

Electricity for HVACR Practice Test (Sample)

Study Guide



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SAMPLE

Questions

- 1. A Legget is used to measure what?**
 - A. Voltage**
 - B. Current**
 - C. Resistance**
 - D. Power**

- 2. Placing the jaws of a clamp-on ammeter around two separate conductors will result in what?**
 - A. An accurate reading**
 - B. No reading**
 - C. An inaccurate reading**
 - D. A doubled reading**

- 3. In electrical terms, what does an inductor do?**
 - A. Stores electric charge**
 - B. Stores electrical energy in a magnetic field**
 - C. Resists changes in current**
 - D. Generates electric current**

- 4. What is the primary function of a starter in a three-phase motor?**
 - A. To increase voltage**
 - B. To decrease current**
 - C. To provide necessary starting torque**
 - D. To limit temperature**

- 5. What is the primary function of a centrifugal switch?**
 - A. To control the speed of the motor**
 - B. To disconnect the start winding when the motor reaches a certain speed**
 - C. To provide protection against overload**
 - D. To regulate the power supply to the motor**

- 6. What does the term "phase" refer to in electrical systems?**
- A. The total power in a circuit**
 - B. The particular point in the cycle of an AC waveform**
 - C. The type of load connected**
 - D. The frequency of the current**
- 7. How much power is consumed by a 120V parallel circuit that contains a 100-load and an 80-load that draws 2.7A?**
- A. 100W**
 - B. 125W**
 - C. 150W**
 - D. 200W**
- 8. What does the abbreviation LED stand for?**
- A. Light Emitting Device**
 - B. Light Emitting Diode**
 - C. Low Energy Device**
 - D. Laser Emitting Diode**
- 9. Define inductance in electrical terms.**
- A. The ability of a conductor to store electrical charge**
 - B. The property of a conductor to resist changes in current flow through electromagnetic fields**
 - C. The measure of electrical resistance in a circuit**
 - D. The capacity to conduct alternating current efficiently**
- 10. If a transformer has 200 windings in its primary and receives 120VAC, how many volts would the secondary with 400 windings produce?**
- A. 120V**
 - B. 200V**
 - C. 240V**
 - D. 400V**

Answers

SAMPLE

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

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Explanations

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1. A Legget is used to measure what?

- A. Voltage**
- B. Current**
- C. Resistance**
- D. Power**

A Legget, also known as a leg meter or Legget meter, is specifically used to measure resistance in electrical circuits. Resistance is a measure of how much an object opposes the flow of electric current. The Legget operates by applying a known voltage across a resistor and measuring the resulting current flow, thus allowing it to calculate the resistance using Ohm's Law. Understanding resistance is crucial in HVACR systems since it affects how efficiently components like motors and heating elements operate. Correctly measuring resistance ensures that circuits are functioning properly and helps in troubleshooting issues related to circuit integrity and performance. In the context of the other choices, while various instruments are designed for measuring voltage, current, and power, those do not apply to the Legget. Voltage is measured with a voltmeter, current with an ammeter, and power with a wattmeter. Each of these tools serves a different purpose in electrical diagnostics and analysis, but the Legget is uniquely focused on resistance.

2. Placing the jaws of a clamp-on ammeter around two separate conductors will result in what?

- A. An accurate reading**
- B. No reading**
- C. An inaccurate reading**
- D. A doubled reading**

When using a clamp-on ammeter, it is essential to understand how it measures current. This device is designed to measure the magnetic field produced by the current flowing through the conductor it encloses. When the jaws of a clamp-on ammeter are placed around two separate conductors simultaneously, the magnetic fields produced by the currents in each conductor can interact. If the currents in these conductors are flowing in opposite directions, their magnetic fields may cancel each other out, leading to a zero or very low reading on the meter. Moreover, if the currents are flowing in the same direction but are not equal, the clamp meter will measure the net magnetic field, which may not accurately represent the current in either conductor. This results in an inaccurate reading as the device does not have the capability to differentiate between the two currents effectively. Therefore, placing the jaws of a clamp-on ammeter around two separate conductors will generate an inaccurate reading, which is why this conclusion is correct within the context of using this type of measurement tool.

