The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians

Le Jury Canadien D'Accréditation en Génie Biomédical et Dialyse Pour Les Technologues et Les Techniciens

Canadian Board of Examiners Certification Programme

For Biomedical Engineering and Dialysis Technologists/Technicians

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Table of Contents

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1.0 Introduction

The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians is a member of the International Certification Commission for Clinical Engineering and Biomedical Technology.

1.1 International Certification Commission (ICC)

The International Certification Commission (ICC) has a membership, which provides broad representation of relevant members of the health care community. It includes representatives from engineering, medical, industrial, and government groups and agencies. It supervises the certification of biomedical engineering technologists and technicians, clinical engineers, and other related specialists through the organization of examining boards.

The International Certification Commission (ICC) shall be provided with the details related to its certified members and the membership of the Canadian Board of Examiners for Biomedical Engineering Technologists and Technicians on a yearly interval.

1.2 Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians

1.2.1. Biomedical Engineering Technologists and Technicians

As guided by the International Certification Commission, the Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians (The Canadian Board) considers that a biomedical engineering technologist or technician is a person knowledgeable in the theory of operation, the underlying physiologic principle, and the practical, safe, clinical application of biomedical equipment. His/her capabilities may include installation, calibration, inspection, preventative maintenance, repair, modification, design and development of general biomedical and related technical equipment, and in equipment control, safety and maintenance.

1.2.2. Dialysis Technologists and Technicians

As guided by the International Certification Commission, the Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians (The Canadian Board) considers that a Dialysis technologist or technician is a person knowledgeable in the principles of dialysis and utilizes technical, scientific and clinical knowledge in operating and maintaining dialysis equipment so that the long-term outcomes of the patient are optimized and complications reduced. The dialysis technologist assumes primary responsibility for medical devices used in the delivery of renal replacement therapies, including but not limited to: dialysis machines, reprocessing equipment, water treatment equipment, artificial kidneys and blood lines, and the setup of dialysis equipment in and off unit, including home installations. Additionally, the dialysis technologist may assume responsibilities for medical devices not strictly related to the Nephrology Program in the hospital, encompassing special therapies such as: continuous arterio-venous haemofiltration (CAVH) and apheresis. The role of the dialysis technologist also includes the teaching of staff and individuals with renal failure, the development and maintenance of quality assurance programs with reference to the activities listed above, administrative and research activities appropriate to the specialty.

The Canadian Board shall adhere to a sub-set of the standards published by the National Organization for Competency Assurance (NOCA) as adapted and evaluated by the International Certification Commission.

1.3 Mission

1. The purpose of the Canadian Board shall be to serve the health care community relative to the certification of Biomedical Engineering and Dialysis Technologists and Technicians.

2. Accordingly, the Canadian Board shall formulate general polices on certification, recommend candidates to the ICC to grant certification, and assist the educational community in developing a body of knowledge relevant to continuing education and fundamental training programs.

3. The Canadian Board shall ensure that applications are carefully evaluated and that written examinations are prepared, administered and evaluated to determine the qualifications of individuals seeking certification.

1.4 Code of Ethics

The Canadian Board recognizes the precepts of personal integrity and professional competence as fundamental ethics, and as such The Canadian Board and members of The Canadian Board shall:

1. Hold paramount the safety, health and welfare of the public, the protection of the environment and the promotion of health and safety.

2. Provide an opinion on professional subject only when it is founded upon adequate knowledge and honest conviction.

3. Act with integrity towards applicants or references, maintain confidentiality and avoid a conflict of interest but, where such conflict arises, fully disclose the circumstances without delay to The Board.

4. Keep informed to maintain proficiency and competence, to advance the body of knowledge within their discipline and further the opportunities for professional development.

5. Conduct themselves with fairness, courtesy and good faith towards applicants, colleagues and others.

6. Report to the appropriate agencies any hazardous, illegal or unethical professional decisions or practices by fellow members or others.

