FDNY Respiratory Medical Officer (RMO) Practice Exam (Sample)

Study Guide

Everything you need from our exam experts!

Questions

1. What could lead to a decrease in the efficiency of a reciprocating compressor?

A. High ambient temperature

B. Leaking suction valve

C. Running at maximum pressure

D. Excess refrigerant

2. What is a key advantage of forced draft cooling towers over natural draft cooling towers?

A. Lower operational costs

B. Smaller tower size

C. Higher efficiency rates

D. Reduced maintenance needs

3. In a condenser, the heat to be removed from the refrigerant is equal to the heat gained in which component?

A. Compressor

B. Evaporator

C. Expansion valve

D. Condenser itself

4. Which example represents an in-line refrigerant cleaning system for use with a centrifugal compressor containing R123 refrigerant?

A. Refrigerant recovery

B. Refrigerant charging

C. Refrigerant recycling

D. Refrigerant expansion

5. What is the purpose of wear rings in a centrifugal pump?

A. Increase flow rate

B. Reduce vibration

C. Prevent wearing of the pump housing and impeller

D. Control the pump's operating temperature

6. What can be found marked on fusible plugs located on a condenser?

A. Expiration date

B. Maximum pressure rating

C. Melting point

D. Manufacturer's information

7. How many gallons of water can be expected from draining a 75-foot long pipe with a diameter of 12 inches?

A. 220 gallons

B. 440 gallons

C. 660 gallons

D. 880 gallons

8. Refrigeration systems that require FDNY approval typically handle which refrigerant?

A. R-410A

B. Freon-12

C. Propane

D. Ammonia

9. What is the benefit of installing an inline refrigerant cleaning system?

A. To increase energy consumption

B. To enhance cooling efficiency

C. To remove impurities from the system

D. To prevent compressor overheating

10. What is the primary role of the Kingsbury thrust bearing in a steam turbine?

A. Support the weight of the rotor

B. Maintain axial positioning of the rotor shaft

C. Control lubrication flow

D. Reduce rotor vibration

Answers

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

Explanations

1. What could lead to a decrease in the efficiency of a reciprocating compressor?

A. High ambient temperature

B. Leaking suction valve

C. Running at maximum pressure

D. Excess refrigerant

A leaking suction valve significantly contributes to the decrease in the efficiency of a reciprocating compressor. When the suction valve leaks, it allows the compressed gas to escape back into the suction line instead of being pushed into the discharge line. This results in a loss of pressure and volume, leading to reduced overall compressor efficiency. Essentially, the compressor has to work harder to compensate for the lost refrigerant, which can lead to increased energy consumption and decreased performance. In a well-functioning system, the suction valve must seal properly to ensure that all the incoming refrigerant is compressed effectively. When this seal is compromised, not only does the efficiency drop, but the compressor may also experience increased wear and tear due to the additional strain on the system. High ambient temperature, running at maximum pressure, and excess refrigerant can influence compressor operation in different ways, but they do not specifically impair the efficiency as directly and critically as a leaking suction valve does. For example, high ambient temperatures can increase discharge pressure but do not directly cause a loss of refrigerant that impacts efficiency in the same way. Increased refrigerant may lead to operational challenges but not necessarily a direct leakage issue.

2. What is a key advantage of forced draft cooling towers over natural draft cooling towers?

A. Lower operational costs

B. Smaller tower size

C. Higher efficiency rates

D. Reduced maintenance needs

The key advantage of forced draft cooling towers over natural draft cooling towers lies in their operational mechanics, which allow for a more controlled airflow. Forced draft cooling towers utilize fans to draw air into the system, creating a forced airflow that significantly enhances the heat exchange process. This method enables these towers to achieve better performance in terms of cooling capacity. The smaller size of forced draft cooling towers is a direct consequence of their design efficiency. Since they can effectively move air with fans, they often require less surface area compared to natural draft towers, which rely on the buoyancy of hot air to create airflow. As a result, forced draft cooling towers can be constructed with a more compact footprint, making them advantageous where space is a constraint. In contrast, while efficiency rates, maintenance needs, and operational costs are important factors in the overall evaluation of cooling tower systems, they do not directly stem from the primary advantage of airflow control that forced draft towers possess. The small physical size and compact design are what allow forced draft cooling towers to be particularly useful in applications where space and efficiency are critical factors.

