CQT

CERTIFIED QUALITY TECHNICIAN

Quality excellence to enhance your career and boost your organization's bottom line

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ASQ

Excellence Through Quality™

Certification from ASQ is considered a mark of quality excellence in many industries. It helps you advance your career, and boosts your organization's bottom line through your mastery of quality skills. Becoming certified as a Quality Technician confirms your commitment to quality and the positive impact it will have on your organization.

Examination

Each certification candidate is required to pass a written examination that consists of multiple-choice questions that measure comprehension of the body of knowledge.

Certified Quality Technician

The Certified Quality Technician (CQT) is a paraprofessional who, in support and under the direction of quality engineers or supervisors, analyzes and solves quality problems, prepares inspection plans and instructions, selects sampling plan applications, prepares procedures, trains inspectors, performs audits, analyzes quality costs and other quality data, and applies fundamental statistical methods for process control.

CQT

Computer Delivered - The CQT examination is a one-part, 110-question exam and is offered in English only. 100 questions are scored and 10 are unscored. Total appointment time is four-and-a-half hours, exam time is 4 hours and 18 minutes.

Paper and Pencil – The CQT examination is a one-part, 100-question, four-hour exam and is offered in English only.

For comprehensive exam information on the Quality Technician certification, visit **asq.org/cert**.

Work Experience

You must have at least four years of higher education and/or work experience in one or more areas of the Certified Quality Technician Body of Knowledge.

If you are now or were previously certified by ASQ as a Quality Engineer (CQE), Quality Auditor (CQA), Reliability Engineer (CRE), Software Quality Engineer (CSQE), Supplier Quality Professional (CSQP), or Manager of Quality/Organizational Excellence (CMQ/OE), experience used to qualify for certification in those fields applies to certification as a Quality Technician.

If you have completed a degree* from a college, university, or technical school with accreditation accepted by ASQ, part of the four-year experience requirement will be waived, as follows (only one of these waivers may be claimed):

- Certificate/Diploma from a technical or trade school—one year waived
- Associate's degree—two years waived
- Bachelor's, master's, or doctorate—three years waived

*Degrees or diplomas from educational institutions outside the United States must be equivalent to degrees from U.S. educational institutions.

BODY OF KNOWLEDGE

Certified Quality Technician (CQT)

Topics in this body of knowledge (BoK) include additional detail in the form of subtext explanations and the cognitive level at which the questions will be written. This information will provide useful guidance for both the Exam Development Committee and the candidate preparing to take the exam. The subtext is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam. It is meant to clarify the type of content to be included in the exam. The descriptor in parentheses at the end of each entry refers to the maximum cognitive level at which the topic will be tested. A complete description of cognitive levels is provided at the end of this document. Note: Approximately 20 percent of the questions in each CQT exam will require calculation.

I. Quality Concepts and Tools (18 Questions)

A. Quality Concepts

1. **Customers and suppliers**
   Define internal and external customers, identify their expectations, and determine their satisfaction levels. Define internal and external suppliers and key elements of relations with them. (Understand)

2. **Quality principles for products and processes**
   Explain basic quality principles related to products (such as features, fitness-for-use, and freedom from defects) and processes (such as monitoring, measuring, and continuous improvement). (Understand)

3. **Quality standards, requirements, and specifications**
   Define and distinguish between national or international standards, customer requirements, and product or process specifications. (Understand)

4. **Cost of quality (COQ)**
   Describe and distinguish between the four classic cost of quality categories (prevention, appraisal, internal failure, external failure) and classify activities appropriately. (Apply)

B. Quality Tools

The seven basic quality tools
Select, construct, and interpret:

1. **Cause and effect diagrams** (Evaluate)
2. **Flowcharts (process maps)** (Evaluate)
3. **Check sheets** (Evaluate)
4. **Pareto charts** (Evaluate)
5. **Scatter diagrams** (Evaluate)
6. **Control charts** (Evaluate)
7. **Histograms** (Evaluate)

8. **Problem-solving techniques**
   Define, describe, and apply problem solving techniques such as 5 Whys and 8D. (Apply)

9. **Six Sigma**
   Identify key Six Sigma concepts and tools such as quality function deployment (QFD), design of experiments (DOE), and design, measure, analyze, improve, control (DMAIC). (Remember)

10. **Lean**
    Identify key lean concepts and tools such as 5S, value-stream mapping, flow, and pull system. (Remember)

11. **Continuous improvement techniques**
    Define and use various continuous improvement techniques including the plan-do-check-act (PDCA) cycle, brainstorming, and benchmarking. (Apply)

C. ASQ Code of Ethics for Professional Conduct

Determine and apply appropriate behaviors and action that comply with this ethical code. (Evaluate)

