

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

Study Guide



Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

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- 1. What external factor can break down CFCs?**
 - A. Heat from appliances**
 - B. UV radiation**
 - C. Water vapor**
 - D. Carbon dioxide**

- 2. Which cooling coil configuration is selected for maximum dehumidification?**
 - A. 4 row high velocity**
 - B. 6 row low velocity**
 - C. 8 row low velocity**
 - D. 10 row high velocity**

- 3. What is one critical maintenance step for air conditioning systems regarding the TXV?**
 - A. Regularly check for leaks**
 - B. Ensure proper refrigerant charge**
 - C. Adjust according to seasonal changes**
 - D. Replace every two years**

- 4. What is a probable cause of high suction pressure on a heat pump?**
 - A. Blocked evaporator coil**
 - B. Leaking 4-way valve**
 - C. Excessive refrigerant charge**
 - D. Faulty expansion valve**

- 5. When fresh air is brought in for ventilation, what effect does it have during summer?**
 - A. Heats the building**
 - B. Reduces indoor pollutants**
 - C. Humidifies the building**
 - D. Increases air conditioning efficiency**

- 6. What purpose does the equalizer line serve on a TXV?**
- A. It helps in maintaining constant pressure**
 - B. It conveys evaporator outlet pressure to the valve diaphragm**
 - C. It circulates refrigerant**
 - D. It controls the liquid flow**
- 7. What does the term "superheat" refer to in HVAC systems?**
- A. The difference between the evaporation temperature and the actual refrigerant temperature**
 - B. The temperature at which refrigerant condenses**
 - C. The temperature of the air leaving the evaporator coil**
 - D. The temperature of refrigerant before entering the compressor**
- 8. If capacitors of 20MFD@370VAC and 15MFD@370VAC are wired in series, what is the total capacitance?**
- A. 10.0MFD@370VAC**
 - B. 35.0MFD@370VAC**
 - C. 8.6MFD@740VAC**
 - D. 5.0MFD@370VAC**
- 9. What is a consequence of CFC stability in the atmosphere?**
- A. They act as short-term pollutants**
 - B. They release ozone-depleting chlorine when reaching the atmosphere**
 - C. They can be quickly absorbed by soils**
 - D. They have no effect on the environment**
- 10. What is the minimum required hole size to accommodate a 30 mm (1 in) O.D. copper pipe with a 20 mm (3/4 in) insulation?**
- A. 50 mm (2 in)**
 - B. 70 mm (2 5/8 in)**
 - C. 90 mm (3 1/2 in)**
 - D. 30 mm (1 in)**

Answers

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

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Explanations

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1. What external factor can break down CFCs?

- A. Heat from appliances
- B. UV radiation**
- C. Water vapor
- D. Carbon dioxide

The correct answer is UV radiation because ultraviolet radiation from the sun is a significant external factor that can lead to the breakdown of chlorofluorocarbons (CFCs) in the atmosphere. When CFC molecules are exposed to UV radiation, they undergo photodissociation, a process in which the chemical bonds within the CFCs break down. This reaction releases chlorine atoms, which then participate in the depletion of ozone (O₃) in the stratosphere, contributing to environmental concerns such as the thinning of the ozone layer. Heat from appliances, while it can affect materials and lead to various chemical reactions, is not a primary factor in breaking down CFCs in the atmospheric context. Similarly, while water vapor and carbon dioxide are important components of the atmosphere, they do not cause the specific breakdown of CFCs like UV radiation does. Therefore, understanding the unique role of UV radiation in the breakdown of CFCs helps highlight the environmental impact of these substances in relation to ozone depletion.

2. Which cooling coil configuration is selected for maximum dehumidification?

- A. 4 row high velocity
- B. 6 row low velocity
- C. 8 row low velocity**
- D. 10 row high velocity

The selection of a cooling coil configuration for maximum dehumidification is influenced by both the number of rows and the airflow velocity through the coil. An 8-row low velocity coil is optimal for enhancing dehumidification because the reduced air speed allows for a longer contact time between the air and the cooling surface. This extended contact time enables more moisture to condense out of the air, effectively lowering humidity levels within the conditioned space. In contrast, higher velocity coils, while promoting better cooling of the air, may not adequately remove moisture due to the shorter exposure time. Furthermore, while an increasing number of rows contributes to more surface area for cooling, balancing the airflow and moisture removal is essential. Therefore, the combination of an 8-row configuration with low airflow velocity is especially effective in maximizing dehumidification. Hence, this configuration stands out as the preferred choice for achieving optimal humidity control in air conditioning systems.

