

# NCEA Level 2 Electricity Practice Exam (Sample)

## Study Guide



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**SAMPLE**

## **Questions**

- 1. What describes a parallel circuit?**
  - A. All components are in a single pathway**
  - B. All components are connected to the same voltage source**
  - C. Each component has a different current flow**
  - D. Components allow multiple paths for current to flow**
- 2. In electrical terms, what does a switch do?**
  - A. Increases the current**
  - B. Decreases the voltage**
  - C. Controls the flow of electric current**
  - D. Converts AC to DC**
- 3. Electric potential energy can be converted into which of the following types of energy?**
  - A. Kinetic energy**
  - B. Thermal energy**
  - C. Both kinetic and thermal energy**
  - D. Gravitational energy**
- 4. What is the purpose of a ground wire in an electrical circuit?**
  - A. To increase the circuit's voltage**
  - B. To provide a decorative element in circuits**
  - C. To protect users from electric shock**
  - D. To conduct current to appliances**
- 5. In an electric circuit, what does a coil primarily act as?**
  - A. A resistor**
  - B. A capacitor**
  - C. An inductor**
  - D. A switch**
- 6. What role do resistors play in electrical circuits?**
  - A. To store electrical energy**
  - B. To control the level of current**
  - C. To amplify electrical signals**
  - D. To change voltage levels**

- 7. What function does a diode serve in an electrical circuit?**
- A. Allows current to flow in both directions**
  - B. Stores energy in a magnetic field**
  - C. Allows current to flow in only one direction**
  - D. Converts AC to DC**
- 8. What happens to impedance if reactance increases in an AC circuit?**
- A. Impedance decreases**
  - B. Impedance remains the same**
  - C. Impedance increases**
  - D. Impedance becomes irrelevant**
- 9. Which type of circuit refers to one allowing current to return to the power source?**
- A. Open circuit**
  - B. Closed circuit**
  - C. Complex circuit**
  - D. Static circuit**
- 10. A capacitor is used in circuits to:**
- A. Change voltage levels**
  - B. Oppose current flow**
  - C. Store electrical energy**
  - D. Act as an on/off switch**

## **Answers**

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

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## **Explanations**

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## 1. What describes a parallel circuit?

- A. All components are in a single pathway
- B. All components are connected to the same voltage source
- C. Each component has a different current flow
- D. Components allow multiple paths for current to flow**

A parallel circuit is characterized by the arrangement of components such that each component is connected across the same two points in a circuit, allowing multiple paths for the current to travel. This means that if one component fails or is removed, the other components can still function because they are not part of a single series pathway. Each branch of the circuit can operate independently, which makes parallel circuits advantageous for ensuring that all components receive the same voltage from the source while allowing different amounts of current to flow based on the resistance of each branch. Choosing this answer emphasizes the essential feature of parallel circuits: the ability to distribute current through multiple pathways, which is fundamental to their operation and efficiency.

## 2. In electrical terms, what does a switch do?

- A. Increases the current
- B. Decreases the voltage
- C. Controls the flow of electric current**
- D. Converts AC to DC

A switch in electrical terms functions as a device that controls the flow of electric current within a circuit. When a switch is in the 'on' position, it closes the circuit, allowing current to flow freely from the power source to the load (such as a light bulb), thus enabling the electrical device to operate. Conversely, when the switch is turned 'off,' it opens the circuit, stopping the flow of current and turning off the device. This functionality is essential for controlling electrical appliances safely and conveniently. For example, light switches allow you to turn lights on or off without needing to manipulate wiring, which could be dangerous. In contrast, other options relate to different electrical concepts. Increasing current refers to the effect of resistance and voltage, while decreasing voltage pertains to the use of transformers or resistors. The conversion from AC to DC is a function of rectifiers and not related to the operational function of a simple switch. Therefore, the correct option highlights the role of a switch in managing electrical current flow within a circuit.

**3. Electric potential energy can be converted into which of the following types of energy?**

- A. Kinetic energy**
- B. Thermal energy**
- C. Both kinetic and thermal energy**
- D. Gravitational energy**

Electric potential energy can indeed be converted into both kinetic energy and thermal energy. This conversion primarily occurs when electric charges move through an electric circuit. When electric potential energy is transformed into kinetic energy, it's typically observed in scenarios such as when charged particles (like electrons) are accelerated by an electric field. As these particles gain speed, the potential energy they initially possessed due to their position in the field is converted into kinetic energy. On the other hand, the conversion to thermal energy happens due to resistive heating as electric current passes through a conductor. As the electrons collide with atoms within the material, some of their energy is transformed into thermal energy, causing an increase in temperature. Given that both kinetic and thermal forms of energy can be generated from electric potential energy, the answer indicating both conversions accurately reflects the relationship between these types of energy in electrical systems. The choice that mentions gravitational energy does not apply here, as gravitational energy is a separate form related to the position of an object in a gravitational field, which does not directly stem from electric potential energy.

**4. What is the purpose of a ground wire in an electrical circuit?**

- A. To increase the circuit's voltage**
- B. To provide a decorative element in circuits**
- C. To protect users from electric shock**
- D. To conduct current to appliances**

The purpose of a ground wire in an electrical circuit is to protect users from electric shock. The ground wire is an essential safety feature in electrical systems. It provides a low-resistance path for electrical current to travel to the ground in case of a fault or malfunction, such as a short circuit. When a fault occurs, such as a live wire touching the metal casing of an appliance, the ground wire ensures that the excess current flows safely into the earth instead of passing through a person who may come in contact with the appliance. This mechanism helps to prevent serious injuries or fatalities due to electric shock. By connecting electrical devices to the ground, this safety measure minimizes the risk of electric shock to users and creates a safer environment for operation. The other choices do not accurately describe the function of a ground wire. Increasing the circuit's voltage, providing decorative elements, or conducting current to appliances do not capture the primary safety role that ground wires play in preventing electric hazards.

