Mechanical for A/C Practice Test (Sample)

Study Guide

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Questions

1. A centrifugal chillers rupture disk is connected to the chiller's _____.

A. condenser

B. evaporator

C. liquid line

D. economizer

2. Refrigerants in large quantities can cause suffocation because?

A. They smell strong and make breathing difficult

B. They are lighter than air and can cause dizziness

C. They are heavier than air and displace oxygen

D. They sting the nose and cause sneezing

3. If a refrigerant belongs to the 700 series in the refrigerant numbering system, it is classified as what type?

A. Methane based

B. Ethane based

C. Inorganic

D. Propane based

4. When using recovery cylinders and equipment with Schrader valves, it is critical to?

A. Inspect the Schrader valve core for bends and breakage

B. Replace the damaged Schrader valve core to prevent leakage

C. Cap the Schrader ports to prevent accidental depression of the valve core

D. All of the above

5. As a substance is heated, its ___ tends to increase.

A. resistance

B. conductance

C. volume

D. None of the above

6. The ozone layer primarily protects the Earth from which type of radiation?

- **A. Nuclear radiation**
- **B. Infrared radiation**
- **C. Ultraviolet radiation**
- **D. Meteorite impact**

7. Which of the following safety precautions should be adhered to for low pressure systems?

- **A. Do not siphon refrigerant by mouth**
- **B. Avoid spilling liquid refrigerant on the skin**
- **C. Use gloves and safety goggles when working with liquid refrigerant**
- **D. All of the above**

8. Which refrigerant is typically used in absorption refrigeration systems?

- **A. R-134a**
- **B. R-717**
- **C. R-12**
- **D. HFOs**

9. What is the primary function of the condenser in a refrigeration system?

- **A. Rejects the heat from the refrigerant**
- **B. Controls the refrigerant flow throughout the system**
- **C. Adds superheat to the refrigerant**
- **D. All of the above**

10. Which of the following refrigerants is classified as an HFC?

- **A. R-123**
- **B. R-134a**
- **C. R-717**
- **D. HCs**

Answers

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

Explanations

1. A centrifugal chillers rupture disk is connected to the chiller's _____.

A. condenser

B. evaporator

C. liquid line

D. economizer

The rupture disk in a centrifugal chiller is connected to the evaporator. This component serves as a safety device designed to prevent pressure from exceeding a safe limit within the evaporator. If the pressure in the evaporator rises to unsafe levels, the rupture disk will break, allowing refrigerant to escape and thus relieving pressure, which protects the system from damage and potential hazards. In the context of a centrifugal chiller, the evaporator is responsible for absorbing heat from the space being cooled. It operates under specific pressure and temperature conditions, and maintaining those limits is crucial to the safe and efficient operation of the chiller. By connecting the rupture disk to the evaporator, the system gets immediate feedback on any dangerous pressure increases, enabling a quick response to maintain safety. Other components like the condenser, liquid line, and economizer have different roles in the refrigeration cycle and would not typically be points of concern for pressure release related to the conditions in the evaporator. This makes the connection of the rupture disk to the evaporator essential for maintaining system integrity and safety.

2. Refrigerants in large quantities can cause suffocation because?

A. They smell strong and make breathing difficult

B. They are lighter than air and can cause dizziness

C. They are heavier than air and displace oxygen

D. They sting the nose and cause sneezing

Refrigerants in large quantities can cause suffocation primarily because they are often heavier than air, leading them to accumulate in low-lying areas. When this occurs, the refrigerants can displace oxygen in the air. Adequate oxygen levels are crucial for human respiration, and without sufficient oxygen, individuals may not be able to breathe properly, resulting in suffocation. In environments where refrigerants are released, the danger increases as the gas can settle in areas where people might be present, posing serious health risks. Proper ventilation and awareness of refrigerant properties are essential in preventing such hazardous situations, particularly because signs of exposure might not be immediately recognizable. Other options do not accurately reflect the nature of refrigerants and their impact on air quality. For instance, while some refrigerants may have detectable odors, they do not consistently present strong smells that could serve as an effective warning. Additionally, while some refrigerants may be lighter than air, this typically does not relate to their suffocating effect, and the idea that they might cause irritation like sneezing does not correlate with their primary risks either. Understanding the specific properties of refrigerants helps highlight the dangers they present in various conditions, particularly emphasizing the risk of oxygen displacement.

