

BOMA-HVAC Practice Test (Sample)

Study Guide



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SAMPLE

Questions

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- 1. What type of HVAC system uses water to distribute heat?**
 - A. Forced Air System**
 - B. Electric Heating System**
 - C. Hydronic Heating System**
 - D. Refrigerant Cooling System**
- 2. Effective temperature can be impacted by environmental factors such as ____.**
 - A. Atmospheric pressure**
 - B. Altitude**
 - C. Humidity**
 - D. Wind direction**
- 3. What is considered an excellent heat carrier because it ____?**
 - A. Has low specific heat**
 - B. Is inexpensive**
 - C. Has high specific heat**
 - D. Is readily available**
- 4. What is one reason systems may operate inefficiently?**
 - A. Regular monitoring**
 - B. Poor thermostat calibration**
 - C. Automated adjustments**
 - D. Routine inspections**
- 5. What is the primary function of the purge unit in a centrifugal chiller?**
 - A. To increase pressure in the system**
 - B. To add refrigerant**
 - C. To remove non-condensibles from the condenser**
 - D. To enhance cooling efficiency**

- 6. What effect does high humidity have in HVAC environments?**
- A. Improves air circulation**
 - B. Causes discomfort and may lead to mold growth**
 - C. Reduces heating efficiency**
 - D. Enhances energy efficiency of the system**
- 7. How is the movement of the pre-rotation vanes controlled?**
- A. Fan speed**
 - B. Chill water temperature control**
 - C. Refrigerant flow**
 - D. Pressure differential**
- 8. What type of fan is mostly used in HVAC and industrial systems?**
- A. Axial**
 - B. Centrifugal**
 - C. Blower**
 - D. Exhaust**
- 9. The refrigeration effect of a refrigerant is improved by ____.**
- A. Increasing the temperature**
 - B. Subcooling the liquid**
 - C. Reducing pressure**
 - D. Enhancing insulation**
- 10. What term describes the expansion or contraction of a gas without a change in temperature?**
- A. Isothermal**
 - B. Adiabatic**
 - C. Isochoric**
 - D. Hyperbaric**

Answers

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

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Explanations

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1. What type of HVAC system uses water to distribute heat?

- A. Forced Air System
- B. Electric Heating System
- C. Hydronic Heating System**
- D. Refrigerant Cooling System

The correct answer is the hydronic heating system, which is designed specifically to use water as a medium for distributing heat throughout a building. In a hydronic system, water is heated in a boiler and then circulated through a network of pipes to radiators or underfloor heating elements. This method allows for a consistent and efficient transfer of heat, providing comfortable warmth in the spaces being heated. Hydronic systems have several advantages, including greater energy efficiency and the ability to maintain more stable temperatures compared to some other heating methods. The use of water as a heat transfer medium can also lead to lower operating costs since water holds and distributes heat effectively. In contrast, a forced air system circulates heated or cooled air through ductwork, making it reliant on air rather than water. An electric heating system typically uses electric resistance to heat air or surfaces directly and does not involve the circulation of water. A refrigerant cooling system focuses on removing heat from the air using refrigerants, which is unrelated to heating through water. Understanding these distinctions highlights why hydronic heating is uniquely suited for the distribution of heat using water.

2. Effective temperature can be impacted by environmental factors such as ____.

- A. Atmospheric pressure
- B. Altitude
- C. Humidity**
- D. Wind direction

Effective temperature refers to how temperature feels to humans, taking into account various environmental factors. Humidity plays a crucial role in determining effective temperature because it affects the body's ability to cool itself through the evaporation of sweat. High humidity levels can make it feel warmer than the actual air temperature because the moisture in the air slows down evaporation. Conversely, low humidity can enhance the cooling effect of sweat, making it feel cooler than the actual temperature. The significance of humidity in affecting perceived warmth is why it is the correct answer. It illustrates a fundamental aspect of thermal comfort, impacting our physiological responses to the environment. While atmospheric pressure, altitude, and wind direction can influence temperature and weather conditions, they do not directly alter the perceived temperature in the same way that humidity does. Atmospheric pressure changes can impact weather patterns, altitude can affect temperature and oxygen levels, and wind direction can influence how quickly air is moving. However, none of these factors have as immediate and impactful a relationship with human comfort as humidity does.

3. What is considered an excellent heat carrier because it _____?

- A. Has low specific heat**
- B. Is inexpensive**
- C. Has high specific heat**
- D. Is readily available**

Water is commonly considered an excellent heat carrier primarily due to its high specific heat capacity. This property allows water to absorb and store large amounts of thermal energy without experiencing a significant change in temperature. When a substance has a high specific heat, it can efficiently regulate temperatures in HVAC systems by absorbing excess heat during warm periods and releasing it when temperatures drop. This characteristic makes water especially effective in heating and cooling applications, as it enables the system to maintain a more stable temperature and improve overall energy efficiency. While factors such as cost, availability, and specific heat are important in evaluating a heat carrier, the high specific heat of water is what fundamentally contributes to its effectiveness in thermal management systems.

4. What is one reason systems may operate inefficiently?

- A. Regular monitoring**
- B. Poor thermostat calibration**
- C. Automated adjustments**
- D. Routine inspections**

Inefficient operation of HVAC systems can often be traced back to poor thermostat calibration. When a thermostat is not calibrated correctly, it can lead to significant temperature discrepancies between the actual room temperature and the temperature set on the thermostat. This misalignment forces the HVAC system to work harder than necessary, as it may overheat or overcool the space, resulting in higher energy consumption, increased wear on equipment, and discomfort for occupants. Regular monitoring, automated adjustments, and routine inspections, on the other hand, are measures that typically contribute to the efficient operation of HVAC systems. When these practices are in place, they help ensure that the system operates as intended, settings are optimal, and any potential issues are detected and addressed promptly.