**5. In an electric circuit, what does a coil primarily act as?**

- A. A resistor**
- B. A capacitor**
- C. An inductor**
- D. A switch**

In an electric circuit, a coil primarily acts as an inductor. Inductors are components that store energy in a magnetic field when electricity flows through them. The coil, typically made of wire wound into a spiral shape, has the ability to oppose changes in current. This property is due to electromagnetic induction, where a change in current through the coil generates a voltage that opposes the change in current itself. When current flows through the coil, it creates a magnetic field. If the current changes, the magnetic field also changes, and this change induces a voltage (known as back electromotive force) that opposes the change in current. This behavior allows inductors to play a crucial role in various applications, such as filtering signals, smoothing out fluctuations in power supply, and in oscillating circuits. The understanding of how coils behave as inductors is fundamental in analyzing and designing circuits that incorporate inductive components, especially in alternating current (AC) systems, where the current direction changes frequently.

**6. What role do resistors play in electrical circuits?**

- A. To store electrical energy**
- B. To control the level of current**
- C. To amplify electrical signals**
- D. To change voltage levels**

Resistors are essential components in electrical circuits, primarily used to control the level of current flowing through the circuit. When integrated into a circuit, a resistor introduces resistance, which restricts the flow of electrical charge. This regulation of current is crucial for ensuring that components receive the appropriate amount of current for their operation to prevent damage or potential malfunction. By adhering to Ohm's Law, which states that Voltage (V) equals Current (I) multiplied by Resistance (R), it's clear that altering the resistance value allows one to effectively manipulate current. If the resistance increases, the current decreases for a given voltage, and vice versa. This capacity to control current makes resistors valuable in various applications, including voltage dividers, current limiters, and signal conditioning circuits. The other options do not accurately describe the primary function of resistors. Resistors are not designed to store electrical energy, which is typically the role of capacitors. They also do not amplify electrical signals; that function is more aligned with transistors or amplifiers. Finally, while resistors can affect voltage levels indirectly through their impact on current, they do not change voltage levels directly, which is more the function of devices specifically designed for voltage regulation, such as transformers or voltage regulators.

**7. What function does a diode serve in an electrical circuit?**

- A. Allows current to flow in both directions**
- B. Stores energy in a magnetic field**
- C. Allows current to flow in only one direction**
- D. Converts AC to DC**

A diode is a semiconductor device that primarily serves to allow current to flow in only one direction. This unidirectional flow is crucial in many electronic applications. When forward-biased, the diode has low resistance and conducts electrical current, while in reverse bias, it presents high resistance and effectively blocks the current. This property is essential for various functionalities in circuits, such as rectification, where alternating current (AC) is converted to direct current (DC). By ensuring that current flows in one direction, diodes protect sensitive components from damage that could occur if current were allowed to flow backwards. Thus, the diode plays a fundamental role in controlling the direction of current flow in electrical circuits, which is why the answer regarding its function is correct.

**8. What happens to impedance if reactance increases in an AC circuit?**

- A. Impedance decreases**
- B. Impedance remains the same**
- C. Impedance increases**
- D. Impedance becomes irrelevant**

In an AC circuit, impedance is the total opposition that a circuit presents to the flow of alternating current and is represented as a combination of both resistance and reactance. When the reactance in the circuit increases, it directly contributes to an increase in total impedance. Impedance is defined mathematically as the square root of the sum of the squares of resistance (R) and reactance (X):  $[ Z = \sqrt{R^2 + X^2} ]$  As reactance (X) increases while resistance (R) remains constant, the value of  $( X^2 )$  becomes larger. Since the impedance formula relies on the sum of the squares of both components, an increase in reactance results in a higher overall value of impedance. Therefore, with an increase in reactance in an AC circuit, impedance indeed increases. This concept is crucial for understanding circuit behavior in AC systems, where both types of opposition, resistance and reactance, play a significant role in determining how the circuit will respond to alternating current.

**9. Which type of circuit refers to one allowing current to return to the power source?**

- A. Open circuit**
- B. Closed circuit**
- C. Complex circuit**
- D. Static circuit**

A closed circuit is one that provides a complete path for current to flow from the power source, through the components of the circuit, and back to the power source. In a closed circuit, the connections are intact, allowing for the continuous movement of electrical charge, which enables devices, like light bulbs or motors, to function. In contrast, an open circuit breaks this path, interrupting the flow of current and thus preventing any devices connected in the circuit from operating. A complex circuit involves multiple components and pathways for current but does not specifically define the criteria for current returning to the power source. A static circuit generally refers to systems where charges may accumulate without flow, rather than emphasizing the current flow back to the source. Thus, the identification of a closed circuit confirms its role in facilitating the return of current to the power source.

**10. A capacitor is used in circuits to:**

- A. Change voltage levels**
- B. Oppose current flow**
- C. Store electrical energy**
- D. Act as an on/off switch**

A capacitor is designed to store electrical energy in an electric field between its plates when voltage is applied across them. This storage capability is crucial in various electrical and electronic applications, such as smoothing voltage fluctuations in power supply circuits, filtering out noise in audio systems, and timing applications in oscillators. The mechanism behind this is that when a voltage is applied, charge accumulates on the plates of the capacitor, and this charge can later be released back into the circuit when needed. The ability to store energy is what distinguishes capacitors from other components in a circuit, making them essential for energy management and buffering in various electronic designs.