



Study Guide for Chemical Technician

Test Number: 2782

Human Resources
Performance Assessment Services
Southern California Edison
An Edison International Company

REV031711

Introduction

The **2782 Chemical Technician Test** is a job knowledge test designed to cover the major knowledge areas necessary to perform the job. This Guide contains strategies to use for taking tests and a study outline, which includes knowledge categories, major job activities, and study references.

Test Session

It is important that you follow the directions of the Test Administrator exactly. If you have any questions about the testing session, be sure to ask the Test Administrator before the testing begins. During testing, you may **NOT** leave the room, talk, smoke, eat, or drink. Since some tests take several hours, you should consider these factors before the test begins.

All cellular/mobile phones, pagers or other electronic equipment will NOT be allowed in the testing area.

All questions on this test are multiple-choice or hot spot questions. Multiple choice questions have four possible answers. Hot spot questions have a picture, and you must click the correct spot on the picture to answer the question. All knowledge tests will be taken on the computer. For more information on this, please see the next section of this study guide on *Computer Based Testing*.

The test has a six hour time limit. This is in order to allow enough time to make any necessary calculations in the test. The test is divided into two parts. After completion of the first part, you have the option of taking a break of up to 30 minutes before continuing. A scientific calculator will be provided for you to use during the test. The calculator provided during the test session will be one of these models:

- Casio fx-250HC,
- Texas Instruments TI-30XA,
- Texas Instruments TI-36X

You will NOT be able to bring or use your own calculator during testing.

You will receive a Test Comment form so that you can make comments about test questions. Write any comments you have and turn it in with your test when you are done.

Study Guide Feedback

At the end of this Guide you have been provided with a Study Guide Feedback page. If a procedure or policy has changed, making any part of this Guide incorrect, your feedback would be appreciated so that corrections can be made.

Computer Based Testing

Taking an SCE knowledge test on the computer is simple. You do not need any computer experience or typing skills. You will only use the keyboard to enter your candidate ID and password. You'll answer all questions by pressing a single button on the mouse.

Log in Screen

You will be seated at a testing station. When you are seated, the computer will prompt you to enter the candidate ID and password you received in your invitation e-mail. You **MUST** have your candidate ID and password or you will be unable to take the test. Once you have confirmed your identity by entering this information, you will see a list of tests available to you.

Sample/Tutorial

Before you start your actual test, a Sample/Tutorial Test is provided to help you become familiar with the computer and the mouse. From the list of exams that appear when you complete the log in, you will select Sample/Tutorial. You will have up to 10 minutes to take the Sample/Tutorial Test. The time you spend on this Sample Test does **NOT** count toward your examination time. Sample questions are included so that you may practice answering questions. In the Sample/Tutorial Test, you will get feedback on your answers. You will not receive feedback on your actual test.

Example

During the test, you may see several different types of items. Many of the questions will be multiple choice items. A few items will be pictures, where you'll have to click the spot on the picture that answers the question. Those picture questions are known as "Hot Spot" questions. More information on each type is below.

Overall Test Information

- When you begin the test, you can see the total time allowed for completion displayed at the top of the screen. You can scroll up to see that information at any time during the test.
- You can change your answers at any time during the test until the time runs out, or you click the "Submit" button. Once you click Submit, you can not change your answers.