7. Promote the public knowledge and appreciation of biomedical engineering certification and protect the Canadian Board of Examiners for Biomedical Engineering Technologists and Technicians from misrepresentation and misunderstanding.

8. Shall be non-commercial, non-sectarian, and non-partisan.

9. Shall not endorse any commercial enterprise or any candidate for public office.

10. Neither the name of The Board nor the name of any of its members in their official capacity shall be used in conjunction with a commercial company with partisan interests.

11. Members of The Board shall not receive any money or gifts for any function of The Board other than stipend covering expenses directly involved in certain board activities.

12. Members of The Board shall not conduct a course of study whose sole purpose is to prepare non-certified individuals for certification examination.

13. The Board does not sponsor/accredit educational programs or courses of study preparing the non-certified individuals for certification examination.

14. The Board membership and composition are determined by The Board, not by outside agencies.

1.5 Communications

All members and applicants are responsible for, and are required, to report all errors, omissions or ambiguities. The members and applicants shall report, direct questions or seek clarification by written notification to:

BMET Certification Canada

97 Pheasant Run Drive

Nepean, ON

K2J 2R3 Canada

OR via e-mail to:

bmetcertcanada@ncf.ca

Notification via facsimile is not permitted. The Board reserves the right to seek clarification and supplementary information.

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2.0 Principles

2.1 Meetings

The Board reserves the right to request one board meeting per year to discuss and make decisions on governance structure, policies, procedures and board membership. A quorum shall be declared when at least two-thirds (2/3) of the board members (The Board) are in attendance. A meeting shall constitute any scheduled event when The Board is called to order through person-to-person meetings at a single location, the use of communication media (i.e. video or teleconference) or a combination thereof, where each board member has an adequate opportunity to represent their board responsibilities. Minutes shall be taken and shared with general membership.

A treasures report shall be available and shared at each meeting to support business decisions.

2.2 Board Members Expertise

The Board reserves the right to request and obtain additional information from the board members, key staff, non-staff consultants, and professionals, to support the governance, credentialing for an area of responsibility, or to demonstrate their respective area of expertise (i.e. resume or curriculum vitae).

The board members, key staff, non-staff consultants, and professionals shall possess adequate knowledge and skill to conduct certification program activities.

2.3 Fair Practice

The board members, applicants, key staff, non-staff consultants, and professionals acknowledge and accept responsibility to provide accurate documentation, and in all respects fair and free from collusion of fraud.

2.4 Confidentiality

With the exception of the certification status of an individual, which is of public interest, all information furnished in connection with board members, applicants, key staff, non-staff consultants, and professionals are confidential and are to be used for the sole purpose of governance of The Board and certification program, unless prior written consent has been provided to The Board (see). All material and information furnished shall remain the property of the Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians.

All confidential material will be disposed of in a responsible manner.

2.5 Personal Information

If the governance of the board and certification program requires any of the collection, use, modification, disclosure, retention and disposal of personal information the board members, key staff, non-staff consultants, and professionals shall ensure privacy, security and confidentiality of that information in all interactions.

Such information is to be used for no other purpose unless prior written consent has been provided by an individual and in accordance with all applicable laws including the Protection of Personal Information and Electronic Documents Act (PIPEDA) of Canada and their applicable regulations.

2.6 Conflict of Interest

Each board members, key staff, non-staff consultants, and professionals must provide confirmation that they do not, and will not, have any conflict of interest (actual or potential) in undertaking their respected role responsibilities, or to the certification program. Where applicable, the board members, key staff, non-staff consultants, and professionals must disclose, information pertaining to any situation which may be a conflict

of interest (i.e. reviewing an applicants' suitability for certification when there is a bias that could affect the outcome). Furthermore, each board member, key staff, non-staff consultants, and professionals must confirm that the board member, key staff, non-staff consultants, and professionals neither have, nor had, access to any Confidential Information that has not been provided as part of the certification process.