II. Statistical Techniques (17 Questions)

A. General Concepts

1. **Terminology**
   Identify and differentiate between statistical terms such as population, sample, parameter, statistic, and statistical process control (SPC). (Understand)

2. **Frequency distributions**
   Define and compare normal, Poisson, and binomial frequency distributions. (Understand)

B. Calculations

1. **Measures of central tendency**
   Define, compute, and interpret mean, median, and mode. (Analyze)

2. **Measures of dispersion**
   Define, compute, and interpret standard deviation, range, and variance. (Analyze)

3. **Confidence levels**
   Explain confidence levels in various situations. (Understand)

4. **Confidence limits**
   Explain confidence limits in various situations. (Understand)

5. **Probability**
   Explain probability using the basic concepts of combinations, permutations, and area under the normal curve. (Understand)

C. Control Charts

1. **Control limits vs. specification limits**
   Identify and distinguish the different uses of control limits and specification limits. (Analyze)

2. **Variables charts**
   Identify, select, construct, and interpret variables charts such as $\bar{X}$-R and $\bar{X}$-s. (Analyze)

3. **Attributes charts**
   Identify, select, construct, and interpret attributes charts such as p, np, c, and u. (Analyze)

4. **Process capability measures**
   Define the prerequisites for capability, and calculate and interpret capability indices (e.g., C_p, C_{pk}, P_p, P_{pk}) and capability ratio (C_R) in various situations. (Analyze)

5. **Common and special cause variation**
   Interpret various control chart patterns (e.g., runs, hugging, trends) and use rules for determining statistical control to distinguish between common cause and special cause variation. (Analyze)

6. **Data plotting**
   Identify the advantages and limitations of using this method to analyze data visually. (Understand)

III. Metrology and Calibration (18 Questions)

A. Types of Measurement and Test Equipment (M&TE)

Describe, select, and use the following types of M&TE, and evaluate their measurement results to determine conformance to specifications. (Evaluate)

1. **Hand tools** (e.g., calipers, micrometers, linear scales, analog, digital, vernier scales)
2. **Gauges** (e.g., pins, thread, custom gauges, gage blocks)
3. **Optical tools** (e.g., comparators, profiles, microscopes)
4. **Coordinate measuring machines (CMM)** (e.g., touch probes, vision, laser)
5. **Electronic measuring equipment** (e.g., digital displays, output)
6. **Weights, balances, and scales**
7. **Hardness testing equipment** (e.g., Brinell, Rockwell)
8. **Surface plate methods and equipment**
9. **Surface analyzers** (e.g., profilometers, roughness reference standards)
10. **Force measurement tools** (e.g., torque wrenches, tensometers)
11. **Angle measurement tools** (e.g., protractors, sine bars, angle blocks)
12. **Color measurement tools** (e.g., spectrophotometer, color guides, light boxes)
13. **Automated in-line inspection methods** (e.g., vision systems, laser inspection systems, pyrometers)

B. Control and Maintenance of M&TE

1. **M&TE identification, control, and maintenance**
   Describe various methodologies for identifying and controlling M&TE to meet traceability requirements, and apply appropriate techniques for maintaining such equipment to obtain optimum performance. (Apply)
2. **Customer-supplied M&TE**
   Describe and apply requirements for validation and control of customer-supplied equipment. (Apply)

C. Calibration of M&TE

1. **Calibration intervals**
   Apply calibration schedules on the basis of M&TE usage history and risk. (Apply)
2. **Calibration results**
   Interpret calibration results and the potential impact of using out-of-calibration tools or failing to calibrate equipment on a regular basis. (Analyze)
3. **Calibration error**
   Identify the causes of calibration error and its effect on processes and products. (Understand)
4. **Hierarchy of standards**
   Explain the levels of standards (e.g., reference, primary, transfer) and their relationship to one another. (Apply)

IV. Inspection and Test (23 Questions)

A. Blueprint Reading and Interpretation

1. **Blueprint symbols and components**
   Interpret drawings and apply requirements in various test and inspection activities. (Analyze)
2. **Geometric dimensioning and tolerancing (GD&T)**
   Define and apply GD&T covered in the ASME Y14.5 standard. (Analyze)
3. **Classification of product defect characteristics**
   Define and distinguish between defect characteristics (e.g., critical, major, minor). (Analyze)

B. Inspection Concepts

1. **Types of measurements**
   Define and select between direct, differential, and transfer measurements. (Understand)

2. **Gauge selection**
   Determine which measurement instrument to use considering factors such as resolution, accuracy, tolerance, environment, and product features. (Evaluate)

3. **Measurement systems analysis (MSA)**
   Define and distinguish between measurement terms such as correlation, bias, linearity, precision-to-tolerance, and percent agreement. Describe how gauge repeatability and reproducibility (R&R) studies are performed and how they are applied in support of MSA. (Analyze)

