

FDNY Operating Engineer Practice Test (Sample)

Study Guide



Everything you need from our exam experts!

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SAMPLE

Questions

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- 1. Which of the following names corresponds with the law that states the total pressure of a combined mixture of gases is the sum of the pressures of each constituent gas?**
 - A. Charles's Law**
 - B. Boyle's Law**
 - C. Avogadro's Law**
 - D. Dalton's Law**
- 2. What is the primary function of hydrostatic testing?**
 - A. To increase pressure in pipelines**
 - B. To test for leaks and strength**
 - C. To purify refrigerant**
 - D. To cool equipment efficiently**
- 3. Which processor is utilized in high-pressure refrigerant leak tests?**
 - A. Halide torch**
 - B. Gas analyzer**
 - C. Manometer**
 - D. Refrigerant scale**
- 4. R-22 is predominantly classified as which type of refrigerant?**
 - A. Hydrochlorofluorocarbon**
 - B. Hydrocarbon**
 - C. Hydrochlorofluorocarbon**
 - D. Sulfur Hexafluoride**
- 5. Which law describes the relationship observed when a gas is maintained at a constant pressure while its volume varies in direct proportion to the change in absolute temperature?**
 - A. Charles's Law**
 - B. Boyle's Law**
 - C. Ideal Gas Law**
 - D. Avogadro's Law**

- 6. Which metering device requires the refrigeration system to be maintained at a critical charge?**
- A. Low side float**
 - B. Electronic expansion valve**
 - C. High side float**
 - D. Capillary tube**
- 7. If 1 BTU is added to 1 pound of water, what is the resultant temperature increase in degrees Fahrenheit?**
- A. 1 degree F**
 - B. 10 degrees F**
 - C. 0.1 degree F**
 - D. 5 degrees F**
- 8. Convert the vacuum pressure of 28" Hg to the corresponding absolute pressure:**
- A. 15 PSIA**
 - B. 3 PSIA**
 - C. 10 PSIA**
 - D. 1 PSIA**
- 9. Which device is commonly utilized to filter out moisture in a refrigeration system?**
- A. Drier**
 - B. Accumulator**
 - C. Receiver**
 - D. Evaporator**
- 10. What could be the consequence of an expansion valve allowing excess refrigerant into a DX coil?**
- A. Increased cooling efficiency**
 - B. Possibility of liquid refrigerant entering the compressor**
 - C. Improved system pressure**
 - D. Refrigerant will evaporate more quickly**

Answers

SAMPLE

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

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Explanations

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1. Which of the following names corresponds with the law that states the total pressure of a combined mixture of gases is the sum of the pressures of each constituent gas?

- A. Charles's Law**
- B. Boyle's Law**
- C. Avogadro's Law**
- D. Dalton's Law**

The law that states the total pressure of a combined mixture of gases is the sum of the pressures of each constituent gas is known as Dalton's Law. This principle, formulated by John Dalton, describes how in a mixture of non-reacting gases, the total pressure exerted is equal to the sum of the partial pressures of each individual gas in the mixture. This law is fundamental in understanding how gases behave in a variety of applications, including engineering and atmospheric science. For instance, when analyzing a gas mixture, you can calculate the total pressure by measuring the individual pressures exerted by each gas, demonstrating the additive nature of gas pressures as long as the temperatures and volumes remain constant. This relationship is critical for the operation of systems involving gas mixtures, such as in combustion engines or HVAC systems where understanding the behavior of air and fuel mixtures is vital for efficiency and safety. The other mentioned laws focus on different gas properties: Charles's Law deals with the relationship between volume and temperature, Boyle's Law relates pressure and volume at constant temperature, and Avogadro's Law pertains to the volume of gas and the number of moles at a constant temperature and pressure. Each of these laws highlights different aspects of gas behavior, making them important in their own contexts,

2. What is the primary function of hydrostatic testing?

- A. To increase pressure in pipelines**
- B. To test for leaks and strength**
- C. To purify refrigerant**
- D. To cool equipment efficiently**

The primary function of hydrostatic testing is to test for leaks and strength in pipelines and pressure vessels. This process involves filling the system with a liquid, typically water, and then pressurizing it beyond its normal operating pressure to identify any weaknesses, leaks, or failures in the material. By applying this increased pressure, it allows operators to ensure that the equipment can safely handle the pressures it will encounter during its normal use. Hydrostatic testing is crucial for maintaining safety standards in various applications, as it helps to prevent potential failures that could lead to hazardous situations. Continuous monitoring for leaks and verification of structural integrity through hydrostatic testing is a best practice in engineering and operations to avoid system failures.