The board members, key staff, non-staff consultants, and professionals may be dismissed from their role of responsibility where that board member, key staff, non-staff consultants, and professionals fails to provide confirmation of the foregoing or makes misrepresentations regarding any of the above. Further, The Board, in addition to any other remedies it may have in law or in equity, shall have the right to rescind any recommendations provided by board members, key staff, non-staff consultants, and professionals, in its sole discretion, determines that the board members, key staff, non-staff consultants, and professionals made a misrepresentation regarding any of the above.

2.7 Intellectual Property

All intellectual property rights derived under the governance of The Board and certification program are to remain exclusive property of The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians.

Requests to present data or publish or present papers derived from the governance of the board and certification program in professional journals or in any other type of publication or at professional conferences must be made to The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians and prior approval must be obtained in writing from The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians.

The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians reserves the right to verify any statement or claim by whatever means it deems appropriate, to contact persons or entities other than those offered, and reject the statement or claim, if, in the judgment of The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians, the statement or claim is unwarranted or questionable.

2.8 Laws

The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians shall practice according to the laws of the Province of Ontario, or the laws of the government of Canada as interpreted in Ontario.

2.9 Board Member, Key Staff, Non-staff Consultants and Professionals

A board member, key staff, non-staff consultants, and professionals shall have no power or authority to bind The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians. or to assume or create any obligation or responsibility, express or implied, on behalf of The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians. A board member, key staff, non-staff consultants, and professionals shall not hold itself out as an agent, partner or employee of The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians.

The chairperson shall be in a position to approve expenditures submitted by the treasurer that have been discussed as reasonable expenses to manage the operation of The Board (i.e. secretarial fees, telephone, internet, bank fees, supplies, postage, etc…). All other business decisions must be approved by The Board prior to proceeding. The financial records shall be available to any board member for the purpose of audit upon request of The Board.

2.10 Indemnification

Board members, key staff, non-staff consultants, and professionals shall indemnify and hold harmless The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians from and against claims, demands, losses, costs, damages, actions, suits or proceedings by third parties that arise

out of, or are attributable to the actions of the board members, key staff, non-staff consultants, and professionals as it relates in undertaking their respected role responsibilities or to the certification program.

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3.0 Examination

3.1 General

The purpose of the examination process is to measure, in a standardized and unbiased manner, the ability of the candidate to apply the knowledge and skills in the role of a professional. Passing a certification examination establishes that the individual is competent to work unsupervised in a given field or profession. The certification does not mean that an individual knows everything required to be considered an expert in a given field.

There is one exam in Canada for both biomedical engineering technologists and biomedical engineering technicians, (as determined by the candidate's provincial certification). Throughout this text the acronym "BMET" refers to both biomedical engineering technologists and technicians.

For dialysis certification, one examination is also used for both technologists and technicians (as determined by the candidate's provincial certification). Throughout this text the acronym "cdt" refers to both dialysis technologists and technicians.

3.2 Eligibility

The basic eligibility requirement for being examined for biomedical engineering or dialysis certification is the candidate's registration with their provincial association as a certified engineering technologist (CET), Applied Science Technologist (AScT), or technician (CTech) as recognized by The Canadian Council of Technicians and Technologists (CCTT), with a minimum number of years of related experience.

1. A certified member, in good standing, of a provincial association of engineering technologists and technicians, recognized by the Canadian Council of Technicians and Technologists.
2. The candidate shall have a minimum of 3 years practical experience as a biomedical engineering, or dialysis technologist or technician in a clinical/hospital environment, OR Candidates, who are graduates of a recognized biomedical post-secondary program, accredited by the Canadian Technology Accreditation Board (CTAB), and/or recognized by The Board, will be allowed to count a maximum of 1-year internship period as part of the 3-year requirement.
3. It is not necessary that the candidate be currently employed by a hospital, but it is required that the candidate have the above experience.
4. The applicant shall submit the names of at least 5 references for the biomedical engineering technologist/technician, 3 references for the dialysis technologist/technician. These references must be health care professionals who are familiar with the individual's competence in the following areas:
    a. Technical ability
    b. Clinical experience interfacing with physicians
    c. Clinical experience interfacing with nursing staff
    d. BMET only - two others who have knowledge of the candidate's work experience.

