulate air**
- 5. Where is the split system evaporator coil typically located?**
  - A. Outside the building**
  - B. In the garage**
  - C. Inside in a basement, crawlspace, attic, or closet**
  - D. On the rooftop**

- 6. What type of heat transfer occurs when campers are heated by a fire outside?**
- A. Conduction**
  - B. Convection**
  - C. Radiation**
  - D. Induction**
- 7. Units that require more than one measurement and cannot be measured in base units are known as what?**
- A. Base units**
  - B. Derived units**
  - C. Imperial units**
  - D. Standard units**
- 8. What heating options are available for package air conditioning units?**
- A. Only electric resistance heat**
  - B. Heat pump operation and electric resistance heat only**
  - C. Gas-fired heat, electric resistance heat, and heat pump operation**
  - D. Only gas-fired heat**
- 9. The three states of matter primarily represent what concept?**
- A. Diverse levels of molecular energy**
  - B. The arrangement of atoms**
  - C. The amount of heat energy present**
  - D. The structure of the material**
- 10. In the context of thermodynamics, what is a vacuum often used for?**
- A. Pumping liquids**
  - B. Insulating materials**
  - C. Creating pressure differences**
  - D. Storing gases**

## **Answers**

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- 1. B**
- 2. B**
- 3. C**
- 4. B**
- 5. C**
- 6. C**
- 7. B**
- 8. C**
- 9. A**
- 10. C**

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## **Explanations**

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**1. Which components are common to both the compression cycle and the absorption cycle?**

- A. Evaporator and compressor**
- B. Evaporator and condenser**
- C. Compressor and metering device**
- D. Condenser and metering device**

In both the compression cycle and the absorption cycle, the evaporator and condenser play critical roles in the refrigeration process. The evaporator is responsible for absorbing heat from the environment, causing the refrigerant inside to evaporate and turn into vapor, which then absorbs heat from the surroundings. This heat exchange process is essential in both systems for providing the cooling effect. The condenser, on the other hand, is where the refrigerant releases the absorbed heat. In the compression cycle, the refrigerant vapor, after being compressed, is sent to the condenser where it releases heat to the external environment and transitions back to a liquid state. In the absorption cycle, a similar process occurs where the refrigerant gives off heat in the condenser, aiding in its conversion from vapor to liquid. While the compression cycle uses a mechanical compressor to circulate the refrigerant, the absorption cycle relies on a thermal process to create the pressure difference needed to promote the flow of refrigerant. Regardless of these differences, the roles of the evaporator and condenser remain central to the operation of both refrigeration cycles.

**2. Which of the following is commonly used to estimate the size of a room?**

- A. Measuring the height of the walls**
- B. Using drop ceilings**
- C. Calculating the area in square feet**
- D. Taking the length and breadth of furniture**

The correct approach to estimating the size of a room involves calculating the area in square feet. This is done by measuring the length and width of the room and then multiplying these two dimensions. This calculation provides a clear representation of the floor space available in the room, which is essential for determining the capacity required for heating, ventilation, and air conditioning systems. Using drop ceilings, while relevant for other aspects of room design such as aesthetics or acoustics, does not directly contribute to understanding the overall size of the room. Measuring the height of the walls, on its own, provides information about the volume of the room but does not assist in calculating the floor area needed for HVAC sizing. Taking the length and breadth of furniture can inform spatial planning, but it doesn't reflect the complete dimensions of the room itself. Thus, for proper HVAC analysis and sizing, calculating the area in square feet is the most effective method.

**3. In mechanical applications, work is typically measured in which of the following units?**

- A. Watts and ohms**
- B. Amperes and joules**
- C. Amperes and watts**
- D. Foot-pounds and volts**

In mechanical applications, work is accurately measured in joules and foot-pounds. However, the choice of amperes and watts relates to electrical work. Watts, in particular, are a measure of power, which is the rate at which work is done or energy is transferred over time. One watt equals one joule per second. This makes watts a relevant unit in contexts where electrical power is involved in performing mechanical work. Amperes, on the other hand, measure the flow of electric current, which is essential in understanding how energy transfers occur in electric circuits. Although the focus here is on mechanical work, the inclusion of watts indicates a connection between electrical energy and mechanical applications, as many mechanical systems utilize electric motors, which operate based on electrical input measured in amperes and watts. The other choices do not specifically address the units used to quantify work in mechanical applications. While there are relevant electrical metrics included in those options, the correct connection to both electrical power and potentially mechanical work is best represented by amperes and watts.

**4. What is the primary role of the evaporator in a refrigeration system?**

- A. To condense refrigerant**
- B. To absorb heat**
- C. To filter refrigerant**
- D. To circulate air**

The primary role of the evaporator in a refrigeration system is to absorb heat. In this component, the refrigerant enters as a low-pressure liquid and evaporates into a gas as it absorbs heat from the surrounding environment, such as air or water. This heat absorption is essential as it lowers the temperature of the air or fluid that is being cooled, making the space being serviced by the refrigeration system cooler. This process is integral to the refrigeration cycle, allowing heat to be transferred from the inside of the refrigerator or air conditioning system to the outside environment. As the refrigerant absorbs heat, it changes state from a liquid to a gas, which is critical for the system to effectively remove unwanted heat from designated spaces. In contrast, other options relate to different functions in a refrigeration system. For instance, condensing refrigerant happens in the condenser, where the gaseous refrigerant releases heat and turns back into a liquid. Filtering does occur within the system, but it's typically handled by a separate component designed for that purpose. Circulating air is important in the overall functioning of HVAC systems, but it does not describe the evaporator's primary function. The key takeaway is that the evaporator's main purpose is to absorb heat, making it vital for the

**5. Where is the split system evaporator coil typically located?**

- A. Outside the building**
- B. In the garage**
- C. Inside in a basement, crawlspace, attic, or closet**
- D. On the rooftop**

The evaporator coil in a split system is typically located inside the building, in areas such as a basement, crawlspace, attic, or closet. This placement is essential for effective heat exchange within the air conditioning system. The evaporator coil is responsible for absorbing heat from the indoor air, which is a crucial function for cooling. By being situated inside, the coil can remove heat efficiently as it cools the air before it is circulated back into living spaces. Having the evaporator coil indoors also helps in maintaining higher humidity levels, which can contribute to better comfort and efficiency. On the other hand, outdoor locations would not allow for effective heat exchange, and spaces like garages might not facilitate optimal airflow or system efficiency.