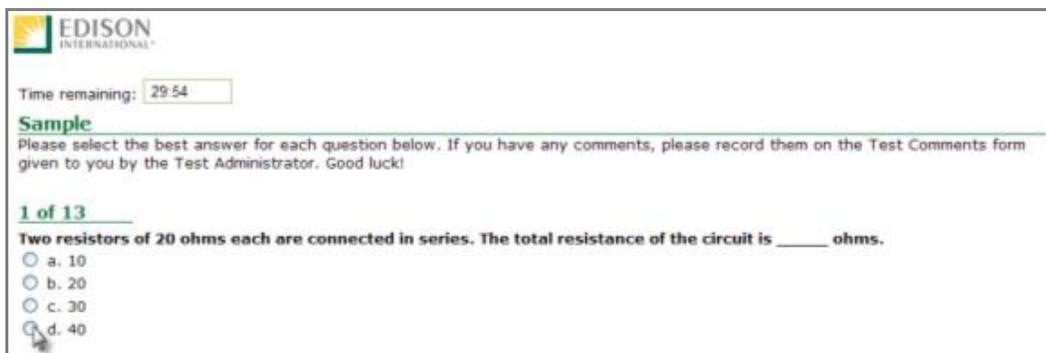


Multiple Choice Questions

To answer each multiple choice question, you should move the mouse pointer over the circle (radio button) next to the answer of your choice, and click the left mouse button.

A sample is shown below:

1. In order to answer each question, first read the question and determine the response that best answers the question. Put the mouse pointer directly over the circle corresponding to that response.



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Time remaining: 29:54

Sample

Please select the best answer for each question below. If you have any comments, please record them on the Test Comments form given to you by the Test Administrator. Good luck!

1 of 13

Two resistors of 20 ohms each are connected in series. The total resistance of the circuit is _____ ohms.

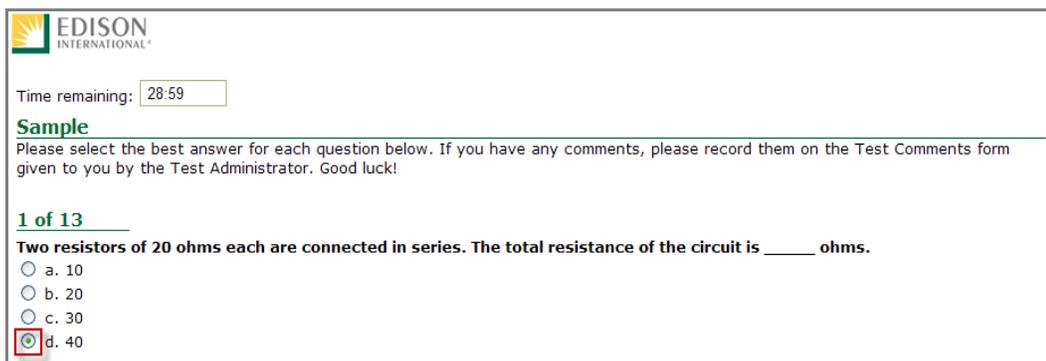
a. 10
 b. 20
 c. 30
 d. 40

2. While the pointer is over the circle corresponding to the best answer, click the left mouse button.



Click the left button when the pointer icon is over your answer choice.

3. The answer you selected should now have a green dot in the circle. If you need to select an alternate answer, simply move the pointer over that circle, and click again.



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Time remaining: 28:59

Sample

Please select the best answer for each question below. If you have any comments, please record them on the Test Comments form given to you by the Test Administrator. Good luck!

1 of 13

Two resistors of 20 ohms each are connected in series. The total resistance of the circuit is _____ ohms.

a. 10
 b. 20
 c. 30
 d. 40

Hot Spot Questions

To answer each Hot Spot question, you should move the mouse pointer over the part of the image that best answers the question, and click the left mouse button. You will see a pointer appear in that spot. If you want to change your answer, simply move the mouse pointer to a new area on the picture and click again. The pointer will move to the new spot.

A sample is shown below:

1. In order to answer each question, first read the question and determine the place on the image that best answers the question. The pointer that will indicate your answer can always be seen in the bottom left of the image. It looks like this:



Put the mouse pointer directly over the spot on the image you want to select, and click the left mouse button.

1 of 8

On the screen below, where would you click to find out how much vacation time you have left?

About Me

Welcome to the "About Me" section

"About Me" has information about your benefits, programs that help you in your work and/or home life and more. Click on the links below to access the various areas.

Pointer starts out at the bottom left of the image.

Place the mouse pointer on the spot you want to select, then click on the left button.

