Residential Air Conditioning Systems Mechanic (313D) Certification Practice Exam (Sample)

Study Guide

Everything you need from our exam experts!

Questions

1. When evaluating the frost at the capillary tubes, what action should be taken if it is determined to be a blockage?

A. Replace the compressor

B. Clean the filters

C. Clear the blockage

D. Increase refrigerant level

2. If you have a 2 ton evaporator and a 3 ton condenser, what is the recommended action?

A. Replace the evaporator with a 3 ton unit

B. Replace the condenser with a 2 ton unit

C. Run the system as is

D. Install a TXV

3. What might cause high superheat readings in a thermal expansion valve (TXV) system?

A. Low refrigerant charge

B. Excessive refrigerant charge

C. A functional metering device

D. A clean evaporator coil

4. What should the common to run value be when diagnosing the motor windings of a hermetic compressor?

A. 1 ohm

B. 3 ohms

C. 5 ohms

D. 10 ohms

5. Which type of relay typically has multiple poles?

A. Normally closed relay

B. Single throw relay

C. Double throw relay

D. Magnetic relay

6. What is the maximum voltage rating for the capacitors mentioned?

A. 370VAC

B. 440VAC

C. 220VAC

D. 600VAC

7. What is the recommended slope for suction and discharge lines?

A. Towards the compressor

B. Away from the compressor

C. Horizontal with no slope

D. Downwards into the system

8. What is the consequence of inadequate refrigerant flow in a heat pump system?

A. Improved energy efficiency

B. Increased system pressure

C. Risk of compressor damage

D. Enhanced cooling performance

9. What might a suction line temperature of 73°F indicate if the suction pressure is at 15 PSIG?

A. Normal operation

B. Superheat condition

C. System undercharged

D. Overheated compressor

10. To ensure proper evacuation, R22 systems should be evacuated down to:

A. 1000 microns

B. 500 microns

C. 1500 microns

D. 2000 microns

Answers

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

Explanations

1. When evaluating the frost at the capillary tubes, what action should be taken if it is determined to be a blockage?

A. Replace the compressor

B. Clean the filters

C. Clear the blockage

D. Increase refrigerant level

When frost is observed at the capillary tubes, it indicates a restriction in the refrigerant flow. This condition typically results from a blockage, which impedes the proper movement of refrigerant through the system. Clearing the blockage is essential because it restores the flow of refrigerant, allowing the system to operate efficiently and effectively. When the blockage is addressed, refrigerant can properly circulate between the evaporator and condenser, ensuring that the air conditioning system can maintain the desired indoor climate. This action directly impacts the performance of the system, helping to eliminate issues such as reduced cooling capacity or frost buildup that can lead to further complications. Addressing the blockage is more critical than actions such as replacing the compressor, cleaning filters, or adjusting refrigerant levels, which do not directly resolve the immediate issue of reduced refrigerant flow through the capillary tubes.

2. If you have a 2 ton evaporator and a 3 ton condenser, what is the recommended action?

A. Replace the evaporator with a 3 ton unit

B. Replace the condenser with a 2 ton unit

C. Run the system as is

D. Install a TXV

In a refrigeration or air conditioning system, the balance between the evaporator and condenser capacities is crucial for optimal performance. When the evaporator capacity is less than that of the condenser, as is the case with a 2-ton evaporator paired with a 3-ton condenser, the system may struggle to operate efficiently. The correct action is to replace the evaporator with a 3-ton unit. This adjustment aligns both the evaporator and condenser capacities, ensuring that the system operates within its designed parameters. A matching capacity helps enhance the efficiency of the system, prevents issues like compressor short cycling (where the compressor turns on and off rapidly), and improves the overall cooling performance. With an unequal pairing where the condenser is larger than the evaporator, the excess capacity of the condenser cannot be effectively utilized, leading to potential underperformance of the system. It can also result in complications such as increased wear on components, higher energy costs, and potential moisture issues due to improper refrigerant flow and heat exchange. In summary, replacing the evaporator with a similarly rated capacity as the condenser ensures proper operation, enhances efficiency, and promotes longevity of the system.

3. What might cause high superheat readings in a thermal expansion valve (TXV) system?

A. Low refrigerant charge

B. Excessive refrigerant charge

C. A functional metering device

D. A clean evaporator coil

High superheat readings in a thermal expansion valve (TXV) system typically indicate that the evaporator is not receiving enough refrigerant to properly absorb heat. When the refrigerant charge is low, there is an insufficient volume of refrigerant entering the evaporator. This leads to the refrigerant turning into vapor too quickly, resulting in a higher superheat value because the vapor has a higher temperature before it returns to the compressor. In contrast, if the refrigerant charge were excessive, superheat readings would generally be low or even negative, as there would be too much refrigerant in the evaporator, preventing complete vaporization. A functional metering device like the TXV normally helps to regulate refrigerant flow according to the cooling load; therefore, it should not cause high superheat on its own. Additionally, a clean evaporator coil allows for efficient heat exchange, further reducing the likelihood of high superheat. Thus, the low refrigerant charge is the primary factor contributing to high superheat readings in this situation.

4. What should the common to run value be when diagnosing the motor windings of a hermetic compressor?

A. 1 ohm

B. 3 ohms

C. 5 ohms

D. 10 ohms

The common to run value for diagnosing the motor windings of a hermetic compressor typically falls around 3 ohms. This value is significant because it indicates the health of the compressor motor windings. When measuring resistance across the motor windings, a reading that is too low or too high can signal issues such as short circuits, open circuits, or winding degradation. A measurement around 3 ohms suggests that the motor is in good condition and that the windings are intact and functioning normally. If the reading deviates significantly from this value—either being much lower or much higher—it could suggest that maintenance is needed, as it may point to problems with the motor that could affect the overall performance of the air conditioning system. Furthermore, understanding this value aids technicians in making informed decisions regarding repairs or replacements, ensuring the compressor operates efficiently and reliably.

