5th Class Power Engineering Practice Exam (Sample)

Study Guide

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Questions

1. What is the purpose of the equalizing line in a thermal expansion valve?

A. It connects the inlet of the evaporator to the thermostat

B. It allows for pressure measurement adjustment

C. It connects the underside of the diaphragm to the outlet of the evaporator

D. It regulates the refrigerant flow directly to the compressor

2. Viscosity is a measure of what property of oil?

A. Chemical stability

B. Internal resistance to flow

C. Thermal conductivity

D. Specific gravity

3. What percentage does the number 3 represent when compared to 25?

A. 8%

B. 12%

C. 15%

D. 20%

4. What term is used to refer to the provinces and territories of Canada within legal documents?

A. Regions

B. Jurisdiction

C. Districts

D. Areas

5. What happens to a fraction if you multiply its numerator or divide its denominator by a number?

A. The fraction decreases

B. The fraction remains the same

C. The fraction is multiplied by that number

D. The fraction is squared

6. If a table has a surface area of 1140 in², what is its area in cm²?

A. 7000 cm²

B. 7353 cm²

C. 7500 cm²

D. 8000 cm²

7. What is the minimum graduation requirement for a pressure gauge installed on the high side of a refrigerating system?

A. 1.0 times the design working pressure

B. 1.1 times the design working pressure

C. 1.2 times the design working pressure

D. 1.5 times the design working pressure

8. What is the maximum temperature for radiant panel heating in floors?

A. 35°C

B. 30°C

C. 28°C

D. 32°C

9. Shell, sleeve, or journal bearings typically have what kind of lining?

A. Copper alloy

B. White-metal alloy

C. Plastic composite

D. Graphite lining

10. How was the crown sheet of a locomotive boiler secured?

A. With bolts and nuts

B. By welding

C. With radial stays

D. Using tension rods

Answers

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

Explanations

1. What is the purpose of the equalizing line in a thermal expansion valve?

A. It connects the inlet of the evaporator to the thermostat

B. It allows for pressure measurement adjustment

C. It connects the underside of the diaphragm to the outlet of the evaporator

D. It regulates the refrigerant flow directly to the compressor

The purpose of the equalizing line in a thermal expansion valve is fundamentally tied to its role in managing the flow of refrigerant and ensuring optimal functioning of the system. By connecting the underside of the diaphragm to the outlet of the evaporator, the equalizing line allows the thermal expansion valve to monitor the pressure in the evaporator. This pressure feedback is crucial because it enables the valve to adjust the refrigerant flow based on the actual conditions within the evaporator. When the pressure increases in the evaporator, it indicates that more refrigerant is needed to absorb heat, thus enhancing cooling efficiency. The diaphragm responds to these pressure changes, allowing the expansion valve to open or close accordingly. This responsive action maintains the intended superheat level, ensuring that the system operates efficiently and effectively without the risk of liquid refrigerant entering the compressor. In contrast, the other options pertain to different functions that do not specifically relate to the role of the equalizing line in managing the pressure balance necessary for effective thermal expansion valve operation.

2. Viscosity is a measure of what property of oil?

A. Chemical stability

B. Internal resistance to flow

C. Thermal conductivity

D. Specific gravity

Viscosity is best described as the internal resistance to flow of a fluid, including oil. This property indicates how readily a fluid can flow; a fluid with high viscosity resists motion because its molecular makeup offers more internal friction. For example, honey has a higher viscosity compared to water, meaning it flows more slowly and with greater resistance. Understanding viscosity is crucial in various applications, such as lubrication, where the right viscosity ensures effective operation and protection of machinery. It impacts the performance of oils under different temperature conditions, where a change in viscosity can influence how effectively an oil can do its job as a lubricant or hydraulic fluid. The other options, while relevant to different properties of oils, do not pertain directly to viscosity. Chemical stability relates to the oil's ability to resist degradation over time, thermal conductivity refers to how well a substance can conduct heat, and specific gravity measures the density of the oil compared to water. Each of these properties is important in its own right, but they do not represent the resistance to flow that characterizes viscosity.

3. What percentage does the number 3 represent when compared to 25?

A. 8%

B. 12%

C. 15%

D. 20%

To determine what percentage the number 3 represents when compared to 25, you would use the formula for calculating percentage, which is given by: $$\text{Percentage} = \left(\frac{\text{Part}}{\text{Whole}} \right) \times 100$$ In this scenario, the part is 3 (the number we are evaluating), and the whole is 25. Plugging in these values into the formula gives us: $$\text{Percentage} = \left(\frac{3}{25} \right) \times 100$$ Calculating this step-by-step: 1. Divide 3 by 25, which equals 0.12. 2. Multiply 0.12 by 100 to convert it into a percentage, resulting in 12%. Thus, the outcome indicates that the number 3 constitutes 12% of 25. This aligns with the answer that has been identified, confirming it as the correct choice in this context.

4. What term is used to refer to the provinces and territories of Canada within legal documents?

A. Regions

B. Jurisdiction

C. Districts

D. Areas

The term "jurisdiction" is specifically used in legal contexts to denote the provinces and territories of Canada. In legal documents, jurisdiction refers to the authority of a particular region or governing body to enact laws and regulations. This includes the power to enforce those laws and the geographical boundaries within which that authority operates. In the case of Canada, each province and territory has its own set of laws and statutes, which highlight their individual jurisdictions. This administrative and legal framework is essential for understanding governance within the country, as each area operates independently under the broader Canadian constitution while also having specific duties, rights, and responsibilities. The other terms such as regions, districts, and areas, while they can describe geographical locales, do not have the same legal significance or specificity as "jurisdiction." They might encompass broader or more general concepts without the explicit legal implications tied to governance and law enforcement found in the term "jurisdiction." This distinction is crucial for accurately interpreting legal texts and understanding the structure of governmental authority in Canada.

