



DEPARTMENT OF HUMAN RESOURCES

**Study Guide**  
**Traffic Signal Technician III Written Examination**

- This booklet contains SAMPLE QUESTIONS ONLY. Studying this booklet will not necessarily improve your exam score.

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## **PURPOSE AND CONTENT OF THIS STUDY GUIDE**

This guide was developed to help you prepare to take the written examination for Traffic Signal Technician III. It contains general test-taking advice and also provides specific information related to the exam content. This information includes the subject areas covered by the exam, the kinds of questions to expect, strategies for approaching the questions, and sample questions. Though this information cannot guarantee a higher examination score, it can give you direction for your examination preparation that will assist you in doing your best.

## **PREPARING TO TAKE THE EXAMINATION**

### **Before the Day of the Exam**

- Review this guide to get familiar with the content of the exam. Knowing about the topics and kinds of questions that will be in the exam will ensure that you will not be surprised by the content of the exam or the manner in which it is presented. This can improve your ability to demonstrate your job potential.
- Make sure that you know where the exam will be administered and all of the relevant details, such as where to park, where to report for the exam, and what identification is required.

### **On the Day of the Exam**

- Make sure that you are well rested and have eaten. These things will help your concentration during the exam.
- Plan your day to allow plenty of time to get yourself prepared and get to the exam site. Allow enough time to cope with weather, traffic, parking, etc. Hurrying creates anxiety, so do not put yourself in the position of having to hurry.
- Listen carefully to all instructions from the examination administrator. Make sure that you understand the instructions and carry them out correctly. Ask questions at the proper time before the exam begins if you are unsure of any aspect of what you should do during the exam.

## GENERAL EXAM TAKING TIPS

- Use your time carefully. The time limit should provide you with more than enough time if you move through the exam steadily and do not spend too much time on any one question.
- Read the questions and answer choices carefully. Read all of the answer choices before you select an answer.
- If you come to a question that is especially difficult, skip that question and come back to it later if you have time.
- Answer every question. Scores are based on the number of correct answers. You will receive no credit if you leave an answer space blank. It is to your advantage to use your best judgment to make a choice among the answer choices provided.

## THE TRAFFIC SIGNAL TECHNICIAN III WRITTEN EXAMINATION

The written exam for the Traffic Signal Technician III is based upon a job study that identified the most important knowledge, skills, and abilities required to perform the job successfully. These areas include:

- your knowledge of electrical concepts.
- your skill in interpreting electrical diagrams and symbols and performing basic electrical problem solving.
- your knowledge of safety practices related to working with electricity.
- your knowledge of electrical concepts related to traffic signal devices and their operation.

All of the exam questions are presented in a multiple-choice format. Each question is identified by a question number that is followed by a question statement. After the question statement, there are between two and four answer choices. You should read all of the answer choices and then choose the best answer. **Each question has only one correct answer.**

## SECTION 1: ELECTRICAL CONCEPTS

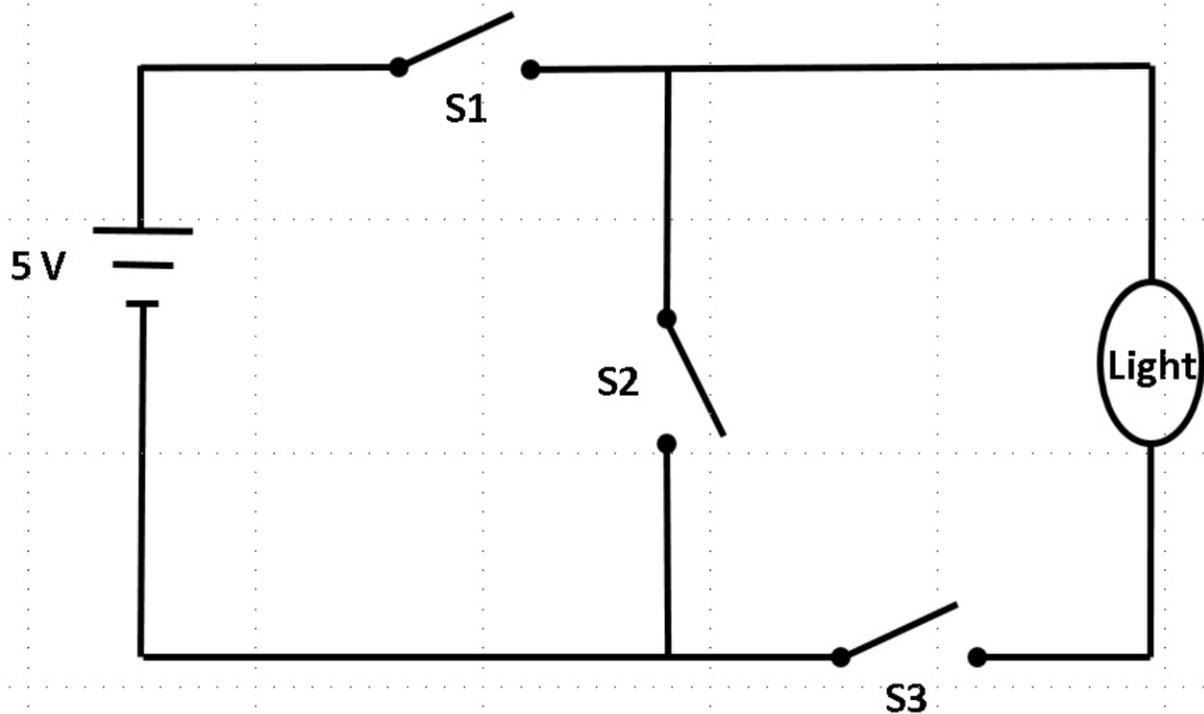
This part of the exam contains twenty-eight (28) questions designed to assess your knowledge of electrical concepts. Question content includes electrical components, equipment, units of measurement, and the flow of current. A good strategy for answering questions in this section is to prepare before the exam by reviewing the areas described above. Then, when taking the exam, identify the concept addressed by the question such as paths of current or power, resistance, conductivity, etc. When you have clarified the concept, you should be better able to draw upon your knowledge base and thoughtfully consider the response choices.

