

# Certification Exam Handbook Petroleum Engineering Technology

Offered by:



**CTTAM**  
Certified Technicians & Technologists  
Association of Manitoba



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## Introduction

The Petroleum Technologist Certification Exam Handbook has been prepared for petroleum engineering technologists who are required to pass a certification exam to achieve registration as a Certified Engineering Technologist or Applied Science Technologist. The handbook is designed to provide candidates with essential information regarding the certification examination.

## Examination Information

### Purpose of Examination

The purpose of the Petroleum Technologist Certification Examination is to identify competent petroleum engineering technologists who possess technical competencies in their discipline, as outlined in a discipline-specific competency profile (**see Appendix A**). The ultimate goal is to protect the public by granting designations only to those professionals who have the skill and knowledge necessary to perform their job in a safe and competent manner.

### Examination Development Process

The Petroleum Technologist Certification Examination consists of 100 multiple-choice questions, including questions with graphs, diagrams, and schematics and questions that require calculations. Each multiple-choice question has four answer options, only one of which is correct. Exam questions vary in the level of cognitive difficulty.

A rigorous exam development process was implemented to ensure that the resultant exam meets professional testing standards as specified in the Standards for Educational and Psychological Testing. Exam development involved numerous consultations with experienced petroleum engineering technologists, as well as education providers and industry representatives. These individuals contributed their expertise to seven stages of exam development, including: 1) competency development; 2) exam blueprinting; 3) item writing; 4) group item review; 5) pilot testing; 6) standard setting; and 7) exam form assembly.

### Examination Content

The Petroleum Technologist Certification Examination tests candidates' competencies in four areas (**see Table 1 and Appendix A for detailed information on examination content**).

**Technical Analysis:** In this competency area, candidates are expected to be able to apply petroleum engineering knowledge, equipment, and tools to gather information, analyze it, and contribute to solutions that meet technical specifications, regulatory requirements, industry standards, local codes, and requirements of internal and external clients.

**Technical Design:** This competency area deals with candidates' ability to apply the results of data analysis to the development and implementation of technical solutions that comply with regulations and standards in the petroleum industry.

**Technical Evaluation:** In this competency area candidates are expected to evaluate systems and processes to ensure their compliance with regulatory requirements, technical specifications, industry standards, and requirements of internal and external clients.

**Project Management:** This competency area deals with candidates' ability to manage small technical projects to ensure the quality of deliverables, satisfaction of internal and external clients, and adherence to schedules and budgets.

**Table 1. Description of Examination by Competency Area**

Competency Area	Percentage of Questions	Number of Questions
1. Technical Analysis	40%	40
2. Technical Design	25%	25
3. Technical Evaluation	25%	25
4. Project Management	10%	10
<b>Total</b>	<b>100%</b>	<b>100</b>

Table 2 provides the breakdown of exam questions by cognitive level. “Knowledge” questions require that candidates recall information and provide its interpretation. “Application” questions require that candidates apply their knowledge to practical situations, while “Critical thinking” questions require that candidates analyze complex situations and provide solutions.

**Table 2. Description of Examination by Cognitive Level of Questions**

Cognitive Level	Percentage of Questions	Number of Questions
Knowledge	30%	30
Application	40%	40
Critical Thinking	30%	30
<b>Total</b>	<b>100%</b>	<b>100</b>

As can be seen in Table 3, 35% of exam questions have an image (e.g., a graphic, figure, table, or a schematic).

**Table 3. Description of Examination by Images**

Images	Percentage of Questions	Number of Questions
Questions with Images	35%	35
Questions without Images	65%	65
<b>Total</b>	<b>100%</b>	<b>100</b>

## Examination Registration

Applicants who are required to complete the Petroleum Technologist Certification Examination will be required to register for the examination at the time of application. Please see the ASET, CTTAM, ASTTBC websites for current information on examination dates, fees, and policies.

## Study Resources for Examination

The following resources may be of use to candidates interested in refreshing their knowledge prior to writing the examination. **Candidates are not expected to study each of these resources.** Rather, candidates may wish to review particular content areas in which they feel they would like to update their current knowledge. For detailed information on the content areas covered on the exam, candidates should refer to **Appendix A**.

Beggs, H. (2002). Gas production operations. Tulsa, OK: OGCI Publications.

Bourgoyne, A. T. (1986). Applied drilling engineering. Richardson, TX: Society of Petroleum Engineers.

Butler, R. M. (1997). Thermal recovery of oil and bitumen. Calgary, AB: GravDrain Inc.