3. Which processor is utilized in high-pressure refrigerant leak tests?

A. Halide torch

B. Gas analyzer

C. Manometer

D. Refrigerant scale

The halide torch is used in high-pressure refrigerant leak tests because it operates by detecting the presence of halogenated refrigerants in the air. When the halide torch flame comes in contact with a refrigerant leak, the flame will change color, indicating the presence of the refrigerant. This method is particularly effective for identifying leaks in refrigeration systems that use halogenated refrigerants, making it a reliable tool for technicians in the field. In contrast, other options serve different purposes. A gas analyzer is designed to measure the concentrations of gases in a given environment, which may not specifically pinpoint refrigerant leaks. A manometer measures pressure but is not directly used for detecting leaks. Similarly, a refrigerant scale is used for weighing refrigerants and monitoring the charge in a system rather than directly finding leaks. Thus, the halide torch provides a specialized approach to leak detection, which is crucial during high-pressure tests in refrigeration systems.

4. R-22 is predominantly classified as which type of refrigerant?

A. Hydrochlorofluorocarbon

B. Hydrocarbon

C. Hydrochlorofluorocarbon

D. Sulfur Hexafluoride

R-22 is predominantly classified as a hydrochlorofluorocarbon (HCFC) refrigerant. HCFCs, such as R-22, are widely used in air conditioning systems and refrigeration due to their efficient thermodynamic properties. They have been favored for their relatively lower ozone depletion potential compared to older substances like CFCs (chlorofluorocarbons), though they are still subject to regulations because they can contribute to ozone layer depletion. Choosing R-22 as an HCFC helps clarify its role in the refrigeration cycle, as its properties allow for effective heat absorption, making it suitable for cooling applications. Moreover, understanding the classification of refrigerants is crucial for compliance with environmental regulations, as many countries are moving towards phasing out HCFCs in favor of more environmentally friendly options. The other options, such as hydrocarbons or sulfur hexafluoride, do not correctly describe R-22. Hydrocarbons are typically flammable and are not used in the same applications as R-22. Sulfur hexafluoride, while a non-toxic, inert gas used in electric insulation, is entirely different and not used as a refrigerant. Recognizing these classifications is essential for the safe and effective operation of HVAC systems.

5. Which law describes the relationship observed when a gas is maintained at a constant pressure while its volume varies in direct proportion to the change in absolute temperature?

A. Charles's Law

B. Boyle's Law

C. Ideal Gas Law

D. Avogadro's Law

The law that describes the relationship between gas volume and temperature when pressure is held constant is Charles's Law. This law states that the volume of a gas is directly proportional to its absolute temperature (measured in Kelvin) when the pressure is constant. This means that as the temperature of the gas increases, its volume will increase, and conversely, as the temperature decreases, the volume will decrease, assuming pressure remains unchanged. In practical applications, this relationship allows engineers and scientists to predict how a gas will behave under varying temperature conditions at constant pressure, which is essential in various fields, including HVAC, meteorology, and even in operating engines. While Boyle's Law deals with the relationship between pressure and volume at a constant temperature, and the Ideal Gas Law integrates pressure, volume, and temperature into a single framework, Avogadro's Law focuses on the volume of gas at constant temperature and pressure proportional to the number of moles of gas present. None of these directly capture the specific scenario of constant pressure with varying volume and temperature, making Charles's Law the correct reference.

6. Which metering device requires the refrigeration system to be maintained at a critical charge?

A. Low side float

B. Electronic expansion valve

C. High side float

D. Capillary tube

The high side float is designed to manage refrigerant levels and is positioned on the high side of a refrigeration system. It plays a crucial role in maintaining the correct charge of refrigerant in the system, and this is critical for operational efficiency and preventing issues like flooding or starvation of the evaporator. In systems utilizing a high side float, the control relies on the pressure of the refrigerant; when the pressure rises due to increased refrigerant flow, the float mechanism acts to regulate and adjust the flow accordingly. Thus, maintaining the proper refrigerant charge is essential, as both overcharging and undercharging can lead to inefficiencies and potential damage to the compressor. Understanding this requirement highlights the importance of regular maintenance and monitoring of refrigerant levels in systems using a high side float, as it directly impacts performance and system longevity.