3. In electrical terms, what does an inductor do?

- A. Stores electric charge
- B. Stores electrical energy in a magnetic field**
- C. Resists changes in current
- D. Generates electric current

An inductor is a passive electrical component that primarily functions by storing electrical energy in a magnetic field when an electric current flows through it. This occurs due to the principle of electromagnetic induction, where the change in current creates a magnetic field around the inductor. When the current changes, the magnetic field also changes, and this change induces a voltage that opposes the change in current, a phenomenon described by Lenz's Law. This specific ability to store energy in a magnetic field makes inductors essential in various applications, particularly in alternating current (AC) circuits and in filters, where they help manage and stabilize current flow. The storage of energy in this form is fundamentally different from how capacitors operate, which store energy in an electric field, emphasizing the unique role that inductors play in electrical systems.

4. What is the primary function of a starter in a three-phase motor?

- A. To increase voltage
- B. To decrease current
- C. To provide necessary starting torque**
- D. To limit temperature

The primary function of a starter in a three-phase motor is to provide the necessary starting torque. When a three-phase motor is started, it requires a significant amount of torque to overcome inertia and begin rotation. The starter ensures that the motor receives the appropriate amount of current during startup, allowing it to reach its operational speed efficiently. Starters may use various techniques, such as reducing the initial voltage or applying resistance, to gradually increase the motor's torque and prevent excessive inrush current. This controlled application of power not only helps achieve the required torque but also protects the motor and electrical system from damage due to high starting currents. While other options may relate to aspects of motor performance, they do not directly address the fundamental purpose of a starter. For instance, increasing voltage is not a primary function because starters typically manage voltage to achieve smoother starting. Decreasing current is a consequence of controlling the starting conditions rather than the main function, and limiting temperature is more aligned with operational safeguards rather than the starting function. The emphasis on providing necessary starting torque highlights the critical role starters play in the operational success of three-phase motors.

5. What is the primary function of a centrifugal switch?

- A. To control the speed of the motor**
- B. To disconnect the start winding when the motor reaches a certain speed**
- C. To provide protection against overload**
- D. To regulate the power supply to the motor**

The primary function of a centrifugal switch is to disconnect the start winding when the motor reaches a certain speed. In a typical single-phase motor, the start winding is used to provide an initial boost of torque to help the motor overcome inertia and start turning. Once the motor achieves a specific speed, the centrifugal switch activates, cutting off the start winding. This is important because keeping the start winding engaged after the motor has started can cause overheating and damage to the winding. This mechanism allows the motor to operate efficiently, using only the run winding for continuous operation, which reduces the risk of failure and ensures that the motor runs at its intended efficiency and performance levels.

6. What does the term "phase" refer to in electrical systems?

- A. The total power in a circuit**
- B. The particular point in the cycle of an AC waveform**
- C. The type of load connected**
- D. The frequency of the current**

The term "phase" in electrical systems specifically refers to the particular point in the cycle of an alternating current (AC) waveform. In AC systems, the voltage and current change direction periodically, and "phase" describes the position of the waveform at a given moment in time relative to a point in its cycle. For instance, when you think about an AC wave, it cycles through a series of peaks and troughs, and each of these points corresponds to different states of flow for the electric current. The phase can be crucial in understanding how multiple AC currents interact, especially in systems designed with multiple phases like three-phase systems, where the phases are spaced evenly apart. The other options, while related to electricity, address different concepts: total power in a circuit involves calculating the combined power from different loads, the type of load refers to the nature of what is being powered (resistive, inductive, etc.), and the frequency of the current denotes how many cycles per second an AC signal undergoes, typically measured in Hertz (Hz). These concepts don't define "phase" but are instead part of broader electrical fundamentals.