**6. What type of heat transfer occurs when campers are heated by a fire outside?**

- A. Conduction**
- B. Convection**
- C. Radiation**
- D. Induction**

The correct answer is radiation. In the context of campers being heated by a fire, radiation refers to the transfer of heat through electromagnetic waves. The heat from the fire escapes into the surrounding environment in the form of infrared radiation, which travels through the air and warms the campers directly. This process does not require a medium like air or water to transfer heat; instead, it occurs even in a vacuum, making it distinct from other forms of heat transfer. Other forms of heat transfer, such as conduction and convection, involve direct contact or movement of fluids. Conduction involves heat transfer through direct contact between materials, while convection involves the movement of fluids (liquids or gases) which carry heat with them. Induction, on the other hand, is typically used in the context of heat transfer through electromagnetic fields, usually seen in induction cooktops, and is not applicable in this scenario. Radiation is the primary mechanism by which heat from a fire warms nearby objects and individuals without any physical contact.

**7. Units that require more than one measurement and cannot be measured in base units are known as what?**

- A. Base units**
- B. Derived units**
- C. Imperial units**
- D. Standard units**

Units that require more than one measurement and cannot be measured in base units are classified as derived units. Derived units are formed by the combination of base units to express a physical quantity. For example, velocity is a derived unit that combines the base units of distance (meters) and time (seconds) to create meters per second (m/s). Derived units are essential in physics and engineering because many physical phenomena cannot be described adequately using base units alone. They allow for a more comprehensive representation of complex measurements, such as force (newtons), pressure (pascals), and energy (joules), which all rely on the combination of base units to convey meaningful information. In contrast, base units represent the fundamental quantities in a measurement system, such as length, mass, and time, and do not combine multiple measurements. Imperial units and standard units generally refer to specific measurement systems but do not define the concept of units requiring combinations of measurements.

**8. What heating options are available for package air conditioning units?**

- A. Only electric resistance heat**
- B. Heat pump operation and electric resistance heat only**
- C. Gas-fired heat, electric resistance heat, and heat pump operation**
- D. Only gas-fired heat**

Package air conditioning units are designed to combine both cooling and heating functions in a single unit. When it comes to heating options, the most versatile choice is the combination of gas-fired heat, electric resistance heat, and heat pump operation. Gas-fired heat provides a highly efficient means of heating, especially in areas where natural gas is readily available and can be more cost-effective for larger spaces. Electric resistance heat offers an alternative solution that's straightforward in implementation and maintenance, useful in areas where a gas supply is not feasible. Heat pump operation not only provides efficient heating by extracting heat from the outside air but also delivers the benefit of air conditioning without significant additional energy consumption, making it an efficient option in moderate climates. This variety of heating methods allows the package air conditioning unit to effectively cater to different heating demands and environmental conditions. Therefore, the correct choice reflects the full spectrum of heating options available in these systems, ensuring flexibility and efficiency.

**9. The three states of matter primarily represent what concept?**

- A. Diverse levels of molecular energy**
- B. The arrangement of atoms**
- C. The amount of heat energy present**
- D. The structure of the material**

The three states of matter—solid, liquid, and gas—are fundamentally linked to the diverse levels of molecular energy. In solids, the molecules are closely packed together and vibrate in place, reflecting low energy. In liquids, the molecules are more loosely connected, allowing them to move past one another, which indicates a medium level of energy. In gases, the molecules have enough energy to overcome intermolecular forces altogether and move freely, reflecting high energy. Understanding these energy levels is crucial as they explain how matter transitions from one state to another through processes such as melting, freezing, condensation, and evaporation. Each state represents a different form of energy distribution and movement among the particles, which underlies many principles in physics and chemistry. The choice regarding the arrangement of atoms, the amount of heat energy, or the structure of the material are related but do not wholly encompass the central concept of how the energy levels influence the states of matter.

**10. In the context of thermodynamics, what is a vacuum often used for?**

- A. Pumping liquids**
- B. Insulating materials**
- C. Creating pressure differences**
- D. Storing gases**

A vacuum plays a crucial role in creating pressure differences, which is foundational to many thermodynamic processes and applications. In refrigeration systems, for instance, a vacuum can be employed to lower the boiling point of a refrigerant, allowing it to evaporate at a lower temperature and absorb heat from the environment. This principle is integral to the operation of refrigeration and air conditioning systems, as the evaporation and condensation cycles rely heavily on pressure differentials to facilitate the transfer of heat. Moreover, vacuums are essential in various industrial applications, where creating a lower pressure environment can aid in processes like distillation or in removing air from containers before sealing. This capability to manipulate pressure is not only critical for system efficiency but also for ensuring that processes function safely and effectively. The other options, while relevant to different aspects of thermodynamics or HVAC applications, do not capture the primary role of a vacuum in the context provided. Pumping liquids relates to fluid dynamics, insulating materials pertains to thermal resistance, and storing gases does not directly address the fundamental thermodynamic principle of utilizing pressure differences effectively. Therefore, emphasizing the role of a vacuum in creating pressure differences aligns perfectly with its significance in thermodynamic applications.