7. If 1 BTU is added to 1 pound of water, what is the resultant temperature increase in degrees Fahrenheit?

A. 1 degree F

B. 10 degrees F

C. 0.1 degree F

D. 5 degrees F

When you add 1 BTU (British Thermal Unit) to 1 pound of water, the resultant temperature increase is indeed 1 degree Fahrenheit. This principle stems from the definition of BTU itself, which is the amount of heat required to raise the temperature of one pound of water by 1 degree Fahrenheit. Understanding this concept is crucial in thermodynamics and HVAC systems, as it directly relates to energy transfer and temperature regulation in fluids. By knowing that 1 BTU results in a 1 degree F increase, you can apply this knowledge to real-world scenarios involving heating systems, ensuring efficient operation and effective temperature management.

8. Convert the vacuum pressure of 28" Hg to the corresponding absolute pressure:

A. 15 PSIA

B. 3 PSIA

C. 10 PSIA

D. 1 PSIA

To convert the vacuum pressure of 28 inches of mercury (Hg) to absolute pressure, it's important to understand the relationship between gauge pressure, absolute pressure, and atmospheric pressure. Atmospheric pressure at sea level is approximately 29.92 inches of mercury, which corresponds to about 14.7 pounds per square inch absolute (PSIA). When you have a vacuum pressure of 28" Hg, it means that the pressure is 28 inches below atmospheric pressure. To find the absolute pressure, you subtract the vacuum pressure from the atmospheric pressure: 1. Convert the atmospheric pressure from inches of mercury to PSIA. - 29.92 inches of mercury is approximately 14.7 PSIA. 2. Subtract the vacuum pressure from the atmospheric pressure. - $14.7 \text{ PSIA} - (29.92 \text{ inches Hg} - 28 \text{ inches Hg}) = 14.7 \text{ PSIA} - 1.92 \text{ inches Hg}$. - Since 1 inch of mercury is approximately 0.491 psi, the conversion of 1.92 inches of mercury gives around 0.943 psi. Thus, the absolute pressure can be calculated as: $14.7 \text{ PSIA} - 0.943 \text{ PSIA} = \text{approximately } 13.$

9. Which device is commonly utilized to filter out moisture in a refrigeration system?

- A. Drier**
- B. Accumulator**
- C. Receiver**
- D. Evaporator**

A drier is a crucial component in refrigeration systems that serves the specific purpose of removing moisture from the refrigerant. Moisture can cause significant damage, such as corrosion and freezing, which can impair system efficiency and operation. The drier typically contains desiccants or filters to absorb or trap water, ensuring that the refrigerant remains dry as it circulates through the system. This preservation of moisture-free refrigerant is essential for maintaining system integrity and performance. The accumulator, receiver, and evaporator each serve different functions in the refrigeration cycle. An accumulator is used to store excess refrigerant in vapor form, preventing liquid refrigerant from impacting the compressor. A receiver acts as a storage vessel for liquid refrigerant after it has been condensed, but it does not filter moisture. The evaporator, on the other hand, is the component where the refrigerant absorbs heat from the surrounding environment, facilitating the cooling process, but it also does not serve to remove moisture from the refrigerant.

10. What could be the consequence of an expansion valve allowing excess refrigerant into a DX coil?

- A. Increased cooling efficiency**
- B. Possibility of liquid refrigerant entering the compressor**
- C. Improved system pressure**
- D. Refrigerant will evaporate more quickly**

The consequence of an expansion valve allowing excess refrigerant into a direct expansion (DX) coil primarily involves the risk of liquid refrigerant entering the compressor. When the expansion valve does not regulate the flow properly, it can permit liquid refrigerant to bypass the evaporator's evaporation process. Since the compressor is designed to handle vapor rather than liquid refrigerant, this can lead to a condition known as "liquid slugging." Liquid slugging can cause significant damage to the compressor, potentially leading to mechanical failure. Compressors are not built to compress liquids; they are meant to compress gases. If liquid enters the compressor, it can create excessive pressure, damage the internal components, and cause system failure. This underscores the importance of the expansion valve functioning correctly, as it plays a critical role in managing the amount of refrigerant entering the DX coil and ensuring that the refrigerant is in a gaseous state when it reaches the compressor.