Cased hole log interpretation principles/applications / Schlumberger. (1989). Houston, TX: Schlumberger Educational Services.

Clegg, J. D. (2007). Production Operations Engineering (Volume IV). Richardson, TX: Society of Petroleum Engineers.

Craft, B. C., Hawkins, M. F., & Terry, R. E. (1991). Applied petroleum reservoir engineering (2nd Ed.). Englewood Cliffs, NJ: Prentice Hall.

Kennedy, J. L. (1993). Oil and gas pipeline fundamentals (2nd ed.). Tulsa, OK: PennWell Publishing Company.

Natural Resources Canada. (2013). 100 Years of Geodetic Surveys in Canada. Retrieved from <http://www.nrcan.gc.ca/earth-sciences/geomatics/geodetic-reference-systems/canadian-spatial-reference-system/9110>

Schlumberger (2014). Oilfield Glossary. Retrieved from <http://www.glossary.oilfield.slb.com/>

Smith, C. R., Tracy, G. W., & Farrar, R. L. (1992). Applied reservoir engineering (Vol. 1). Tulsa, OK: Oil and Gas Consultants International Inc.

Van Dyke, K. (1997). Fundamentals of petroleum (4th ed.). Austin, TX: Petroleum Extension Service, Continuing & Extended Education, The University of Texas at Austin.

## Exam Accommodations for Candidate with Disabilities

According to Canadian human rights legislation and test industry standards, exam developers are responsible for providing candidates with disabilities with exam accommodations where appropriate and feasible. Exam accommodations are designed to remove barriers related to individual characteristics of candidates that may prevent them from demonstrating their technical competencies on the exam. “An appropriate accommodation is one that that responds to specific individual characteristics but does so in a way that does not change the construct the test is measuring or the meaning of scores.”<sup>1</sup>

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<sup>1</sup> American Educational Research Association (2014). *Standards for Educational and Psychological Testing*. Washington, DC (p. 67).

Candidates with disabilities should request accommodations to write the certification exam at the time of application. To protect the integrity of the examination, documented evidence of the candidate's disability must be submitted to ASET, CTTAM, or ASTTBC along with the application form. Such evidence includes a formal detailed diagnosis of the specific disability from an appropriate professional (e.g., physician, psychologist, rehabilitation counsellor) and supporting documentation citing the need for exam accommodations and what accommodations the candidate received in the past.

ASET, CTTAM, or ASTTBC will review the candidate's written request for accommodation and determine if it can be supported. Depending on the candidate's individual needs, ASET, CTTAM, or ASTTBC may modify exam material or exam administration conditions, including exam setting, exam presentation, or the addition of individuals to the exam (e.g., readers, scribes). Each request will be reviewed on a case-by-case basis.

Below is a list of reasonable exam accommodations for candidates with a disability.

**1. *Separate Room***

A separate room is provided to candidates who due to the nature of their disability require an exam environment that minimizes distractions resulting from noise or movement or process information by talking aloud.

**2. *Additional Time***

Extending additional time to candidates is a frequently used exam accommodation that is used with a variety of disability-related conditions. Often candidates are offered time-and-one-half to complete the exam (e.g., a 3-hour exam is extended to 4.5 hours).

**3. *Interpreter***

Candidates with hearing impairment may request an interpreter who has proficiency in sign language.

**4. *Reader***

A reader is an individual who reads exam instructions and/or exam questions to a candidate. Candidates with visual impairment or those with a learning disability may benefit from services of a reader during the examination.

**5. *Recorder***

A recorder is an individual who fills in the answers for a candidate who has difficulty writing independently.

Costs related to exam accommodations will be the responsibility of the candidate.

## **Examination Administration**

The Petroleum Technologist Certification Examination will be administered on a computer in one of Yardstick's exam centers in Alberta, Manitoba, or British Columbia. Generally, exam centers are located in colleges and universities. An experienced proctor will oversee the examination. Limited space is also available for virtual proctoring of examinations. Please contact ASET, CTTAM, or ASTTBC for more information.

## Admissions to the Exam Centre

ASET and CTTAM provide Yardstick with a list of examination candidates for each exam sitting. When an exam appointment is made, candidates will receive a booking confirmation email from Yardstick. **It is important that candidates bring this email with them to an examination center on the day of the examination.**

Upon entering the examination center, candidates will be asked to register with the proctor. The following information will need to be provided to the proctor.

- Candidate's first and last name
- Valid government-issued photo ID
- Candidate's booking email as provided by Yardstick

After the initial verification of identity, candidates will be asked to sign a roster.