7. How much power is consumed by a 120V parallel circuit that contains a 100-load and an 80-load that draws 2.7A?

- A. 100W**
- B. 125W**
- C. 150W**
- D. 200W**

To determine the power consumed by the circuit, we first need to understand how the parallel circuit operates. In a parallel circuit, each load receives the same voltage, which in this case is 120 volts. The total power consumed by the circuit can be calculated using the formula for power, which is: $\text{Power (P)} = \text{Voltage (V)} \times \text{Current (I)}$. From the information provided, the circuit draws a total current of 2.7 amperes at a voltage of 120 volts. By applying the formula: $P = 120V \times 2.7A$. Calculating this gives: $P = 324W$. However, you are also given loads of 100W and 80W. Since both loads are connected in parallel, the total power consumed in terms of these loads is: $\text{Total Power} = \text{Power of Load 1} + \text{Power of Load 2}$ $\text{Total Power} = 100W + 80W = 180W$. However, the power calculated based on the 2.7A is the total power consumed in the circuit, and it indicates the actual power being drawn from the supply. The question mentions "contains a 100-load and an 80-load," suggesting we look at the impact of

8. What does the abbreviation LED stand for?

- A. Light Emitting Device**
- B. Light Emitting Diode**
- C. Low Energy Device**
- D. Laser Emitting Diode**

The abbreviation LED stands for Light Emitting Diode. This terminology correctly identifies the fundamental component used in LED technology. A Light Emitting Diode is a semiconductor device that emits light when current flows through it. The light is produced as a result of electroluminescence, where electrons recombine with holes within the device, releasing energy in the form of photons. Understanding what an LED is helps in grasping its applications in various fields, including HVACR, where energy efficiency and improved lighting solutions are critical. LEDs are renowned for their low energy consumption and long lifespan compared to traditional incandescent or fluorescent bulbs, making them a popular choice in modern lighting solutions, including those used in HVAC systems. The other options do not accurately describe the technology in question. For instance, "Light Emitting Device" is a general term that could apply to various types of devices and does not specify the semiconductor aspect that is essential to understanding how LEDs function. "Low Energy Device" suggests energy efficiency but does not pertain specifically to the light-emitting properties or technology behind LEDs. "Laser Emitting Diode" incorrectly combines terms relevant to laser technology, which operates on different principles than LEDs.

9. Define inductance in electrical terms.

- A. The ability of a conductor to store electrical charge
- B. The property of a conductor to resist changes in current flow through electromagnetic fields**
- C. The measure of electrical resistance in a circuit
- D. The capacity to conduct alternating current efficiently

Inductance is fundamentally defined as the property of a conductor or coil that allows it to resist changes in current flow through the influence of electromagnetic fields. This phenomenon occurs when a changing current in a wire generates a magnetic field around it, which can induce a voltage in the wire itself or in nearby conductors. The ability to resist changes in current is critical in various applications, particularly in inductors and transformers within electronic and HVACR systems, because it helps maintain a stable flow of electricity despite fluctuations in demand or supply. When the current through an inductor changes, the magnetic field also changes, creating an induced electromotive force (emf) that opposes the change according to Lenz's law. This aspect is key in the operation of many electrical devices and systems, such as in filtering applications and energy storage, making the understanding of inductance essential for HVACR professionals.

10. If a transformer has 200 windings in its primary and receives 120VAC, how many volts would the secondary with 400 windings produce?

- A. 120V
- B. 200V
- C. 240V**
- D. 400V

To determine the output voltage of the secondary winding of a transformer based on the number of windings in the primary and secondary, the transformer turns ratio can be used. The relationship is defined by the formula: $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ where (V_p) is the primary voltage, (V_s) is the secondary voltage, (N_p) is the number of turns (windings) in the primary, and (N_s) is the number of turns in the secondary. In this scenario, the primary winding has 200 turns and the transformer is supplied with 120VAC. The secondary winding has 400 turns. Using the formula, we can rearrange it to solve for the secondary voltage: $V_s = V_p \times \frac{N_s}{N_p}$ Substituting the known values into the equation: $V_s = 120V \times \frac{400}{200}$ This simplifies to: $V_s = 120V \times 2 = 240V$ Thus, the secondary voltage produced by the transformer with 400 windings is 240 volts. This