3. In a condenser, the heat to be removed from the refrigerant is equal to the heat gained in which component?

A. Compressor

B. Evaporator

C. Expansion valve

D. Condenser itself

In a refrigeration cycle, the condenser serves the purpose of rejecting heat from the refrigerant after it has absorbed heat during the evaporation process. The heat gained by the refrigerant in the evaporator is transferred to the condenser, where it is then rejected to the surrounding environment. When the refrigerant enters the evaporator, it absorbs heat from the space that needs to be cooled, allowing it to convert from a low-pressure liquid to a low-pressure vapor. This process is fundamental for maintaining the cooling effect, as the energy absorbed in the evaporator directly correlates to the amount of heat that must be removed in the condenser. Thus, in this context, the correct answer highlights the fundamental relationship in the refrigeration cycle: the heat removed from the refrigerant in the condenser is indeed equal to the heat gained in the evaporator. This is critical for maintaining the efficiency of the refrigeration cycle and ensuring that all absorbed heat is properly dissipated.

4. Which example represents an in-line refrigerant cleaning system for use with a centrifugal compressor containing R123 refrigerant?

A. Refrigerant recovery

B. Refrigerant charging

C. Refrigerant recycling

D. Refrigerant expansion

The correct choice is the example that identifies a refrigerant recycling process. In-line refrigerant cleaning systems are designed to purify refrigerants, particularly in applications involving centrifugal compressors that utilize specific refrigerants like R123. Refrigerant recycling involves filtering and cleaning refrigerant that is already in use or recovered from a system, ensuring that it meets necessary purity standards before being reused. This is crucial for maintaining the efficiency and lifespan of the compressor and is especially relevant when dealing with refrigerants, as improper handling can lead to system inefficiencies or failure. In contrast, refrigerant recovery typically refers to the process of removing refrigerant from a system for the purpose of disposal or storage, but does not necessarily involve cleaning or purification. Refrigerant charging is simply the act of adding refrigerant to a system, and refrigerant expansion refers to the process by which refrigerant undergoes a reduction in pressure as it passes through an expansion valve, which is not related to cleaning or recycling. This distinction highlights why the recycling process is critical in the context of maintaining high performance and compliance with environmental regulations in refrigeration systems.

5. What is the purpose of wear rings in a centrifugal pump?

A. Increase flow rate

B. Reduce vibration

C. Prevent wearing of the pump housing and impeller

D. Control the pump's operating temperature

Wear rings serve a crucial role in a centrifugal pump by preventing the wear and tear that can occur between the pump housing and the impeller during operation. As the impeller rotates, it creates a significant amount of fluid motion, and for this reason, wear rings are designed to minimize the gap between these components. This effectively reduces the migration of fluid leakage and maintains operational efficiency by ensuring that most of the fluid moves through the intended pathways. Over time, without wear rings, the continual friction and movement can cause both the impeller and the casing to degrade, leading to reduced performance, increased maintenance needs, and potentially catastrophic failure of the pump. Therefore, wear rings are a vital component to preserve the integrity of essential pump parts, extend the life of the pump, and maintain optimum performance levels throughout its service life.

6. What can be found marked on fusible plugs located on a condenser?

A. Expiration date

B. Maximum pressure rating

C. Melting point

D. Manufacturer’s information

Fusible plugs are designed to provide a safety mechanism in systems such as condensers, where temperature control is critical. The correct answer relates specifically to the melting point marked on these plugs. Fusible plugs are made from materials that will melt at a certain temperature, which indicates their designed operational thresholds. When the temperature exceeds the designated melting point, the plug will fail and relieve pressure or liquid, thereby preventing potential damage or risk of explosion within the condenser system. This feature is pivotal in maintaining system safety and is essential for the proper operation of the equipment, making it important for users to be aware of the specific melting point in order to monitor system integrity and conditions. The other options, while they may seem relevant in various contexts, do not pertain to fusible plugs. Expiration dates are more typically found on consumable goods rather than on safety components like plugs. Maximum pressure ratings would be more relevant to the overall system design rather than specifically indicated on the plugs themselves. Manufacturer’s information, although often present on many parts, serves more in identification and quality assurance rather than in indicating operational parameters such as melting points.