3. What is one critical maintenance step for air conditioning systems regarding the TXV?

- A. Regularly check for leaks**
- B. Ensure proper refrigerant charge**
- C. Adjust according to seasonal changes**
- D. Replace every two years**

Ensuring proper refrigerant charge is crucial for the efficient operation of an air conditioning system, particularly when it comes to the thermal expansion valve (TXV). The TXV is designed to regulate the flow of refrigerant into the evaporator coil based on the cooling demands of the system. If the refrigerant charge is low or high, the TXV may not function optimally, leading to various issues, including poor cooling performance, increased energy consumption, and even potential damage to the compressor. An incorrectly charged system can result in either insufficient refrigerant entering the evaporator, causing the coil to frost over, or too much refrigerant, leading to liquid slugging in the compressor. Maintaining the correct level of refrigerant ensures that the TXV can perform its job of optimizing the refrigerant flow based on the load, which enhances overall system efficiency and longevity. Regular checks for leaks, adjusting based on seasonal changes, or setting a rigid replacement schedule for components are all important maintenance aspects, but they do not address the specific operational necessity of the TXV, which directly correlates with the refrigerant charge being maintained at optimal levels.

4. What is a probable cause of high suction pressure on a heat pump?

- A. Blocked evaporator coil**
- B. Leaking 4-way valve**
- C. Excessive refrigerant charge**
- D. Faulty expansion valve**

The high suction pressure in a heat pump system is often associated with excessive refrigerant flow into the evaporator. In this context, a leaking 4-way valve can lead to the reverse flow of refrigerant or allow too much refrigerant to enter the suction line, ultimately raising the suction pressure. The 4-way valve is crucial for directing the refrigerant flow in both heating and cooling modes, and any malfunction, such as a leak, can disrupt the proper balance of refrigerant, contributing to the observed high pressure. Understanding the role of the 4-way valve helps clarify how improper function can result in higher suction pressures, as it affects both the refrigerant's direction and its flow rate within the system. This distinction is vital for diagnosing and addressing issues within heat pump systems.

5. When fresh air is brought in for ventilation, what effect does it have during summer?

- A. Heats the building**
- B. Reduces indoor pollutants**
- C. Humidifies the building**
- D. Increases air conditioning efficiency**

When fresh air is introduced for ventilation during the summer months, it brings in outside air, which is often warmer and potentially more humid than the indoor air. This influx of warm, moist air can significantly increase the indoor humidity levels, leading to a stuffy and uncomfortable environment within the building. The cooling system may then need to work harder to remove this excess moisture from the air to maintain a comfortable indoor temperature, ultimately affecting the overall efficiency of the air conditioning system. By adding humidity to the indoor air, the fresh air can lead to discomfort and reduced efficiency of cooling equipment, potentially causing increased energy consumption as the air conditioning units strive to compensate for the added heat and humidity. In contrast, while fresh air can help reduce indoor pollutants and improve air quality, that does not directly relate to the primary consequence of introducing warm, humid air during the summer. Additionally, fresh air does not typically enhance the efficiency of air conditioning systems but rather can have the opposite effect due to the increased load from higher humidity.

6. What purpose does the equalizer line serve on a TXV?

- A. It helps in maintaining constant pressure**
- B. It conveys evaporator outlet pressure to the valve diaphragm**
- C. It circulates refrigerant**
- D. It controls the liquid flow**

The equalizer line on a thermal expansion valve (TXV) plays a crucial role in the system's functionality by conveying evaporator outlet pressure to the valve diaphragm. This connection is essential since it allows the TXV to sense the pressure of the refrigerant as it exits the evaporator coil. By providing the outlet pressure information to the diaphragm, the equalizer line helps the TXV modulate the flow of refrigerant into the evaporator based on the actual load conditions. This ensures that the TXV can adjust to varying demands on the system, ultimately maintaining optimal performance and efficiency. When the evaporator experiences changes in pressure — such as during varying cooling loads — the equalizer line helps the TXV respond appropriately by balancing the pressures on both sides of the diaphragm. This interaction allows for precise control of the refrigerant flow, thus enhancing the overall efficiency and effectiveness of the air conditioning system.