About Me Map

| | |
|--|---|
| <p>Overview An Overview of what's contained in this section of the Portal</p> | <p>Career & Jobs Find out about career information and opportunities at Edison International.</p> |
| <p>Pay Find information about base pay, job descriptions, Results Sharing, and recognition awards here.</p> | <p>Time & Attendance Use this section to complete and submit your timesheet for approval, or to view your time-off balances and time</p> |

2. The pointer will move from the bottom left of the image and appear over the spot you selected.

1 of 8

On the screen below, where would you click to find out how much vacation time you have left?

About Me



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"About Me" has information about your benefits, programs that help you in your work and/or home life and more. Click on the links below to access the various areas.

About Me Map

| | |
|--|---|
|  Overview An Overview of what's contained in this section of the Portal |  Career & Jobs Find out about career information and opportunities at Edison International. |
|  Pay Find information about base pay, job descriptions, Results Sharing, and recognition awards here. |  Time & Attendance Use this section to complete and submit your timesheet for approval, or to view your time-off balances and time |

The pointer now appears over the correct answer.

3. To change your answer, simply move the mouse pointer to the new spot, and click again. The pointer graphic will move to the new spot you've selected. In order for your answer to be considered be correct, the center of the pointer (•) must be over the correct spot on the graphic.

Test Taking Strategies

Introduction

The **2782 Chemical Technician Test** contains multiple-choice questions and may also contain hot spot questions. The purpose of this section is to help you to identify some special features of a multiple-choice test and to suggest techniques for you to use when taking one.

Your emotional and physical state during the test may determine whether you are prepared to do your best. The following list provides common sense techniques you can use before the test begins.

| Technique | Remarks |
|------------------------------|--|
| <i>Be confident</i> | <ul style="list-style-type: none"> - If you feel confident about passing the test, you may lose some of your anxiety. - Think of the test as a way of demonstrating how much you know, the skills you can apply, the problems you can solve, and your good judgment capabilities. |
| <i>Be punctual</i> | <ul style="list-style-type: none"> - Arrive early enough to feel relaxed and comfortable before the test begins. |
| <i>Concentrate</i> | <ul style="list-style-type: none"> - Try to block out all distractions and concentrate only on the test. You will not only finish faster but you will reduce your chances of making careless mistakes. - If possible, select a seat away from others who might be distracting. - If lighting in the room is poor, sit under a light fixture. - If the test room becomes noisy or there are other distractions or irregularities, mention them to the Test Administrator immediately. |
| <i>Budget your times</i> | <ul style="list-style-type: none"> - Pace yourself carefully to ensure that you will have enough time to complete all items and review your answers. |
| <i>Read critically</i> | <ul style="list-style-type: none"> - Read all directions and questions carefully. - Even though the first or second answer choice looks good, be sure to read all the choices before selecting your answer. |
| <i>Make educated guesses</i> | <ul style="list-style-type: none"> - Make an educated guess if you do not know the answer or if you are unsure of it. |

- Changing answers*
- If you need to change an answer, be sure to erase your previous answer completely. On the computer, be sure that the new answer is selected instead of the old one.
- Return to difficult questions*
- If particular questions seem difficult to understand, make a note of them, continue with the test and return to them later.
- Double-check math calculations*
- Use scratch paper to double check your mathematical calculations.
- Review*
- If time permits, review your answers.
 - Do the questions you skipped previously.
 - Make sure each answer bubble is completely filled in. Erase any stray marks on your answer sheet. When testing on the computer, make sure each multiple choice question has a green dot next to the correct answer.

Remember the techniques described in this section are only suggestions. You should follow the test taking methods that work best for you.

Job Knowledge Categories and Study References

Below are the major job knowledge areas (topics) covered on the **2782 Chemical technician Test** and the associated study references. Listed next to each knowledge category is the number of items on the exam that will measure that topic. You can use this information to guide your studying. Some exams also contain additional pretest items. Pretest items will appear just like all of the other items on your exam, but they will not affect your score. They are an essential part of ensuring the **2782 Chemical technician Test** remains relevant to successful performance of the job.

There are a total of 90 items on the **2782 Chemical technician Test** and the passing score is 70%.