5. What happens to a fraction if you multiply its numerator or divide its denominator by a number?

A. The fraction decreases

B. The fraction remains the same

C. The fraction is multiplied by that number

D. The fraction is squared

When you multiply the numerator of a fraction by a number, the overall value of the fraction increases, since you are increasing the number that represents the part of the whole. For example, if you have the fraction 1/2 and you multiply the numerator by 2, the fraction becomes 2/2, which equals 1. This demonstrates that the fraction has effectively been multiplied by that number. On the other hand, if you divide the denominator of a fraction by a number, you are also increasing the value of the fraction. Using the same example of 1/2, if you divide the denominator by 2, the fraction changes to 1/(2/2), which simplifies to 1/1, also equal to 1. Here, again, the value of the fraction has increased. Thus, multiplying the numerator or dividing the denominator by a number results in the fraction being effectively multiplied by that number, which leads to an increase in its overall value. This is why the selected answer is the correct choice.

6. If a table has a surface area of 1140 in^2, what is its area in cm^2?

A. 7000 cm^2

B. 7353 cm^2

C. 7500 cm^2

D. 8000 cm^2

To convert the area from square inches to square centimeters, it is essential to use the correct conversion factor. One square inch is equivalent to 6.4516 square centimeters. Therefore, to convert the surface area of the table from square inches to square centimeters, you multiply the area in square inches by this conversion factor. Starting with the given area of the table: 1140 in^2 * 6.4516 cm^2/in^2 = 7353.824 cm^2 By rounding this value to the nearest whole number, the area in square centimeters is approximately 7354 cm^2. This aligns closely with the answer option of 7353 cm^2, making it the correct choice. The conversion steps illustrate how dimensional analysis is applied when changing units, particularly in geometry and engineering contexts where precise measurements are vital.

7. What is the minimum graduation requirement for a pressure gauge installed on the high side of a refrigerating system?

A. 1.0 times the design working pressure

B. 1.1 times the design working pressure

C. 1.2 times the design working pressure

D. 1.5 times the design working pressure

The minimum graduation requirement for a pressure gauge installed on the high side of a refrigerating system is established to ensure accurate and reliable readings that can safely reflect the operating conditions of the system. A gauge that is graduated to 1.2 times the design working pressure ensures that it can accurately measure pressures above the normal operating range without risk of damage or failure. Graduating the gauge at this level allows for some margin above the design pressure, accommodating potential fluctuations or surges in pressure that can occur during operation. This safety margin is critical in maintaining system reliability and safety, as pressures can occasionally exceed the standard operating conditions. By using a gauge that meets this graduation requirement, operators can better monitor the system's performance and detect any issues that may arise, thereby enhancing overall safety. Graduating closer to the design pressure would limit the effectiveness of the gauge in critical situations, potentially leading to inadequate pressure monitoring and increased risk of accidents or system failures. Therefore, setting the graduation at 1.2 times the design working pressure is a standard practice that balances accuracy, reliability, and safety in refrigeration systems.

8. What is the maximum temperature for radiant panel heating in floors?

A. 35°C

B. 30°C

C. 28°C

D. 32°C

In radiant panel heating systems installed in floors, maintaining a safe and comfortable temperature is crucial to ensure the effectiveness of the system and the well-being of the occupants. The maximum temperature for radiant panel heating in floors is typically around 30°C. This temperature limit is set to prevent overheating and to ensure that the heat is evenly distributed without causing discomfort or risk of damage to flooring materials. Keeping the temperature at or below this threshold also helps in controlling humidity levels in a space and reduces the risk of overheating and potentially adverse health effects associated with excessively high temperatures. Therefore, the choice of 30°C as the maximum temperature is aligned with safety and performance standards for radiant floor heating systems, ensuring the comfort and safety of building occupants.

9. Shell, sleeve, or journal bearings typically have what kind of lining?

A. Copper alloy

B. White-metal alloy

C. Plastic composite

D. Graphite lining

The correct choice is a white-metal alloy for the lining of shell, sleeve, or journal bearings, primarily due to its characteristics that are well-suited for these applications. White-metal alloys, which usually consist of tin, lead, and antimony, are known for their excellent properties of low friction, high resistance to wear, and good load-bearing capabilities. This type of lining enables the bearings to work efficiently within their intended applications, providing smooth movement between parts and minimizing the wear and tear that can occur due to friction with metal components. Additionally, white-metal liners can conform slightly to the surfaces they contact, which helps in distributing the load more evenly and reducing the risk of localized damage. Other materials listed, like copper alloy, plastic composite, and graphite lining, have their particular advantages in different applications, but they do not offer the same comprehensive benefits for high-load, high-speed conditions typical in shell or journal bearings as effectively as white-metal alloys do.

10. How was the crown sheet of a locomotive boiler secured?

A. With bolts and nuts

B. By welding

C. With radial stays

D. Using tension rods

The crown sheet of a locomotive boiler is secured with radial stays, which are crucial for maintaining the structural integrity of the boiler. The crown sheet is the upper part of the boiler that contains the steam space. Since it is subjected to significant pressure and temperature changes, it must be securely fastened to prevent bulging or failure. Radial stays are positioned in a way that they can effectively transfer the stresses experienced by the crown sheet to the sides of the boiler. These stays are typically made of steel and extend from the crown sheet down to the shell of the boiler, helping to provide support and distribute the loads evenly across the structure. This method of securing the crown sheet is essential in locomotive design, as it provides the necessary strength and support to withstand the high-pressure steam generated within the boiler. The use of radial stays also allows for proper thermal expansion and contraction, further ensuring the longevity and safety of the boiler in operation.