    Note: If a physician reference (b) is not available, include an additional nursing reference (c).

    The names of references are requested on the application form. Confidential questionnaires will be sent to the referees by the Secretariat. These forms are returned directly to the Secretariat.

3.3 Certification Process

The process is as follows:

1. Upon receipt of completed application form and fee, the candidate will receive a receipt of payment, which will indicate that the candidate's file has been activated.
2. The Secretariat will send out reference requests to the references indicated on the candidate's application form.
3. Upon receipt of these completed references, the candidate's file is directed to the Board of Examiners for review. The Board will determine if the candidate meets the requirements for examination, or if additional information, or further study is required.
4. When the Secretariat has been advised of the candidate's acceptance for examination, a proctor will be appointed to oversee the written examination. The proctor will be a qualified examiner, as deemed by the Board, located in the candidate's city/town, or as close as possible. The candidate shall have made arrangements with the proctor and written the exam within two (2) years of the acceptance date.
5. BMET examination candidates will be given eight (8) hours to complete the BMET examination. The use of hand-held scientific calculator (no calculators that allow text storage or formulation(s)) and one 7.6 cm by 12.7 cm card with formulas is allowed for the BMET examination. The card shall only contain formulas (no text) on both sides and shall have a font size of not less than 8 pitch. Calculators that are included as part of cellular phones, or other electronic communication devices will not be permitted. The formula card must be handed in together with the completed exam.

   Dialysis examination candidates will be allowed three (3) hours to complete the dialysis examination. The use of a scientific calculator is permitted. Calculators that are included as part of cellular phones, or other electronic communication devices will not be permitted. No cue cards or other aids are permitted for dialysis examination candidates.
6. Upon successful completion of the written examination, the Board will advise the candidate of the results. The Board then makes its recommendation to the International Certification Commission, and a Certificate will be issued.
7. If the BMET candidate has not achieved a passing mark on the BMET exam, he/she will be given a time period to study in the area(s) of weakness, and then be given the opportunity to rewrite a supplementary examination that focuses on this area.
8. If the dialysis candidate is not successful on the exam, the entire examination can be re-written.
9. The candidate's Certificate is sent to the Canadian Board Chairman for signature and the candidate will be consulted as to whether he/she wishes it to be sent to their supervisor for presentation, or directly to him/herself.

3.4 Examination Content

The content of the BMET examination is based on the following premises:

The BMET must be able to communicate intelligently with physicians and other hospital staff members. Also, in order to fulfill his/her responsibilities in the area (e.g. in the area of safety and device performance), he/she must have a reasonable knowledge of anatomy and physiology. The knowledge should include familiarity with terminology and body functions/systems.

The BMET should possess a broad knowledge of equipment and laboratory instrumentation used in a clinical setting. His/her knowledge should include, but not be limited to, the theory of operation, clinical application, safety requirements, regulations and standards relating to physiological monitors, analytical laboratory instruments, vacuum and gas pressure vessels and controls, anaesthesia equipment, information systems

interfaces, ventilators, imaging devices (including MRI, CT, PET, X-Ray and ultrasound), physiological instruments, electrosurgical units, lasers (YAG, CO2, etc), renal dialysis, non-invasive surgical instruments…..etc.

The BMET should be able to perform theoretical troubleshooting, using schematics, for equipment ranging from the simple fibre optic light source to the microprocessor based electromyography. The BMET should also possess basic management and supervisory skills.

The content of the dialysis examination covers the Critical and Supporting Competencies.