Candidates' personal belongings, such as bags and jackets, will be stored in a designated area. Electronic devices, including but not limited to cell phones, tablets, and reference books, may not under any circumstances be brought into the exam center. The only exception to this rule is personal calculators. The proctor is responsible for inspecting candidate's calculators prior to the exam.

Candidates may bring with them into the exam center water, juice, coffee or another drink in a spill proof container with no label and, only if approved by the proctor, a sweater without pockets, and disposable ear plugs.

The use of scratch paper is permitted. The proctor will provide scratch paper to the candidates before the exam and collect it after the exam.

## Taking the Exam

At the beginning of the examination, candidates will hear verbal examination instructions from the proctor and read the Candidate's Statement of Understanding and/or Non-disclosure Agreement in the software. Failure to comply with the regulations outlined in these documents will result in the candidate's results being invalidated. Candidates will not be able to begin the examination without agreeing to the conditions outlined in the document.

Next, exam candidates will be given written exam instructions in the software. These exam instructions will emphasize the fact that some exam questions contain images and/or require calculations. If the images appear too small on the screen, candidates will be advised to hover their mouse over them to get an expanded view.

Following exam instructions, there will be a tutorial available to candidates before they proceed to the exam.

## After the Examination

Upon submitting their exam responses, candidates will be offered an opportunity to provide feedback on exam material and exam administration conditions by completing a short online

survey. Then, candidates will submit their scrap paper to the proctor, sign out from the candidate roster, and leave the examination center.

## **Examination Scoring and Reporting**

Multiple-choice examination questions are scored dichotomously, using a score of “0” for an incorrect response and a score of “1” for a correct response. The Technologist Certification Examinations are criterion-referenced exams, which means that a candidate should obtain a score that is equal or higher than an exam pass mark to pass the examination.

Each Technologist Certification Examination has its own pass mark. The pass mark for the Petroleum Technologist Certification Examination was determined by the Exam Committee, which took into account the difficulty of exam questions and the expected level of performance for a minimally competent technologist. A psychometrically acceptable standard-setting methodology was used to set examination pass marks.

The examinations are electronically scored. Candidates can expect to obtain their exam score and the associated pass/fail decision within four to six weeks after the date of exam administration. Unsuccessful candidates will also receive a performance report indicating a failure to pass, their score, and areas of strength and weakness in the four tested competency areas. The unsuccessful candidates will be able to retake the exam.

## **Review and Appeal Process**

A candidate who fails the Technologist Certification Examination may request that their exam score be verified. Due to the automated scoring and extensive quality control procedures, errors in scoring are extremely unlikely. However, candidates may request that ASET, CTTAM, or ASTTBC manually rescore their exam to verify the original score. The candidate will be responsible for any expenses incurred during the review and appeals process.



## Appendix A: Petroleum Technologist Professional Competencies

### Role Description

**Entry-level petroleum engineering technologists** collect and analyze data for optimizing processes in the petroleum industry, which include but are not limited to the performance of wells, reservoirs, equipment and facilities. **Entry-level petroleum engineering technologists** apply the results of data analysis to developing technical solutions and creating documents that are in compliance with industry regulations and standards. Also, they may manage projects of varying scope in the petroleum industry.

### Competency Name:

#### Technical Analysis (Petroleum Engineering Technologists)

### Competency Definition:

Apply engineering knowledge, equipment, and tools to analyze technical problems in the petroleum industry and provide solutions that meet technical specifications, industry standards, and requirements of internal and external clients.

#	Competency Indicators
1.1	Collect quantitative and qualitative information to better understand technical problems and develop solutions.
1.2	Identify the regulatory organizations in the Alberta petroleum industry.
1.3	Identify the scope of work in consultation with one's supervisor.
1.4	Provide the rationale for conducting technical tests.
1.5	Conduct relevant technical tests.
1.6	Consult equipment manuals and data sheets.
1.7	Define such concepts as permeability, porosity, compressibility, and fluid saturations.
1.8	Identify basic components of a reservoir study.
1.9	Identify variables involved in reserve calculations (e.g., volumetrics or material balance).
1.10	Identify reservoir drive mechanisms (e.g., water drive, solution gas drive, and gas cap drive).
1.11	Identify the relationships between pressure, volume and temperature of hydrocarbons.
1.12	Identify the components of a hydrocarbon reservoir.
1.13	Identify the types of data collected from open-hole logging.
1.14	Describe a typical well bore design for oil and gas applications.
1.15	Distinguish between conventional and unconventional well reservoirs, including oil sands and in situ recovery.
1.16	Identify processes involved in drilling.
1.17	Identify processes involved in well completion.
1.18	Identify processes involved in well work-over.
1.19	Identify processes involved in well abandonment.
1.20	Identify basic principles of fluid mechanics, such as hydrostatic pressure, friction losses, and viscosity.
1.21	Identify down-hole completion equipment and its applications.
1.22	Interpret geological maps, such as structural and isopach maps.
1.23	Examine historical data.