3. If a refrigerant belongs to the 700 series in the refrigerant numbering system, it is classified as what type?

A. Methane based

B. Ethane based

C. Inorganic

D. Propane based

A refrigerant that belongs to the 700 series in the refrigerant numbering system is classified as inorganic. The 700 series typically includes compounds that do not contain carbon, and this classification is used to identify refrigerants that are primarily of a non-organic nature. In the context of refrigerants, inorganic substances can include those like ammonia (R-717) and water (R-718), which do not fall within the organic hydrocarbon categories that include methane, ethane, or propane. This makes the identification straightforward; refrigerants from the 700 series are distinct from those in the other series that classify organic refrigerants by their carbon content and structure. Thus, recognizing that the 700 series is specifically for inorganic refrigerants helps in understanding their properties and uses compared to hydrocarbon-based refrigerants categorized under different series.

4. When using recovery cylinders and equipment with Schrader valves, it is critical to?

A. Inspect the Schrader valve core for bends and breakage

B. Replace the damaged Schrader valve core to prevent leakage

C. Cap the Schrader ports to prevent accidental depression of the valve core

D. All of the above

To ensure the safe and effective use of recovery cylinders and equipment with Schrader valves, it is essential to adopt several precautionary measures. Each of the actions mentioned contributes to maintaining the integrity of the system and preventing refrigerant leakage, which could lead to safety hazards and environmental concerns. Inspecting the Schrader valve core for bends and breakage is vital because any damage to the core can compromise the seal and allow refrigerants to escape. This inspection helps to identify any mechanical issues that could lead to leaks during operation. Replacing a damaged Schrader valve core is equally important. If a core is found to be broken or malfunctioning, addressing this issue promptly prevents leakage during operation, ensuring no unintended release of refrigerants occurs. Keeping the system sealed is a key part of maintaining its efficiency and safety. Finally, capping the Schrader ports serves as an additional protective measure against accidental depression of the valve core. This is important because unintentional activation of the valve can lead to refrigerant loss, creating potential hazards and regulatory compliance issues. Combining all of these actions creates a comprehensive approach to the safe handling of recovery cylinders and equipment equipped with Schrader valves, reinforcing the importance of maintenance and proper handling practices in HVAC systems.

5. As a substance is heated, its ___ tends to increase.

A. resistance

B. conductance

C. volume

D. None of the above

When a substance is heated, its volume tends to increase due to the principles of thermal expansion. As the temperature of a material rises, the kinetic energy of its particles increases, causing them to move more vigorously and occupy more space. This phenomenon is observed in most substances, particularly in liquids and solids, where an increase in temperature generally leads to an increase in volume. The concept of thermal expansion applies to gases as well, but in gases, the increase in volume can also result in changes in pressure if the gas is contained in a fixed volume. However, the primary focus here is on the general behavior of materials when they are heated, which consistently shows an increase in volume. Resistance and conductance relate to electrical properties, where resistance usually increases with temperature in conductive materials while conductance decreases. These characteristics are not directly related to the concept of heating a substance in the context of its physical dimensions. Therefore, the correct assertion regarding the increase as a substance is heated is the increase in its volume.

6. The ozone layer primarily protects the Earth from which type of radiation?

A. Nuclear radiation

B. Infrared radiation

C. Ultraviolet radiation

D. Meteorite impact

The ozone layer is primarily responsible for protecting the Earth from ultraviolet (UV) radiation. This region of the atmosphere, located in the stratosphere, contains a high concentration of ozone (O_3) molecules, which absorb the majority of the sun's harmful UV radiation. Ultraviolet radiation can cause significant harm to living organisms, including skin cancer in humans, cataracts, and negative effects on ecosystems and wildlife. The ozone layer acts as a shield, preventing much of this radiation from reaching the Earth's surface, thereby safeguarding health and environmental integrity. In contrast, nuclear radiation pertains to radioactive materials and is not something the ozone layer protects against. Infrared radiation involves heat energy, which is generally not harmful in the way UV radiation can be. Meteorite impacts are physical events rather than types of radiation, and while they can cause damage, they are not influenced by the ozone layer or atmospheric composition. Thus, the role of the ozone layer is crucial in filtering out UV radiation to protect life on Earth.