Examples of these types of questions are shown below. Each question is followed by a brief explanation of the correct answer.

1. Which of the following is the base unit of electric current in the International System of Units used to indicate the quantity of electric current?
  - A. Volt.
  - B. Ohm.
  - C. Ampere.
  - D. Watt.

**Answer:** The correct answer to sample question #1 is response choice "C". The ampere is the base unit of electric current in the International System of Units. A volt is the difference in electric potential between two points. A watt is a unit of power that quantifies the rate of energy transfer. An ohm is the standard unit of electrical resistance.

2. In the circuit shown below, which switch or switches need to be closed to turn on the light?
  - A. S1 only.
  - B. S1 and S2.
  - C. S3 only.
  - D. S1 and S3.



**Answer:** The correct answer to sample question #2 is response choice "D". In order for current to flow and turn on the light, there must be a continuous connection from the battery to the light and then back to the battery. Therefore, switches S1 and S3 must be closed to complete that connectivity. S2 being open has no impact on the functioning of the light.

3. Two or more elements in an electric circuit are in parallel when they:

- A. form a loop.
- B. have the same current.
- C. are connected sequentially.
- D. are connected to the same two nodes.

**Answer:** The correct answer to sample question #3 is response choice "D". Two or more elements in a circuit are parallel if they are connected to the same two nodes. Elements that are connected sequentially, and thus, have the same current are defined as series. A loop is a closed path in a circuit.

## SECTION 2: ELECTRICAL DIAGRAMS AND PROBLEM SOLVING

This part of the exam contains twenty-eight (28) questions that evaluate your skill in interpreting electrical diagrams and symbols and performing basic electrical problem solving. Questions include identification of electrical symbols, interpreting basic circuit diagrams, and determining outcomes in specific circumstances. A good strategy to prepare for this examination section is to review electrical symbols and practice calculating outcomes such as resistance, voltage, and power usage in basic circuits.

Examples of the types of questions in this exam section are shown below. Each question is followed by an explanation of the correct answer.

4. The symbol shown below is used in electrical diagrams to represent:



- A. a fuse.
- B. a capacitor.
- C. an inductor.
- D. a circuit breaker.

**Answer:** The correct answer to sample question #4 is response choice "D". Schematic diagrams provide a picture of electrical circuits that are often easier to interpret than descriptions using words. These diagrams use basic electrical symbols to identify components. A circuit breaker is an automatically operated electrical switch that is depicted on electrical schematic diagrams by the symbol shown above.

5. A motor uses 120 volts and draws 4 amperes. What is the internal resistance of the motor?
- A. 30 ohms.
  - B. 60 ohms.
  - C. 100 ohms.
  - D. 120 ohms.

**Answer:** The correct answer to sample question #5 is response choice "A". To determine the resistance of the motor, you must apply Ohm's Law (Voltage = Current x Resistance). In this case, voltage and current are known so the equation must be reconfigured to solve for the unknown variable, resistance. Therefore, the correct calculation is: Resistance = Voltage/current ( $R=120/4$ ), which results in the correct answer of 30 ohms.

6. A circuit contains two sealed lead acid batteries connected in series that are rated at 3 volts each. Given this configuration, the output voltage of the circuit is:
- A. 3 V.
  - B. 6 V.
  - C. 9 V.
  - D. 12 V.

**Answer:** The correct answer to sample question #6 is response choice "B". In a series circuit, the voltage across the circuit is the sum of the battery voltages. In a parallel circuit, the voltage across each of the components remains constant.