4. **Rounding rules**
   Use truncation and rounding rules on both positive and negative numbers. (Apply)

5. **Conversion of measurements**
   Convert between metric and English units. (Apply)

6. **Inspection points**
   Define and distinguish between inspection point functions (e.g., receiving, in-process, final, source, first-article), and determine what type of inspection is appropriate at different stages of production, from raw materials through finished product. (Analyze)

7. **Inspection error**
   Explain various types of inspection error, including operator error (e.g., parallax, fatigue), environment (e.g., vibration, humidity, temperature), and equipment (e.g., limitations, capability, setup). (Understand)

8. **Product traceability**
   Explain the requirements for documenting and preserving the identity of a product and its origins. (Apply)

9. **Certificates of compliance (COC) and analysis (COA)**
   Define and compare these two types of certificates. (Understand)

C. Inspection Techniques and Processes

1. **Nondestructive testing (NDT) techniques**
   Explain various NDT techniques (e.g., X-ray, eddy current, ultrasonic, liquid penetrant, magnetic particle). (Understand)

2. **Destructive testing techniques**
   Explain various destructive tests (e.g., tensile, fatigue, flammability). (Understand)

3. **Other testing techniques**
   Describe characteristics of testing techniques used for electrical measurement (e.g., DC, AC, resistance, capacitance, continuity), chemical analysis (e.g., pH, conductivity, chromatography), physical/mechanical measurement (e.g., hardness, pressure tests, vacuum, flow), and other techniques such as gravimetric testing, cleanliness testing, contamination testing, and environmental testing (e.g., bioburden, surface, air, water testing). (Remember)

D. Sampling

1. **Sampling characteristics**
   Identify and define sampling characteristics such as operating characteristic (OC) curve, lot size, sample size, acceptance number, and switching rules. (Apply)

2. **Sampling types**
   Define and distinguish between sampling types such as fixed sampling, single, double, skip lot, 100 percent inspection, attributes, and variables sampling. (Apply)

3. **Selecting samples from lots**
   Determine sample size (e.g., AQL), selection method and accept/reject criteria used in various situations. (Apply)

E. Nonconforming Material

1. **Identifying and segregating**
   Determine whether products or material meet conformance requirements, and use various methods to label and segregate nonconforming materials. (Evaluate)

2. **Material review process**
   Explain various elements of this process such as the function of the material review board (MRB), the steps in determining fitness-for-use, and product disposition. (Understand)

V. Quality Audits (12 Questions)

A. Audit Types and Terminology

Define basic audit types: 1) internal, 2) external, 3) systems, 4) product, 5) process. Distinguish between first-, second-, and third-party audits. (Understand)

B. Audit Components

Describe and apply various elements of the audit process: 1) audit purpose and scope, 2) audit reference standard, 3) audit plan (preparation), 4) audit performance, 5) opening and closing meetings, 6) final report and verification of corrective action. (Apply)

C. Audit Tools and Techniques

Define and apply various auditing tools: 1) checklists and working papers, 2) data gathering and objective evidence, 3) forward- and backward-tracing, 4) audit sampling plans and procedural guidelines. (Apply)

D. Audit Communication Tools

Identify and use appropriate interviewing techniques and listening skills in various audit situations, and develop and use graphs, charts, diagrams, and other aids in support of written and oral presentations. (Apply)

VI. Risk Management (12 Questions)

A. Risk Assessment and Mitigation

Describe methods of risk assessment and mitigation such as trend analysis (SPC), failure mode and effects analysis (FMEA), root cause analysis (RCA), product and process monitoring reports, and control plans. (Understand)

B. Corrective Action

Explain and apply elements of the corrective action process: identify the problem, contain the problem (interim action), assign responsibility (personnel) to determine the causes of the problem and propose solutions to eliminate it or prevent its recurrence (permanent action), verify that the solutions are implemented, and confirm their effectiveness (validation). (Apply)

C. Preventive Action

Explain and apply elements of a preventive action process: use various data analysis techniques to identify potential failures, defects, or process deficiencies; assign responsibility for improving the process (e.g., develop error- or mistake-proofing devices or methods, initiate procedural changes), and verify the effectiveness of the preventive action. (Apply)

LEVELS OF COGNITION

Based on Bloom's Taxonomy—Revised (2001)

In addition to **content** specifics, the subtext for each topic in this BoK also indicates the intended **complexity level** of the test questions for that topic. These levels are based on "Levels of Cognition" (from Bloom's Taxonomy—Revised, 2001) and are presented below in rank order, from least complex to most complex.

REMEMBER | Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

UNDERSTAND | Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

APPLY | Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

ANALYZE | Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

EVALUATE | Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

CREATE | Put parts or elements together in such a way as to reveal a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.

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