7. Which of the following safety precautions should be adhered to for low pressure systems?

A. Do not siphon refrigerant by mouth

B. Avoid spilling liquid refrigerant on the skin

C. Use gloves and safety goggles when working with liquid refrigerant

D. All of the above

Adhering to safety precautions for low-pressure systems is essential to ensure both personal safety and the proper handling of refrigerants. The correct choice encompasses all mentioned safety measures because they address various risks associated with working with refrigerants. Firstly, not siphoning refrigerant by mouth is crucial as refrigerants can be toxic and harmful to ingest. This practice prevents accidental poisoning or adverse health effects. Secondly, avoiding the spillage of liquid refrigerant on the skin is important because refrigerants can cause frostbite or skin irritation due to their low temperatures. This protection is vital in maintaining skin health and preventing injuries while handling refrigerants. Lastly, using gloves and safety goggles is a standard safety measure when working with any chemical or hazardous material, including refrigerants. Gloves provide a barrier against skin exposure, while safety goggles protect the eyes from splashes or vapors that may irritate or damage eyesight. The combination of these precautions forms a comprehensive approach to safely managing low-pressure systems, reinforcing the necessity of adhering to all recommended safety practices.

8. Which refrigerant is typically used in absorption refrigeration systems?

A. R-134a

B. R-717

C. R-12

D. HFOs

Absorption refrigeration systems commonly utilize R-717, also known as ammonia. This refrigerant is effective due to its excellent thermodynamic properties, including high latent heat of vaporization and good energy efficiency. Ammonia is especially suitable for absorption systems because it can dissolve in water, creating a strong absorbent solution that allows for effective heat transfer and refrigeration cycles. In addition to its efficiency, ammonia has a low environmental impact compared to some synthetic refrigerants, contributing to its use in large-scale industrial applications and commercial refrigeration systems. Its availability and historical usage further support its preference in these types of systems. Other refrigerants listed, such as R-134a and R-12, are primarily used in vapor-compression refrigeration cycles, not absorption systems. HFOs, while being newer refrigerants focused on reducing greenhouse gas potential, are also not typical for absorption refrigeration applications.

9. What is the primary function of the condenser in a refrigeration system?

A. Rejects the heat from the refrigerant

B. Controls the refrigerant flow throughout the system

C. Adds superheat to the refrigerant

D. All of the above

The primary function of the condenser in a refrigeration system is to reject heat from the refrigerant. During the refrigeration cycle, the refrigerant absorbs heat from the indoor environment in the evaporator and carries that heat to the condenser. In the condenser, the refrigerant releases this absorbed heat to the outside air or another medium, allowing it to condense from a gas to a liquid. This process is essential for maintaining the efficiency of the refrigeration cycle, as it completes the heat exchange process necessary for the system to operate effectively. While the other options describe functions that may relate to the overall refrigeration system, they do not accurately capture the main role of the condenser. Controlling refrigerant flow is typically the role of metering devices or expansion valves, adding superheat occurs after the refrigerant has left the evaporator and before entering the compressor, and stating that all of the above implies that the condenser is responsible for every function, which is not the case. The explanation highlights not just the central function of the condenser but also clarifies why the other options do not pertain directly to its primary role.

10. Which of the following refrigerants is classified as an HFC?

A. R-123

B. R-134a

C. R-717

D. HCs

Refrigerants are classified into different categories based on their chemical composition, and HFCs, or hydrofluorocarbons, are a significant group. R-134a is a well-known HFC, characterized by its chemical formula of C2H2F4. HFCs like R-134a are commonly used in refrigeration and air conditioning systems due to their lower ozone depletion potential compared to older refrigerants like CFCs (chlorofluorocarbons). They also have better thermodynamic properties, making them suitable for use in a wide range of applications. R-134a specifically is widely adopted as a replacement for R-12, reflecting a shift in industry standards toward more environmentally friendly options. Other options, such as R-123, belong to the HCFC category, which stands for hydrochlorofluorocarbons. R-717 is ammonia, which is categorized as a natural refrigerant or an inorganic substance rather than an HFC. Lastly, HCs refer to hydrocarbons that are also not HFCs but are sometimes used in specific applications due to their natural origin and lower environmental impact. Thus, R-134a stands out as the only refrigerant in the provided list that is identified