7. How many gallons of water can be expected from draining a 75-foot long pipe with a diameter of 12 inches?

A. 220 gallons

B. 440 gallons

C. 660 gallons

D. 880 gallons

To find the volume of water that can be expected from draining a 75-foot long pipe with a diameter of 12 inches, it's important to first convert the measurements into a consistent unit and then use the formula for the volume of a cylinder, which is given by the formula: Volume = π * r² * h In this case, the height (h) is the length of the pipe, which is 75 feet. We need to convert the diameter into radius and also convert feet to inches for consistency, since the diameter is given in inches. The radius is half of the diameter, so it would be 6 inches (12 inches / 2). Next, we convert 75 feet to inches: 75 feet × 12 inches/foot = 900 inches Now we can plug the values into the volume formula: 1. Convert the radius into feet (since we calculated the length in feet): Radius = 6 inches = 0.5 feet 2. Now calculate the volume: Volume = π * (0.5 feet)² * 75 feet = π * 0.25 feet² * 75 feet = π * 18.75 cubic feet ≈

8. Refrigeration systems that require FDNY approval typically handle which refrigerant?

A. R-410A

B. Freon-12

C. Propane

D. Ammonia

Refrigeration systems that handle ammonia are often subject to FDNY approval due to the potential hazards associated with this refrigerant. Ammonia is considered a toxic and flammable substance, making its use in refrigeration systems particularly scrutinized for safety reasons. The FDNY regulates ammonia refrigeration systems to ensure compliance with safety standards and to mitigate risks related to leaks, exposure, or emergencies. In contrast, the other refrigerants listed, while they have their own considerations and regulations, do not typically require the same level of oversight from the FDNY. R-410A is a common, non-toxic refrigerant used in residential and commercial applications without the need for specific approvals. Freon-12, also known as dichlorodifluoromethane, is an older refrigerant that has been largely phased out due to environmental concerns but does not usually require FDNY approval when used in legacy systems. Propane, while flammable, is considered a low-risk refrigerant in many applications and does not necessitate the same level of oversight as ammonia. Thus, the requirement for FDNY approval specifically ties back to the significant safety risks associated with ammonia, making it critical that systems utilizing this refrigerant meet stringent safety standards invoked by regulatory bodies like

9. What is the benefit of installing an inline refrigerant cleaning system?

A. To increase energy consumption

B. To enhance cooling efficiency

C. To remove impurities from the system

D. To prevent compressor overheating

Installing an inline refrigerant cleaning system offers the significant benefit of removing impurities from the system. Over time, refrigerant systems can accumulate contaminants such as dirt, moisture, and debris, which can adversely affect the efficiency and performance of the system. By maintaining a clean refrigerant flow, the system can operate as designed, maximizing heat transfer effectiveness and improving overall reliability. This cleaning process helps to prevent issues like corrosion and blockage, ensuring that the system functions smoothly and extends the lifespan of the components. While other options may touch on aspects of system performance, the primary focus of an inline refrigerant cleaning system is its role in removing contaminants, making it critical for maintaining optimal system health.

10. What is the primary role of the Kingsbury thrust bearing in a steam turbine?

A. Support the weight of the rotor

B. Maintain axial positioning of the rotor shaft

C. Control lubrication flow

D. Reduce rotor vibration

The primary role of the Kingsbury thrust bearing in a steam turbine is to maintain axial positioning of the rotor shaft. This is essential for the smooth operation of the turbine, as proper axial positioning ensures that the rotor remains centered and aligned within the turbine casing. By preventing excessive axial movement of the rotor, the thrust bearing helps maintain optimal performance and efficiency during turbine operation. This positioning helps in reducing wear and tear on components and minimizes the risk of mechanical failure due to misalignment. The Kingsbury thrust bearing utilizes a series of radial grooves and pads to support the axial load and effectively manage the thrust forces generated during operation. This design allows for the distribution of load, providing stability while accommodating any necessary axial movement as the turbine operates under different conditions. The other functions mentioned, such as supporting the rotor's weight, controlling lubrication flow, or reducing rotor vibration, are important aspects of turbine operation but are not the primary responsibility of the Kingsbury thrust bearing. Instead, they are typically managed by other components of the turbine system or by different types of bearings specifically designed for those functions.