

Arizona R-39/CR-39 Residential and Commercial Air Conditioning and Refrigeration HVAC Contractor Practice Exam (Sample)

Study Guide



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SAMPLE

Questions

- 1. How does radiant heating primarily transfer heat?**
 - A. Through convection**
 - B. Through conduction**
 - C. Through radiation**
 - D. Through ventilation**
- 2. A leaky building envelope can lead to which of the following?**
 - A. Inefficiency and high load on equipment**
 - B. Higher indoor humidity levels**
 - C. Sufficient air circulation**
 - D. Lower utility bills**
- 3. Which type of HVAC system combines both heating and cooling functions into a single package?**
 - A. Unitary system**
 - B. All-water system**
 - C. All-air system**
 - D. Air and water system**
- 4. What can impact capacity and lead to evaporator coil freezing according to ACCA Manual D?**
 - A. Improper insulation**
 - B. Oversized ducts**
 - C. Undersized ducts**
 - D. Dirty filters**
- 5. What is the purpose of a pressure relief device in HVAC systems?**
 - A. To monitor temperature**
 - B. To relieve excessive pressure**
 - C. To control airflow**
 - D. To enhance energy efficiency**

- 6. How many feet must any intake openings be from lot lines?**
- A. 5 feet**
 - B. 10 feet**
 - C. 15 feet**
 - D. 20 feet**
- 7. What is an important consideration in sizing an air conditioning unit?**
- A. Only the size of the equipment itself**
 - B. The color of the unit**
 - C. The heat load of the space**
 - D. Whether it is residential or commercial**
- 8. Which type of boiler needs a temperature gauge?**
- A. Both steam and water boilers**
 - B. Just steam boilers**
 - C. Just water boilers**
 - D. No boilers need it**
- 9. What can be a result of improperly vented gas appliances?**
- A. Lower utility bills**
 - B. Carbon monoxide poisoning**
 - C. Improved air quality**
 - D. None of the above**
- 10. What is the proper approach to measuring humidity in conjunction with temperature?**
- A. Using a dry bulb thermometer**
 - B. Using a barometer**
 - C. By employing a wet bulb measurement**
 - D. Using a hygrometer only**

Answers

SAMPLE

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

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Explanations

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1. How does radiant heating primarily transfer heat?

- A. Through convection**
- B. Through conduction**
- C. Through radiation**
- D. Through ventilation**

Radiant heating primarily transfers heat through radiation, which is the correct choice. This method relies on the emission of infrared radiation from a hot surface, such as radiant floor heating systems or ceiling panels, directly to the objects and people in the room. Unlike convection, which requires a medium (like air) to transfer heat through movement, or conduction, which requires direct contact between materials for heat transfer, radiation allows heat to travel through space without the need for a physical medium. Consequently, this kind of heating can efficiently warm up a room by directly affecting the occupants and objects within it, enhancing comfort levels without needing to heat the air first. In contrast, ventilation involves moving air to distribute heat but does not inherently raise the temperature of surfaces through direct heating. Thus, while convection and ventilation are important concepts in HVAC systems, they do not accurately describe the primary method of heat transfer involved in radiant heating.

2. A leaky building envelope can lead to which of the following?

- A. Inefficiency and high load on equipment**
- B. Higher indoor humidity levels**
- C. Sufficient air circulation**
- D. Lower utility bills**

A leaky building envelope can significantly affect the efficiency of HVAC systems and increase the load on the equipment. When there are leaks in the building envelope, outside air can infiltrate the conditioned space, introducing unconditioned air and making it more challenging for the HVAC system to maintain the desired indoor temperature. This results in the system working harder, leading to increased energy consumption and potentially higher operational costs. This inefficiency causes an elevated load on the equipment, as it must compensate for the losses in heating or cooling due to drafts, which can further shorten the lifespan of the HVAC components and lead to more frequent repairs. In contrast, higher indoor humidity levels, while a consequence of poor envelope performance, usually requires separate strategies to manage, and options that suggest lower utility bills or sufficient air circulation do not align with the expected outcomes of a leaky envelope. Thus, the focus is on the direct impact of equipment efficiency and load as a result of compromised building integrity.