The **critical** competencies are:

1. Water Treatment
2. Dialysis Membrane Technology
3. Basic Principles of Dialysis
4. Haemodialysis Systems Components
5. Dialysis Electrical and Electronic Systems
6. Computer Systems
7. Haemodialysis On-line Technologies
8. Safety Standards and Directives

The **supporting** competencies are:

1. Renal anatomy/physiology & pathology
2. Treatment modalities
3. Dialyser Re-processing
4. Assessment of Dialysis Adequacy
5. Access Assessment Techniques and Technologies
6. Anticoagulation & Coagulometric Technologies
7. Complications of Haemodialysis Treatment
8. Applied Chemistry
9. Applied Microbiology
10. Professional Practice

3.5 Study Guide

A Study Guide is available, which provides an insight into the examination by means of a mini sample examination and recommended readings. The Study Guide for both specialties is available from the Secretariat.

3.6 Examination Fee

The application fee is subject to annual review. This fee is non-refundable after the candidate has been accepted for examination. The fee is to cover the cost of processing the candidate's application and one examination session (if the candidate is determined eligible to test for certification). If, after the receipt of references and review by the Board, it is decided that the candidate is not eligible for examination, the candidate's fee will be refunded, less an administration fee to cover costs to that point. The Examination Fee will be reviewed on an annual basis and adjusted as required to cover the costs associated with maintaining The Board.

3.7 Application

A Certification Application form must be completed. Curriculum Vitae are not acceptable in lieu of the completed form. This application form is directed to The Board Secretariat. The Secretariat will obtain the applicant's references and send the application together with the references to The Board of Examiners for review.

3.8 Application Review

The application will be reviewed by three (3) board members and they will decide whether or not the applicant is qualified to take the examination based upon the eligibility requirements. The applicant is then informed of his/her eligibility to take the examination.

If the Board does not recommend testing, the applicant is informed and he/she may choose to follow the appeal procedure.

3.9 Application Appeal Procedure

The Secretariat submits the candidate's application for review by the Chairperson of The Board. The Chairperson will undertake a review of the application that is consistent with the intent of the original application review.

3.10 Examination Location

The Board will make every effort to provide examinations in a location that the candidate might easily access. The examination site should provide appropriate testing conditions including good lighting, large desk, lack of noise, and a nearby rest room. The examination date will be mutually agreed between the candidate and the examination proctor or supervisor. The examination may begin no earlier than 0800 hours and no later than 1300 hours (full examination only).

3.11 Examination Format

The BMET examination is divided into two parts. The first part is in multiple-choice format (1 point for correct answer, 0 points for incorrect or no answer) and includes five (5) sections that cover the topics of:

- Anatomy and Physiology
- Electronics
- Medical Instrumentation
- Troubleshooting
- Canadian and other recognized standards.

The second part contains Essay questions pertaining to the practice and organizational management of Biomedical Engineering Programs.

The dialysis examination is multiple choice format with the value of question awarded at 1, 2 or 3 points, depending on degree of difficulty. The critical and supporting competencies are represented in the examination. Four different examinations are available and are written on a rotating basis to ensure that a different selection of questions is used. Approximately 120 questions will appear on each examination.

3.12 Examination Proctors and Supervisors

Examination proctors and supervisors shall be individually selected for each candidate, by The Board, based upon geographic location, determining if there is a previous relationship that could bias and affect the outcome and being a certified member of the engineering profession. Proctors are given instructions as follows (see Appendix C):

1. The examination site should provide appropriate testing conditions including good lighting, large desk, lack of noise, and a nearby rest room
2. To protect the security of the examination, the examinee should be closely monitored by the proctor who must remain at all times in the examination room, or in an adjacent room where security can still be adequately maintained. The proctor may appoint a replacement supervisor to substitute from time to time if necessary (provide name(s) to the Secretariat)

3. The examination may begin no earlier than 0800 hours and no later than 1300 hours (full examination only)
4. The examinee will be given up to eight (8) hours (full examination), or two (2) hours (supplemental examination), as required, to complete the BMET examination. The examinee may only leave the room to go to the rest room. Lunch break may be taken in the room, if the examinee desires, and he/she may be advised to bring a lunch. At the discretion of the proctor, the candidate may go out to lunch with the proctor, after the examination papers have been appropriately secured.