7. What does the term "superheat" refer to in HVAC systems?

- A. The difference between the evaporation temperature and the actual refrigerant temperature**
- B. The temperature at which refrigerant condenses**
- C. The temperature of the air leaving the evaporator coil**
- D. The temperature of refrigerant before entering the compressor**

Superheat is a critical concept in HVAC systems that refers specifically to the measurement of the temperature of a vapor refrigerant relative to its saturation temperature at the same pressure. It is defined as the difference between the evaporation temperature (saturation temperature) and the actual temperature of the refrigerant as it exits the evaporator coil. When refrigerant evaporates in the evaporator coil, it absorbs heat from the indoor air, which causes it to change from a liquid to a vapor. If the refrigerant continues to be heated beyond its boiling point at that pressure, it becomes superheated. Monitoring superheat is essential because it ensures that the compressor is only handling vapor; this is crucial for preventing liquid refrigerant from entering the compressor, which can cause damage. Understanding superheat is important for diagnosing HVAC system performance, as an inadequate or excessive superheat can indicate issues like low refrigerant levels or airflow problems. Thus, the term accurately captures the measurement necessary for maintaining efficient operation within air conditioning systems.

8. If capacitors of 20MFD@370VAC and 15MFD@370VAC are wired in series, what is the total capacitance?

- A. 10.0MFD@370VAC**
- B. 35.0MFD@370VAC**
- C. 8.6MFD@740VAC**
- D. 5.0MFD@370VAC**

When capacitors are connected in series, the total capacitance is calculated using the formula: $\frac{1}{C_{total}} = \frac{1}{C_1} + \frac{1}{C_2}$. In this case, you have one capacitor with a capacitance of 20 microfarads (MFD) and another with 15 MFD, both at a voltage rating of 370VAC. Applying the values: $\frac{1}{C_{total}} = \frac{1}{20} + \frac{1}{15}$. To perform this calculation, you convert the fractions to a common denominator, which in this case is 60: $\frac{1}{C_{total}} = \frac{3}{60} + \frac{4}{60} = \frac{7}{60}$. Now, take the reciprocal to find the total capacitance: $C_{total} = \frac{60}{7} \approx 8.57$ MFD. This rounds to approximately 8.6 MFD, which aligns with the value presented in the correct answer choice. Additionally, since capacitors

9. What is a consequence of CFC stability in the atmosphere?

- A. They act as short-term pollutants**
- B. They release ozone-depleting chlorine when reaching the atmosphere**
- C. They can be quickly absorbed by soils**
- D. They have no effect on the environment**

CFCs, or chlorofluorocarbons, are stable compounds in the atmosphere due to their strong carbon-chlorine bonds, which do not readily break down under normal atmospheric conditions. When CFCs eventually rise high into the stratosphere, they are exposed to ultraviolet (UV) radiation, which causes them to break apart and release chlorine atoms. These chlorine atoms play a significant role in the destruction of ozone molecules, contributing to ozone depletion. The stability of CFCs makes them persist in the atmosphere for many years, which is why they can accumulate and lead to significant environmental impacts, particularly concerning the ozone layer. This property directly correlates with their ability to release ozone-depleting chlorine once they reach the upper atmosphere, highlighting the environmental consequences of their use and persistence. Understanding the mechanism by which CFCs contribute to ozone layer depletion underscores the importance of regulating substances that can harm the environment, particularly those that can withstand long-term atmospheric conditions before having detrimental effects.

10. What is the minimum required hole size to accommodate a 30 mm (1 in) O.D. copper pipe with a 20 mm (3/4 in) insulation?

- A. 50 mm (2 in)**
- B. 70 mm (2 5/8 in)**
- C. 90 mm (3 1/2 in)**
- D. 30 mm (1 in)**

To accommodate a 30 mm (1 in) O.D. copper pipe with 20 mm (3/4 in) of insulation, it is essential to consider the total diameter of the insulated pipe. First, the insulation adds an additional thickness around the copper pipe. Since the insulation is 20 mm thick and it wraps around the entire diameter of the pipe, you will need to add this thickness to both sides of the copper pipe's diameter. This leads to a calculation of the required hole size as follows: 1. The diameter of the copper pipe is 30 mm. 2. The insulation adds 20 mm on one side and 20 mm on the other side, which totals 40 mm of insulation. 3. Therefore, the total diameter of the insulated pipe becomes 30 mm + 40 mm = 70 mm. To accommodate this overall diameter, a hole size of at least 70 mm (2 5/8 in) is necessary. This ensures that the insulated pipe can fit through the hole without being squeezed or damaged. This is why the choice indicating a hole size of 70 mm is the correct answer. It appropriately allows for both the pipe and its insulation, ensuring proper installation and function in the residential air

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

<https://313dcert.examzify.com>

We wish you the very best on your exam journey. You've got this!

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