1.24	Gather data for a well optimization process.
1.25	Assess information to identify potential opportunities and constraints for technical solutions.
1.26	Analyze test data in relation to technical requirements, industry standards, codes of practice, and requirements of internal and external clients.
1.27	Analyze electric line logging data for potential hydrocarbon zones.
1.28	Analyze well production data.
1.29	Explain the uses of data from reservoir fluid lab analyses.
1.30	Identify potential technical, health, and environmental risks associated with the implementation of specific technical solutions.
1.31	Consider the limitations of data.
1.32	Use the Dominion Land Survey System to identify the location of assets.
1.33	Develop technical solutions.
1.34	Consider the cost effectiveness of technical solutions.
1.35	Perform a cost and benefit analysis of technical solutions.
1.36	Run simulations or estimations to identify potential solutions.

**Competency Name:**

**Technical Design (Petroleum Engineering Technologists)**

**Competency Definition:**

Apply the results of data analysis to the development and implementation of technical solutions that comply with regulations and standards in the petroleum industry.

#	Competency Indicators
2.1	Identify organizations regulating the petroleum industry in Western Canada
2.2	Adhere to provincial regulations in the petroleum industry, such as Alberta Energy Regulator Act and Regulation and Environmental Protection and Enhancement Act.
2.3	Describe a drilling program.
2.4	Describe a well completion.
2.5	Describe a facility.
2.6	Describe production operations.
2.7	Assist engineers and scientists in developing technical applications.
2.8	Collaborate with a multi-disciplinary team to solve technical problems.
2.9	Provide customers with technical support and recommendations for the implementation of technical solutions.
2.10	Monitor surface and sub-surface equipment associated with oil and gas production.
2.11	Identify basic well optimization strategies, such as hydraulic fracturing and acid work-over.
2.12	Implement well optimization based on the analysis of field and simulation data.
2.13	Recognize problems that require troubleshooting and corrective action.
2.14	Take corrective action within limits of one's competence.
2.15	Maintain a log for design and implementation of technical solutions.
2.16	Prepare technical documents, such as drawings and reports, for approval and implementation.

<b>Competency Name:</b>	
<b>Technical Evaluation (Petroleum Engineering Technologists)</b>	
<b>Competency Definition:</b>	
Evaluate systems and processes to ensure their compliance with regulatory requirements, technical specifications, industry standards, and requirements of internal and external clients.	
<b>#</b>	<b>Competency Indicators</b>
3.1	Confirm the expected outcomes with internal and external clients.
3.2	Evaluate technical results against expected outcomes at predetermined intervals.
3.3	Perform design validation using field tests.
3.4	Verify that technical documentation is written in accordance with internal requirements, industry standards, and regulations.
3.5	Assist in identifying non-conforming systems and processes.
3.6	Monitor the non-conforming systems and processes until corrective solutions are effectively implemented.
3.7	Assist in identifying lessons learned.
3.8	Assist in evaluating the efficiency of drilling and completion of a well.
3.9	Monitor pipelines, including cathodic protection, leak detection, and integrity of valves.
3.10	Monitor the production rates of oil and gas.
3.11	Prepare regulatory reports for submission to appropriate authorities, such as Alberta Energy Regulator.

<b>Competency Name:</b>	
<b>Project Management (Petroleum Engineering Technologists)</b>	
<b>Competency Definition:</b>	
Manage small technical projects to ensure the quality of deliverables, satisfaction of internal and external clients, and adherence to schedules and budgets.	
<b>#</b>	<b>Competency Indicators</b>
4.1	Research equipment or component needs, sources, competitive prices, delivery times, or operational costs.
4.2	Take into account the influence of other engineering disciplines on projects.
4.3	Calculate cost, material, and resource estimates for small projects.
4.4	Prepare budgets and schedules for deliverables.
4.5	Monitor spending and schedules for projects.
4.6	Prepare progress reports.
4.7	Establish effective working relationships with internal and external clients.
4.8	Manage internal and external clients' expectations through regular communication.
4.9	Provide clear direction to team members.
4.10	Prioritize own work activities to ensure that project objectives are met on time and on budget.
4.11	Explain the value of workplace safety legislation.
4.12	Comply with workplace safety legislation.