   Three (3) hours are given for the dialysis examination. Because of this concentrated period of time, no food is permitted in the room, unless medically necessary. Beverages may be brought in provided they are in a closed container.
5. The examination proctor or supervisor must maintain appropriate security of the examination documents at all times. If the security of the examination is compromised in any way, or if there is a suspicion that the security of the examination has been compromised, please inform the BMET Board Secretariat at once at the number shown below.
6. The proctor or supervisor must ask each examinee entering the room for personal photographic identification. A driver's licence, birth certificate or Company I.D. card are acceptable.
7. The proctor should confirm that the examinee's full name matches that printed on each page of the examination.
8. The BMET examinee may bring a hand held calculator and/or a cue card to the BMET examination. The cue card should be no larger than 7.6 cm by 12.7 cm and should contain equations, not words. Both sides of the card can be used. The dialysis examinee may use a scientific calculator, but may not use any cue cards for the dialysis examination.
9. The examinee must not have any form of communicating device (cell telephone, Blackberry, pager, camera etc.) on his person whilst writing the examination.
10. The examinee should clearly mark answers in the boxes provided on the multiple-choice section of the examination in pencil.
11. For the full BMET examination, the proctor should emphasize that there are two essay questions to be answered, after the completion of the multiple-choice section.
12. The proctor or supervisor may not answer any technical questions concerning the examination, but may answer questions about examination procedures.
13. All pages of the exam, including any allowed list of equations, plus any additional sheets of paper requested by the examinee, must be collected by the proctor and placed into the addressed envelope provided prior to mailing.
14. Note that proctors and supervisors will not be eligible to take the BMET examination for four (4) years from the date of the examination supervised or proctored.
15. Call the BMET BOARD SECRETARIAT if you have any questions about proctoring or supervising the BMET Certification Examination. Telephone: (613) 823-9447 (0900 – 1700 EST)

The proctor is required to sign the confidentially statement found in Appendix F.

3.13 Examination Materials

All pages of the exam, including any allowed equations card, plus any additional sheets of paper requested by the examinee, must be collected by the proctor and placed in the addressed envelope provided prior to mailing.

3.14 Transportation of Examination Materials

Examination materials, including answer templates where appropriate, shall only be sent via courier or registered mail to the proctor's home address, board member's home address or the secretary's address. All electronic versions of the examination shall only be shared within The Board membership with electronic password control on each document.

3.15 Examination Grading

Two (2) members of The Board will be assigned to grade the examination using a predetermined answer template. The Board members will complete the BMET certification examination scoring sheet (BMET Sample in Appendix D, cdt Sample in Appendix E) and submit it with all materials to the Secretariat.

For the **BMET Examination,** a minimum mark of 50% is required in each of the six (6) sections. 75% of the marks gained in the first five (5) sections, plus 25% of the mark gained in the essay section, will constitute the final mark attained. The final mark attained must equal or exceed 60%, with each of the six (6) sections receiving a mark of 50% or more, for a pass to be granted.

For the **cdt examination** a minimum mark of 70% is required for a pass to be granted.

3.16 Examination Appeal Procedure

Upon notification of the examination results, a candidate wishing to appeal the outcome must submit a letter to The Board Secretariat requesting an appeal within ninety (90) days of receiving the examination results. If challenging a particular item on the examination, provide as much detail as possible about the item. Each appeal is handled individually depending upon its nature. Candidates will be contacted if additional information is needed, or when a decision has been reached. Challenges made by way of notations on the examination booklet are not considered an appeal and will not be reviewed by The Board or taken into consideration. Upon receiving the letter of appeal, the Secretariat submits the candidate's examination for review by the Chairperson of The Board. The Chairperson will undertake the grading of the examination that is consistent with the prescribed examination grading procedure. The Chairperson will complete the BMET certification examination scoring sheet (BMET Sample in Appendix D, cdt Sample in Appendix EAppendix) and submit it with all materials to the Secretariat.