### SECTION 3: ELECTRICAL SAFETY

This part of the exam contains twenty-eight (28) questions that assess your knowledge of safety practices related to working with electricity. Question content addresses basic safety practices, recognition of hazards, and responding to accidents. A good strategy to use in preparing for this exam section is to locate and study resource materials that describe electrical safety practices geared towards those who work with electricity. These can be readily located in textbooks or online resources. When answering the questions, consider the nature of the hazard presented and the best method for minimizing it. Try to visualize the situation and then consider the impact of each response choice.

Examples of the types of questions in this exam section are shown below. Each question is followed by a brief explanation of the correct answer.

7. Which of the following is a recommended safety precaution when working on electrical equipment such as a breaker that is housed in a cubicle or box with a door?
- A. Stand to the open side of the cubicle door.
  - B. Stand to the hinged side of the cubicle door.
  - C. Stand as far away from the door as possible.
  - D. Fasten the cubicle door to something that will hold it open.

**Answer:** The correct answer to sample question #7 is response choice "B". For this question it is important to consider the potential hazard in working with equipment encased within a structure that has a door. Given that the choices involve positioning, the most likely type of hazard involves electrical arc blasts. In such a situation, standing to the hinged side of the door while working will provide the greatest protection in the event of such an occurrence.

8. Which of the following is most important to do before attempting to assist in a situation involving an electrical accident injury?
- A. Put on non-flammable clothing.
  - B. Take slow steps towards the victim.
  - C. Make sure that your hands and feet are dry.
  - D. Place feet widely apart before touching the victim.

**Answer:** The correct answer to sample question #8 is response choice "C". For this question, one should consider the nature of the hazard when someone has experienced an electrical shock. The greatest risk to a responder is a transfer of electrical current from the victim or immediate environment. Therefore, it is important that hands and feet are dry because the human resistance to electrical current is significantly lower when skin is wet.

9. According to the Occupational Safety and Health Administration (OSHA), if no other hazards are present, work on energized parts can be conducted if the parts operate at less than:
- A. 20 volts to ground.
  - B. 30 volts to ground.
  - C. 40 volts to ground.
  - D. 50 volts to ground.

**Answer:** The correct answer to sample question #9 is response choice "D". Gaining familiarity with basic safety practices as outlined by OSHA would help in answering this question. These guidelines are easily located and are used as a standard for workplace safety. OSHA rules specify that energized parts that operate at less than 50 volts to ground do not need to be de-energized before working on or near them.

### SECTION 4: ADVANCED CONCEPTS

This part of the exam contains twenty-five (25) questions designed to assess your knowledge of electrical concepts related to traffic signal devices and their operation and maintenance. Question content includes terms used to identify components and logic functions and understanding of equipment, traffic signal phases, and the flow of current. A good strategy for answering questions in this section is to prepare before the exam by reviewing the areas described above. Information related to these areas may be found online or in print from organizations such as the National Electrical Manufacturers Association (NEMA) of U.S. Department of Transportation.

Examples of the types of questions in this exam section are shown below. Each question is followed by a brief explanation of the correct answer.

**Use the information shown in Table 1 below to answer the question that follows.**

**Table 3**

<b>φ#</b>	<b>Splits</b>	<b>Yellow</b>	<b>All Red</b>	<b>Green Time</b>
1	25	5	2	A
2	15	4	2	B

10. According to Table 3 above, which of the following is the correct Green time for A in a standard eight phase operation (Concurrent Lefts the Concurrent Throughs)?
- A. 10.
  - B. 15.
  - C. 18.
  - D. 20.

**Answer:** The correct answer to sample question #10 is response choice "C". The table indicates a total of 25 with 5 yellow and 2 all red. The correct answer is reached by subtracting the yellow and red from the total ( $25-7=18$ ).

11. The time relationship, expressed in seconds or percentage of a cycle length, determined by the difference between a defined interval portion of the coordinated phase green and a system reference point is known as a/an:
- A. split.
  - B. offset.
  - C. interval.
  - D. separation.

**Answer:** The correct answer to sample question #11 is response choice "B". It is important to understand the terminology used to describe the elements of traffic signal operations. The definition shown in the question is provided in reference materials published by the U.S. Department of Transportation.

12. Which of the following terms is used to identify a type of signal where time for each phase is at least partially controlled by detector actuations?
- A. Actuated signal control.
  - B. Adjustable signal control.
  - C. Advanced signal control.
  - D. Critical Intersection control.

**Answer:** The correct answer to sample question #12 is response choice "A". It is important to understand the terminology used to describe components associated with traffic signal operations. The definition shown in the question is provided in reference materials published by the U.S. Department of Transportation.

### ADDITIONAL ASSISTANCE

If you feel that you would benefit from more practice, your local library or relevant internet web sites may have reference materials that can be helpful. This is true for all of the subject areas covered by the Traffic Signal Technician III written examination.