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Guide for SES QSTI/QSTO Exam Success

We have watched a large number of people taking the QSTI/QSTO exams, watching their and successes. We have debriefed many after the exams to determine what went right and wrong. The following guidance is based upon we learned.

The major problem has been failure of the applicants to prepare, that is, study for the exams. Yes, it is open book. Yes, many of the applicants have years of experience. The ones who study seem to do well, even thrive. Those who don't seem to suffer.

Ok, so how do you study? We recommend these steps:

- Read again each of the methods the exam will cover. Refer either to the instack or the SES website for the list of methods to be covered. Make sure you review those variations on the methods and the differences between them and the main method. Don't just scan the methods; read the methods completely. You may be surprised at what you find that you have forgotten or did not know especially if you have not done that method for a while.

- Field experience alone is not going to get you through the exam. You will need knowledge of the methods as well.

- This is going to help in more than one way. It is just impossible to look up 50 questions in an hour. You should know at least 60 to 70 percent of the answers right off the top of your head. That gives you time to complete the exam.

- Look at the structure of the method so you can look up that little detail asked for in a question. While you might not remember the detail exactly, getting to it quickly is of critical importance.

- Study with others; for example, have someone read a line from the method leaving out something. This creates read-through questions. Most of the questions are right from the methods.

- Make sure your CFRs are in good shape and current.

Some tips from the pros on taking the exam:

1. Read each question carefully. If you know the answer, mark the correct answer and move to the next question.

2. If you do not know the answer make a mark beside the question and move to the next question and repeat the process. This keeps you from losing valuable time. When you get to the end of the exam, go back to the front and look up answers as you need to.
3. If you cannot find the answer, try to eliminate clearly wrong answers and pick the best looking one. Master test takers know that the first guess is more likely than not to be right.

4. Make sure you have an answer for each question. Be careful here, people have failed by missing a couple of pages of questions.

5. Lastly if there is time, review the questions and answers.

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Here are a few example questions from general knowledge and Method 9. They are not on any of the QSTI exams but show you how exam questions are structured. Download Method 9 and give them a shot.

1. As the contrast between the background and plume decreases the viewed plume opacity.

A. Stays the same
B. Increases
D. Decreases

2. The defined accuracy of Method 9 is:
A. + 7.5%
B. + 5 %
C. +/- 7.5%
D. +/- 5 %
E. A or B
F. C or D

3. To certify a Method 9 Observer must have an absolute average error on his certification run of 50 readings of less than 7.6%

A. True
B. False

4. The equation of changes in volume where pressure is constant is

A. P1/P2 = V1/V2
B.V1/T1 = V2/T2
C. P V= N R T
D. V1/T2 = V2 / T1

5. In Method 9 you always observe the opacity of the plume at the densest part of the plume.

A. True
B. False

Give yourself six minutes.

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Here are some examples of the types of equations covered by the SES QSTI/QSTO exams.

1) The following equation can be used to correct the measured "wet basis" concentration to a "dry basis" concentration:

dry concentration = wet concentration (1-w)
where:
w = fraction of the emitted exhaust gas, by volume, which is water vapor

Thus, a wet basis concentration of 40 ppmv in a gas having 10 volume percent water vapor would have a dry basis concentration = 40 ÷ (1 - 0.10) = 44.44 ppmv.

2) The following equation can be used to correct a measured pollutant concentration in an emitted gas (containing a measured O_2 content) to an equivalent pollutant concentration in an emitted gas containing a specified reference amount of O_2:

$C_r = C_m (20.9 - r)/(20.9 - m)$
where:
C_r = corrected concentration in a dry gas having a specified reference volume % O_2 = *r*
C_m = measured concentration in a dry gas having a measured volume % O_2 = *m*

Thus, a measured NOx concentration of 45 ppmv (dry basis) in a gas having 5 volume % O_2 is

45 × (20.9 - 3) ÷ (20.9 - 5) = 50.7 ppmv (dry basis) of NOx when corrected to a gas having a specified reference O_2 content of 3 volume %.

3) The following equation can be used to correct a measured pollutant concentration in an emitted gas (containing a measured CO_2 content) to an equivalent pollutant concentration in an emitted gas containing a specified reference amount of CO_2:

$C_r = C_m (r/m)$
where:
C_r = corrected concentration in a dry gas having a specified reference volume % CO_2 = r
C_m = measured concentration in a dry gas having a measured volume % CO_2 = m

Thus, a measured particulates concentration of 0.1 grain per dscf in a gas that has 8 volume % CO_2 is

0.1 × (12 ÷ 8) = 0.15 grain per dscf when corrected to a gas having a specified reference CO_2 content of 12 volume %.

See also equation 5-8 and section 12.10 in Method 5 and table 19-1 in Method 19.

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Reference materials for study

In addition to method-specific questions, each of the SES QSTI/QSTO method group exams includes some questions about gas laws and other physical and chemical principles that are not specifically included in the subject methods. On the other hand, the introduction to each of the EPA test methods directs the user to have an understanding of other methods used in conducting a test. The introductory note to Method 29, for example, encourages the user to have a thorough knowledge of Methods 5 and 12 which in turn refer to Methods 1-4. These background methods address the fundamental principles of operation of source sampling equipment, sample recovery, and calculations including basic gas laws, corrections to standard conditions, and corrections for dilution. The SES believes a source testing individual to be qualified for any of the methods groups must demonstrate knowledge of these principles and that it is appropriate for each of the SES QSTI/QSTO exams to include questions relative to these points.

There are background source testing supporting documents on the EPA website that also can help in review (see http://www.epa.gov/ttn/emc/index.html) and in the Quality Assurance Handbook (see http://www.epa.gov/ttn/emc/email.html). On the whole, the SES believes that almost all of the questions on the exams can be answered from information included in the subject method(s) or found in these fundamental background methods (e.g., flow and volume corrections from Method 2, dilution corrections in Method 3, moisture corrections in Method 4, isokinetic calculations from Method 5, etc.) to which the subject methods refer.

The few questions about safe material handling and stack safety that could appear on the exams are drawn from the guidance and references within the test methods (e.g., handling of corrosive materials in Method 6 and other wet chemistry methods). The exam questions are also drawn from information generally available to the source testing professional. These include gas cylinder handling protocols available from many sources including the gas vendors and DOT regulations, and stack access, equipment handling, and other related guidance from standard safety training materials including the SES Safety Manual available to all SES members. The QA handbook and EPA test methods include information about sample handling, labeling, and transport (e.g., Method 5, section 8.1.2; Method 29, section 8.0) are sources for questions about tester/laboratory communications. The number and types of questions on the exams about these safety and other standard practices areas are limited to basic issues with which the qualified source testing individual is most likely to experience.

Some links to publicly available policy, guidance, and other resource materials:

- Basic calculation techniques, http://www.epa.gov/tri/TWebHelp/WebHelp/appendix_b_basic_calculation_techniques_6.htm
- EPA test methods and technical guidance materials, http://www.epa.gov/ttn/emc/
- Compressed gas handling, http://www.osha.gov/SLTC/compressedgasequipment/index.html
- Electrical instrument safety, http://www.osha.gov/SLTC/electrical/otherresources.html
- Hazardous waste, http://www.osha.gov/SLTC/hazardouswaste/index.html
- Reactive chemical safety, http://www.osha.gov/SLTC/reactivechemicals/index.html
- Scaffold and platform safety, http://www.osha.gov/SLTC/scaffolding/index.html