5. What is the primary function of the purge unit in a centrifugal chiller?

- A. To increase pressure in the system**
- B. To add refrigerant**
- C. To remove non-condensibles from the condenser**
- D. To enhance cooling efficiency**

The primary function of the purge unit in a centrifugal chiller is to remove non-condensibles from the condenser. In a chilled water system, non-condensibles, such as air or other gases, can accumulate in the condenser. These substances can hinder the system's efficiency by taking up space that would otherwise be occupied by refrigerant, thus reducing the overall heat exchange performance of the chiller. By extracting these non-condensibles, the purge unit helps maintain optimal system pressure and enhances the heat transfer process, which in turn supports the chiller's efficiency and performance. Efficient removal of these gases ensures that the refrigerant can condense properly, leading to better cooling and system operation. Other options involve functions that are either not primary focuses of a purge unit or are managed by different components within the cooling system. For example, increasing pressure in the system or adding refrigerant is managed by other components in the chiller system, while enhancing cooling efficiency is a result of improved performance but not a function specific to the purge unit itself.

6. What effect does high humidity have in HVAC environments?

- A. Improves air circulation**
- B. Causes discomfort and may lead to mold growth**
- C. Reduces heating efficiency**
- D. Enhances energy efficiency of the system**

High humidity in HVAC environments primarily causes discomfort and may lead to mold growth. When the humidity levels rise, the air feels warmer than it actually is, which can create a feeling of sticky discomfort. This condition can make it difficult for individuals to regulate their body temperature effectively. Additionally, excessive humidity can lead to condensation on surfaces, contributing to a moist environment that is ideal for mold and mildew growth. These factors can compromise indoor air quality and may lead to health issues for occupants, as well as potential damage to building materials and furnishings. Therefore, maintaining appropriate humidity levels is crucial for comfort, health, and the integrity of the building.

7. How is the movement of the pre-rotation vanes controlled?

- A. Fan speed**
- B. Chill water temperature control**
- C. Refrigerant flow**
- D. Pressure differential**

The movement of the pre-rotation vanes is primarily controlled by chill water temperature control because these vanes are designed to optimize the performance of a cooling system, particularly in variable air volume (VAV) systems. By adjusting the position of the pre-rotation vanes, the system can effectively enhance the airflow characteristics and improve the energy efficiency of the cooling process. Specifically, when the chilled water temperature is adjusted, the cooling load in the space changes, leading to a need for modifications in air distribution. The pre-rotation vanes help manage this airflow in response to the chilled water temperature to maintain appropriate indoor conditions. This adaptability ensures that the system can efficiently respond to varying cooling demands while maximizing efficiency. The other options pertain to different aspects of HVAC operation. Fan speed affects airflow but does not directly control the positioning of the vanes. Refrigerant flow is more related to the cooling process and the operation of the compressor and evaporator, rather than directly impacting the vanes. Pressure differential may influence air movement but is not the primary control mechanism for the pre-rotation vanes themselves.

8. What type of fan is mostly used in HVAC and industrial systems?

- A. Axial**
- B. Centrifugal**
- C. Blower**
- D. Exhaust**

Centrifugal fans are predominantly used in HVAC and industrial systems due to their ability to generate high pressure and move large volumes of air efficiently. They operate by drawing air into the center of the fan and then forcing it outwards through a discharge nozzle. This design allows centrifugal fans to handle high resistance in the ductwork and achieve sufficient airflow, making them ideal for applications requiring consistent and controlled airflow, such as in heating, cooling, and ventilation systems. Furthermore, their versatility makes them suitable for various configurations and applications, whether in commercial buildings, industrial processes, or even in more complex systems requiring precise air management. The characteristics of centrifugal fans allow them to be effective in situations where other fan types may not perform as effectively, such as in systems that require high static pressure or in circumstances where air needs to be moved through long duct runs.

9. The refrigeration effect of a refrigerant is improved by ____.

- A. Increasing the temperature
- B. Subcooling the liquid**
- C. Reducing pressure
- D. Enhancing insulation

Subcooling the liquid in a refrigeration cycle enhances the refrigeration effect by ensuring that the refrigerant remains in a liquid state below its saturation temperature as it exits the condenser. When the refrigerant is subcooled, it can absorb more heat from the space being cooled during the evaporator phase because it has a lower temperature and higher capacity for heat absorption. This increased capacity leads to a more efficient cooling process and improved overall system performance. By subcooling, the refrigerant becomes more effective at dropping in temperature as it transitions from liquid to vapor in the evaporator. The more heat it can absorb from the environment during this phase, the more efficient the refrigeration cycle becomes, ultimately improving the system's performance and lowering energy consumption. Thus, subcooling plays a crucial role in optimizing the refrigeration effect.

10. What term describes the expansion or contraction of a gas without a change in temperature?

- A. Isothermal
- B. Adiabatic**
- C. Isochoric
- D. Hyperbaric

The term that describes the expansion or contraction of a gas without a change in temperature is adiabatic. In an adiabatic process, the system is thermally insulated so that any changes in pressure and volume occur without heat transfer to or from the surroundings. This means that the gas can either expand or contract, and while its internal energy may change, the temperature remains constant throughout the process. In contrast, isothermal processes involve changes occurring at a constant temperature, where heat exchange with the environment allows for temperature stabilization. Isochoric processes happen at a constant volume, meaning the gas cannot expand or contract, and any heat added increases the pressure instead. Hyperbaric refers to conditions of high pressure but does not specifically relate to temperature changes of gases during expansion or contraction. Thus, adiabatic is the most accurate term for gas behavior characterized by expansion or contraction without temperature change.