3. Which type of HVAC system combines both heating and cooling functions into a single package?

- A. Unitary system**
- B. All-water system**
- C. All-air system**
- D. Air and water system**

Unitary systems are designed to consolidate both heating and cooling functionalities within a single unit, making them ideal for both residential and commercial applications. These systems typically involve an air-cooled condenser and an indoor coil that works together to either heat or cool the air in a space. By integrating both functions, unitary systems simplify installation and maintenance, reduce space requirements, and often improve energy efficiency as they use a single set of components for both temperature control needs. In contrast, an all-water system primarily utilizes water for heating and cooling, typically requiring additional equipment like boilers and chillers, which makes it less compact and more complex. An all-air system, on the other hand, mainly uses air as the medium for distributing heating or cooling but does not necessarily provide both functions in a single package. Lastly, an air and water system combines features of both air and water systems but is not as streamlined as a unitary system that integrates the two functions. Thus, the unitary system stands out as the most efficient solution for managing both heating and cooling requirements in one cohesive unit.

4. What can impact capacity and lead to evaporator coil freezing according to ACCA Manual D?

- A. Improper insulation**
- B. Oversized ducts**
- C. Undersized ducts**
- D. Dirty filters**

The impact of undersized ducts on capacity and the potential for evaporator coil freezing is significant, as described in ACCA Manual D. When ducts are too small to accommodate the required airflow for the system, the air velocity increases, but the volume of air delivered decreases, causing the system to struggle to maintain the designed temperature. This reduces the capacity of the air conditioning unit to effectively cool the space. As a result of insufficient airflow, the evaporator coil may not receive enough warm air to transfer heat away effectively. When the air does not circulate properly over the coil, it can lead to a drop in temperature on the coil's surface. If the surface temperature of the evaporator coil drops below the freezing point of water, moisture can condense on the coil and eventually freeze, causing ice buildup. This ice not only restricts airflow even further but also diminishes the overall efficiency of the HVAC system, leading to potential operational failures. In contrast, the other options—such as improper insulation, oversized ducts, and dirty filters—can affect system performance but do not directly cause the same mechanism of freezing in the evaporator coil as undersized ducts do. While these factors may contribute to inefficiencies and other operational issues, it is the duct sizing that

5. What is the purpose of a pressure relief device in HVAC systems?

- A. To monitor temperature**
- B. To relieve excessive pressure**
- C. To control airflow**
- D. To enhance energy efficiency**

The primary purpose of a pressure relief device in HVAC systems is to relieve excessive pressure. These devices are critical safety components designed to prevent potential damage to equipment and reduce the risk of hazardous situations. When the internal pressure of the system exceeds safe operating limits—due to factors like thermal expansion, blockages, or system malfunctions—the pressure relief valve opens and allows excess pressure to escape. This function helps maintain safe operating conditions and prevents failures like ruptures or leaks that could lead to property damage or personal injury. While monitoring temperature, controlling airflow, and enhancing energy efficiency are important aspects of HVAC operation, they do not directly relate to the specific function of pressure relief devices. Instead, they are managed by other components and systems within the HVAC framework.

6. How many feet must any intake openings be from lot lines?

- A. 5 feet**
- B. 10 feet**
- C. 15 feet**
- D. 20 feet**

The regulation that dictates the distance intake openings must be from lot lines focuses on ensuring adequate air quality and minimizing the risks associated with contaminants. This requirement aims to establish a safe separation distance that avoids direct intake of exhaust from vehicles, nearby structures, or other sources that may negatively affect the air quality entering into HVAC systems. The specified distance of 10 feet is significant because it provides a buffer zone that helps prevent potential pollutants from being sucked into an air conditioning system. This regulation is designed to protect the efficiency and functionality of the HVAC system, as well as to comply with health and safety standards established at the local or state level. In this context, the other distances mentioned do not align with the commonly accepted standards or requirements. Distances shorter than 10 feet would increase the likelihood of air quality issues, while distances longer than 10 feet may not be practical or necessary, thus making 10 feet the appropriate and enforceable standard.