5. Which type of relay typically has multiple poles?

A. Normally closed relay

B. Single throw relay

C. Double throw relay

D. Magnetic relay

A double throw relay is designed to have multiple contacts or poles, allowing it to switch between two different circuits or states. This type of relay can connect to one of two output paths, enabling complex control operations in a system. For example, in air conditioning systems, a double throw relay can be utilized to switch between heating and cooling modes or to direct power to different components depending on the system's operational mode. This versatility is crucial in applications where different configurations are needed based on the operational requirements. The ability to manage multiple circuits simultaneously makes double throw relays particularly useful in residential air conditioning and HVAC systems where efficiency and adaptability are essential. The other types of relays mentioned do not offer the same functionality. A normally closed relay often features a single contact configuration that is closed by default. A single throw relay, as the name suggests, connects to only one circuit and does not have the capacity to switch between multiple circuits. A magnetic relay can have various designs, but it is not specifically known for its multiple pole configurations like the double throw relay.

6. What is the maximum voltage rating for the capacitors mentioned?

A. 370VAC

B. 440VAC

C. 220VAC

D. 600VAC

The maximum voltage rating for the capacitors referenced in residential air conditioning systems is 370VAC. This rating is significant because it indicates the highest voltage these capacitors can safely handle in alternating current (AC) applications without risk of failure or damage. Using capacitors with a voltage rating lower than the system's voltage can lead to overheating, dielectric breakdown, or catastrophic failure, which can be both dangerous and costly. In most residential systems, components like compressor start and run capacitors are often specifically rated at 370VAC, designed to work efficiently under typical operating conditions. Other voltage ratings like 440VAC or 600VAC are typically used in different applications or commercial settings where higher voltage capacities are needed, while 220VAC rating is insufficient for most residential air conditioning systems, which usually operate at higher voltages. Hence, 370VAC is the most appropriate rating for typical residential air conditioning capacitor use.

7. What is the recommended slope for suction and discharge lines?

A. Towards the compressor

B. Away from the compressor

C. Horizontal with no slope

D. Downwards into the system

The recommended slope for suction and discharge lines is towards the compressor. This design is crucial for ensuring proper drainage of any condensate that may form within the lines and to facilitate the efficient flow of refrigerant. When the lines are sloped towards the compressor, it helps prevent liquid refrigerant from pooling in the lines, which can cause inefficiencies, potential compressor damage, and reduced system performance. In a properly designed system, the refrigerant vapor should move smoothly towards the compressor without encountering any hindrances created by trapped liquids. Additionally, maintaining a slope ensures that any refrigerant that condenses in the line can effectively return to the compressor rather than accumulating within the line. This contributes to the longevity of the compressor and overall system efficiency, reducing the risk of operational issues.

8. What is the consequence of inadequate refrigerant flow in a heat pump system?

A. Improved energy efficiency

B. Increased system pressure

C. Risk of compressor damage

D. Enhanced cooling performance

Inadequate refrigerant flow in a heat pump system can lead to significant issues, particularly the risk of compressor damage. The compressor relies on a specific amount of refrigerant to function effectively. If the refrigerant flow is insufficient, it can cause the compressor to run in a low refrigerant state, resulting in an increase in operating temperature. This excessive heat can lead to overheating and eventual failure of the compressor, which is often one of the most expensive components to replace in a heating and cooling system. Proper refrigerant flow is essential for maintaining balance within the system, ensuring that heat is effectively absorbed and released as needed. When flow is restricted, not only does it impact the compressor, but it can also influence the overall performance and longevity of the system. In contrast, options suggesting improved energy efficiency, increased system pressure, or enhanced cooling performance are unlikely outcomes of inadequate refrigerant flow. Instead, these scenarios typically represent situations where the flow is optimal, ensuring the system operates as designed.

9. What might a suction line temperature of 73°F indicate if the suction pressure is at 15 PSIG?

A. Normal operation

B. Superheat condition

C. System undercharged

D. Overheated compressor

A suction line temperature of 73°F with a corresponding suction pressure of 15 PSIG may indicate a system undercharged condition. In a properly charged system, the expected suction line temperature should align with the saturation temperature corresponding to the suction pressure. Using typical refrigerant properties, the saturation temperature for 15 PSIG is significantly lower than 73°F. A suction temperature that is higher than expected suggests that the refrigerant is not present in sufficient quantity to absorb heat effectively, resulting in a higher temperature at the suction line. This scenario implies that the system lacks the necessary refrigerant, leading to lower efficiency and potentially causing performance issues. When the system is undercharged, it cannot adequately absorb heat, leading to higher temperatures in the suction line. This condition can place the compressor at risk of damage if not addressed promptly, making it essential for HVAC technicians to monitor suction pressures and temperatures to maintain system integrity and efficiency.

10. To ensure proper evacuation, R22 systems should be evacuated down to:

A. 1000 microns

B. 500 microns

C. 1500 microns

D. 2000 microns

To ensure proper evacuation of R22 systems, the ideal target is down to 500 microns. When performing evacuation, reaching this level is crucial because it indicates that the system is free of moisture and non-condensables. Evacuating to 500 microns creates a vacuum that effectively removes atmospheric air, which contains water vapor that can cause ice formation and damage the system. At this micron level, the low pressure allows any residual moisture to vaporize and be evacuated, ensuring the refrigerant can effectively perform its cooling duties without interference. Achieving this evacuation level is essential for the optimal performance and longevity of the air conditioning system. It minimizes the risk of compressor failure and enhances efficiency by avoiding potential operational issues related to contamination or humidity.