A. Laboratory Equipment and Materials (26 items)

Ability to apply the theoretical principles of analytical chemistry and water treatment. Skills in performing laboratory work and performing the necessary calculations pertaining thereto.

References for Laboratory Equipment and Materials:

- ✓ Any college chemistry textbook that includes an introduction to analytical chemistry.
- ✓ Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials, 1995 or later edition. Procedures D859-94, D1125-95, D1293-95, D2187-94-G, D1429-95, and D5128-90.
- ✓ Bueker, Power Plant Water Chemistry A Practical Guide, Pennwall Publishing Company, 1997, Chapters 1-5, 7

B. Process Equipment and Materials (14 items)

Knowledge of the operation of process equipment and sampling system devices.

References for Process Equipment and Sample Conditioning:

- ✓ Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials, 1995 or later edition. Procedures: D511-93A, D888-92, D1192-95, D1193-91, D1293-95, D2791-93A, D3864-79, D5391-93, D5462-93, D5540-94A, and D5542-94.

C. Power Plant Chemistry (41 items)

Knowledge of unit cycles and auxiliary systems, water chemistry, water treatment, and associated Division Orders. Understanding of methods for conducting high purity water measurements.

References: Power Plant Chemistry

- ✓ Annual Book of ASTM Standards, Volume 11.02, American Society for Testing and Materials, 1994 or later edition. Procedure D2187-94.
- ✓ Bueker, Power Plant Water Chemistry A Practical Guide, Pennwall Publishing Company, 1997, Chapters 1-5, 7.
- ✓ California Department of Health Services, 1993. Chapters 14 and 16.
- ✓ Standard Methods for the Examination of Water and Wastewater, APHA, 19th edition, Method SM 4500-CIA.

D. Environmental Compliance (9 items)

Knowledge of proper sampling and preservation techniques when collecting environmental samples. Knowledge of pH and chlorine measurements. Familiarity with hazardous waste guidance regulations as related to spent chemical reagents, debris, and containers.

References for Environmental Compliance:

- ✓ “Report on Minimum Criteria to Assure Data Quality”, United States Environmental Protection Agency, October 24, 1989.
- ✓ “Methods for Chemical Analysis of Water and Wastewater”, EPA - 600/4-79-020, revised March 1983. Pages xvi-xx.
- ✓ “Test Methods for Evaluating Solid Waste”, Physical/Chemical Methods, EPA SW 846, Update III, January, 1995. Chapter 1.

The study materials may be found at university libraries, technical bookstores, by accessing the internet's various book sellers, or on the world wide web (with a keyword search of USEPA and ASTM). Additionally, several of study materials may be accessed by contacting Shawn Simmons (Shawn.Simmons@sce.com) or Ralph Esqueda (Ralph.Esqueda@sce.com).

Job Activities

Below are the major job activities covered on the Chemical Technician Test.

1. Monitors Power Plant Water and Takes Corrective Action When Out-of-Limits Conditions Occur

The Chemical Technician is responsible for maintaining proper water chemistry based on chemical tests. Good chemical control rests on a foundation of accurate measurement made at the correct frequency. When out-of-limits conditions occur during normal operation or a startup, the Chemical Technician is relied upon to ensure that corrective action is taken.

2. Calibrates, Maintains, and Troubleshoots On-Line Chemical Process Monitors

The Chemical Technician is responsible for calibrating, maintaining, and troubleshooting sensing elements as found in pH, conductivity, sodium, silica, and dissolved oxygen monitors. Calibrated and properly maintained process monitors are an essential part of an effective chemical control program.

3. Adjusts and Clears Sample System Orifices such as Filters, Flowmeters, and Needle Valves

The Chemical Technician is responsible for adjusting, troubleshooting, and cleaning sampling system devices and orifices that provide feedwater to on-line chemical monitors.

4. Feeding of Chemicals

The Chemical Technician must be able to properly align and operate chemical feed pumps, as well as refill day tanks that contain dilute solutions of bulk chemicals. Before feeding a chemical, the Chemical Technician must be able to calculate the dose required.