3.17 Supplemental Examination Procedure

For the **BMET examination** process, the aim is to encourage the candidate to successfully complete the certification examination, therefore, the candidate will be given the opportunity to rewrite sections of the examination where their original score was insufficient for a pass to be granted, until The Board is satisfied that the candidate meets the standards required. Supplementary examination(s), covering the section(s) in which the candidate was unsuccessful in the original examination process, will be made available. In taking supplementary examination results into consideration, the candidate must obtain a grade level that is consistent with the original examination process of a minimum mark of 50% in each of the six sections previously written (one or more of which may have been re-written as a supplementary examination) and a final attained mark of equal to, or exceeding, 60%. The candidate shall have written all supplementary examinations within two (2) years of notification that supplementary examination is required by The Board.

For the **dialysis examination** process, no supplementary examination is offered if the candidate is not successful on his/her first attempt. The candidate may re-write the complete examination the next time it is offered.

3.18 Certification Renewal Fee

A certification annual renewal fee is implemented to maintain the Canadian Certification process and provides a listing to the International Certification Commission Directory of Certified Individuals. Renewal Fees are due on successful completion of the Certification Examination, on a pro-rated basis, and in full in January of each

year thereafter. The certification renewal fee will be reviewed on an annual basis and adjusted as required to cover the costs associated with maintaining The Board.

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4.0 The Board

4.1 General

The Board shall be composed of CBET(C), or cdt, certified individuals that are representative of the membership in the geographical regions/provinces across Canada. Note that a number of Certified Dialysis Perfusionists (CDP), that were certified under a now non-existent organization, are members of the cdt group and as such are eligible to sit on the Board to represent the cdt group. The Board will consist of at least nine (9) members, at least five (5) CBET(C), or cdt/CDP, certified individuals (both groups must be represented), one (1) Certified Clinical Engineer (CCE), and the balance may be advisors and other supporting roles.

Each member shall hold tenure for three (3) years in a staged order to maintain a balance of experienced board members, unless it is deemed by The Board to maintain consistent membership for longer tenure. Any certified member may petition The Board in his/her name or may suggest another candidate for membership. Each candidate must submit a resume or curriculum vitae to the Secretariat. The Secretariat shall make copies of the resume or curriculum vitae available to each board member prior to a board membership election. Board members are selected by a majority vote of the existing Board members.

4.2 Co-Chairpersons

A co-chair model shall be applied to the chairmanship of the Board. One co-chair will represent the dialysis members and the other co-chair will represent the BMET members, each duly elected by, and from, the Board members representing each discipline.

The Co-Chairpersons shall be responsible for:

1. Reporting all Board related activities to the membership and to International Certification Commission (ICC) in the form of a yearly report.
2. Liaison between The Board and the International Certification Commission (ICC).
3. Representing The Board at meetings of the International Certification Commission (ICC) yearly.
4. Chairing all board related meetings.
5. Approving expenditures submitted by the treasurer that have been discussed as reasonable expenses to manage the operation of The Board (i.e. secretarial fees, telephone, internet, bank fees, supplies, postage, etc…).
6. Supporting the appeals processes.
7. Undertaking any of the other roles and responsibilities in the absence of a board member.
8. Promoting certification.

4.3 Board Member

A Board Member shall be responsible for:

1. Attending meetings of The Board.
2. Participating in the preparation of examination materials and assessment tools as required.
3. Participating in the preparation of supplementary examination materials and assessment tools as required.
4. Participating in the preparation of study guide materials as required.
5. Evaluating applications from candidates for certification as required.

6. Grading examinations, supplementary examinations and other assessment tools as required.
7. Preparing information or resource material for the internet page.
8. Providing recommendations on governance structure, polices, procedures and board membership.
9. Providing recommendations related to member fees, examination fees, yearly budgets, and other proposed financial decisions.
10. Promoting certification.
11. Undertaking any of the other roles and responsibilities in the absence of a co-chairperson, advisor, secretariat or treasurer.