7. What is an important consideration in sizing an air conditioning unit?

- A. Only the size of the equipment itself**
- B. The color of the unit**
- C. The heat load of the space**
- D. Whether it is residential or commercial**

When sizing an air conditioning unit, the heat load of the space is a critical consideration. Heat load refers to the total amount of heat energy that must be removed from a space to maintain a comfortable indoor environment. This involves assessing various factors such as the dimensions of the space, the number of windows, insulation quality, occupancy levels, and the presence of heat-generating appliances. By calculating the heat load, HVAC professionals can determine the appropriate capacity of the air conditioning unit needed to efficiently cool the area without overworking the system or causing humidity problems. This consideration ensures optimal comfort and energy efficiency, helping to prevent the potential for equipment failure or increased energy costs. Other factors, like whether the unit is intended for residential or commercial use, while important, are secondary when it comes to the actual sizing process. The size of the equipment itself is inherently related to its capacity, but the proper sizing is fundamentally rooted in understanding the specific heat load of the space it is intended to serve. The color of the unit has no effect on its cooling performance or capacity, making it irrelevant to the sizing considerations.

8. Which type of boiler needs a temperature gauge?

- A. Both steam and water boilers**
- B. Just steam boilers**
- C. Just water boilers**
- D. No boilers need it**

The correct choice indicates that both steam and water boilers require a temperature gauge to operate effectively and safely. Temperature gauges play a crucial role in monitoring the operating conditions of these systems. For steam boilers, the temperature gauge is vital for ensuring the steam produced does not exceed safe operating limits. High temperatures can lead to excessive pressure, making the system unsafe and potentially leading to catastrophic failures. Water boilers, on the other hand, require temperature monitoring to maintain efficient heating and to prevent overheating. By keeping track of the water temperature, a water boiler can maintain the optimal thermal efficiency and prevent issues such as scaling or system damage due to excessive heat. Both types of boilers utilize temperature gauges to provide operators with critical information regarding their current state, ensuring both efficiency and safety in their operation. The dependence on this monitoring instrument underscores the importance of temperature management in both steam and water systems.

9. What can be a result of improperly vented gas appliances?

- A. Lower utility bills
- B. Carbon monoxide poisoning**
- C. Improved air quality
- D. None of the above

Improperly vented gas appliances can lead to the accumulation of harmful gases, particularly carbon monoxide, in enclosed spaces. Carbon monoxide is a colorless, odorless gas that is produced during the combustion of fossil fuels. When appliances such as furnaces, water heaters, or stoves do not vent correctly, they can release carbon monoxide, posing severe health risks, including poisoning. Symptoms of carbon monoxide poisoning may include headaches, dizziness, confusion, and even loss of consciousness, making it crucial to ensure that gas appliances are properly installed and vented to avoid these dangerous outcomes. Other options, such as lower utility bills and improved air quality, are not likely outcomes of improper venting. In fact, faulty venting could potentially lead to higher utility bills due to inefficient operation or unnecessary energy consumption. Additionally, the presence of unvented carbon monoxide would significantly decrease air quality, not improve it. Thus, the primary concern with improperly vented gas appliances is the risk of carbon monoxide exposure and its associated dangers.

10. What is the proper approach to measuring humidity in conjunction with temperature?

- A. Using a dry bulb thermometer
- B. Using a barometer
- C. By employing a wet bulb measurement**
- D. Using a hygrometer only

Measuring humidity alongside temperature is crucial in HVAC applications for properly managing indoor climate conditions. Utilizing a wet bulb measurement effectively provides a way to assess both temperature and humidity simultaneously. When you employ a wet bulb thermometer, it has a wick that is moistened and will register a lower temperature than that of a dry bulb thermometer due to the cooling effect of evaporation. This relationship can then be used to determine the relative humidity when compared to the dry bulb temperature. Wet bulb readings can be crucial for recognizing how much moisture is in the air and help in calculating dew points and relative humidity levels, which are fundamental for system performance and comfort control in heating, ventilation, and air conditioning systems. Other tools like a hygrometer measure humidity directly, but they do not incorporate temperature into the measurement process unless you are using a specific type that includes both functionalities. Using a barometer is focused on measuring atmospheric pressure, which does not provide direct information about humidity. Thus, while a hygrometer or other methods might offer humidity readings independently, using a wet bulb measurement effectively integrates both temperature and humidity into a single assessment, making it the most appropriate choice for evaluating those two variables together.