5. Monitoring of Outage Protection

During unit outages, the Chemical Technician documents the outage protection measures taken by Operations. At the end of each month, the Chemical Technician provides an outage protection summary.

6. Monitoring of Demineralized Performance

Chemical Technicians are responsible for conducting chemical tests on effluents from ion-exchange demineralizers, reverse osmosis systems, and condensate polishers. Chemical Technicians must have an understanding of these systems.

7. Performs Routine Chlorination and Collects Samples of Plant Effluents for Environmental Monitoring

The Chemical Technician is responsible for chlorinating every available condenser half daily and while doing so, measuring the chlorine residual. In addition, the Chemical Technician is responsible for collecting a variety of environmental samples and forwarding them to a certified laboratory. Chemical Technicians must maintain good documentation of environmental tests they do themselves (pH, chlorine, turbidity, etc.).

8. Chemical Safety

Small amounts of hazardous chemicals are used by the Chemical Technician to perform chemical tests. Every hazard is represented: toxic, corrosivity, reactivity, flammability, toxicity, pressure, etc. The Chemical Technician must be familiar with the properties of each chemical they use. Incompatible chemicals must be stored apart. Corrosive and toxic chemicals are stored so that accidental spills are contained. Laboratories and other work areas are to be kept in a clean and safe manner. Regulatory guidelines are to be followed when disposing of spent chemicals and hazardous debris.

Sample Questions

The following are samples of the type of questions, arranged by knowledge area, that you may encounter in the test. They include a reference for each question to show you the appropriate section to study. An answer page follows the questions.

1. The conductance of a solution of 0.01 N KCl is measured with a cell whose constant is 0.098 cm^{-1} . A reading of 14,418 micromhos is measured. When the conductance of the same solution is measured with a second cell, a reading of 14,900 micromhos is measured. What is the constant of the second cell?
 - a. 0.0938
 - b. 0.0948
 - c. 0.0968
 - d. 0.1030

2. A sodium chloride solution containing 0.1690 grams of sodium chloride per liter is used to standardize a mercuric nitrate titrant. The titration of 100 mL of the sodium chloride solution requires 20.50 mLs of titrant. What is the normality of the titrant?
 - a. 0.0141
 - b. 0.0282
 - c. 0.0423
 - d. 0.0564

3. In a drum boiler, the feedwater flow to the boiler is 2×10^6 lbs/hr. If the boiler contains 200,000 lbs of water, what sodium chloride increase in the boiler will be noted each hour, if there is a 1 ppm sodium chloride contamination in the feedwater?
 - a. 1.0
 - b. 6.0
 - c. 10.0
 - d. 16.0

4. The temperature compensator on a pH meter is being checked for accuracy. The dial is set at 20°C . At 20°C , the slope is 0.058 V/pH unit. If -118 mV is input to the meter, what pH value should the meter display?
 - a. 3.97
 - b. 5.97
 - c. 8.03
 - d. 9.03

5. When sodium hydroxide is fed to a drum-type boiler, which of the following should not increase in the boiler water?
- a. pH
 - b. straight conductivity
 - c. cation conductivity
 - d. alkalinity
6. A water softener has an exchange capacity of 1,500 Kgr CaCO_3 . If the inlet water has a total hardness of 171 ppm as CaCO_3 , how many gallons of water can be softened before the softener exhausts?
- a. 150,000
 - b. 250,000
 - c. 375,000
 - d. 1,000,000
7. A retention basin sample is collected for the determination of oil and grease. The sample will not be analyzed immediately. The sample should not be:
- a. taken in an all glass container
 - b. preserved with sulfuric acid
 - c. collected in a plastic bottle
 - d. refrigerated until analyzed
8. The sample in question 7 must be analyzed within:
- a. 7 days
 - b. 14 days
 - c. 21 days
 - d. 28 days

Sample Answers

1. B Category A
2. A Category A
3. C Category B
4. D Category B
5. C Category C
6. A Category C
7. C Category D
8. D Category D

Study Guide Feedback

Please use this page to notify us of any changes in policies, procedures, or materials affecting this guide. Once completed, return to:

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| Page | Comments |
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