4.4 Senior Board Members

A Senior Board Member (there can be more than one) is an appointed, voting, member of The Board, who is a Certified Biomedical Engineering or Dialysis Technologist or Technician (CBET(C), cdt/CDP) and who has been a long standing member of The Board. This appointment is reviewed annually and tenure could be longer than other Board members. The role is to ensure that standards are maintained and that there is some consistency with the way the Board operates. These established members (typically past board chairpersons) are called upon to review proposed changes in policy and procedure (developed by Board Members) to ensure that the direction of the programme is consistent with its aims.

Senior Board Members consult with the Board in their area of expertise, attend and participate in meetings, and may be invited to participate in other Board matters. They are not normally involved in the process of assessing candidates for the examinations.

The Senior Board Members shall be responsible for:

1. Attending meetings of The Board.
2. Promoting certification.
3. Providing recommendations on governance structure, polices, procedures and board membership.
4. Providing recommendations related to member fees, examination fees, yearly budgets, and other proposed financial decisions.
5. Undertaking any of the other roles and responsibilities in the absence of a co-chairperson, board members, advisor, secretariat or treasurer.

4.5 Secretariat

The Secretariat shall be responsible for:

1. Acting as a central point for verbal/written communications related to inquires, general communications, and document distribution (i.e. Study Guides, Exams, Applications, and Reference Forms).
2. Coordinating the application and certification process.
3. Maintaining the database of the membership and membership status.
4. Processing fees and general membership support.
5. Other mutually agreed upon duties as requested by The Board.

4.6 Treasurer(s)

The treasurer shall be responsible for:

1. Providing accounting and book keeping services.
2. Developing yearly budgets.
3. Other mutually agreed upon duties as requested by The Board.
4. Financial accountability for each certification stream will be maintained separately.

4.7 Clinical Engineer Advisor

The Clinical Engineer Advisor is a non-voting appointed member of The Board that is a Certified Clinical Engineer (CCE). It is not necessary that this individual be a CBET, or cdt. This appointment is reviewed annually and tenure could be longer than other Board members.

This advisor consults with the Board in their area of expertise, attends and participates in meetings, and may be invited to participate in other Board matters. They are not normally involved in the process of assessing candidates for the examinations.

4.8 Education Advisor(s)

The Education Advisor is a non-voting appointed member of The Board that is preferably a Certified Biomedical Engineering Technologist or Technician (CBET(C)) or a Certified Clinical Engineering (CCE) and/or a Certified Dialysis Technologist or Technician (cdt or CDP) and is a professional educator for a community college or university. This appointment is reviewed annually and tenure could be longer than other Board members.

This advisor consults with the Board in their area of expertise, attends and participates in meetings, and may be invited to participate in other Board matters. They are not normally involved in the process of assessing candidates for the examinations.

4.9 Internet Resources and Communications Advisor

The Internet Resources and Communications Advisor is a non-voting appointed member of The Board that is preferably a Certified Biomedical Engineering Technologist or Technician (CBET(C)) or a Certified Dialysis Technologist or Technician (cdt or CDP). This appointment is reviewed annually and tenure could be longer than other Board members. The role includes the management and up keep of the web page for Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians with content as approved by The Board.

This advisor consults with the Board in their area of expertise, attends and participates in meetings, and may be invited to participate in other Board matters. They are not normally involved in the process of assessing candidates for the examinations.

4.10 Financial Audits

A random board member will be selected, on a yearly basis, to review and audit the financial transactions of The Board. The board member will be provided with account summaries, and transaction summaries. The board member can request any specific transaction details and will be provided the supporting document regarding the transaction approval and account summary related to that specific transaction. The board member will provide a report of the findings to The Board during the annual meeting.

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5.0 Assessment Instruments

5.1 General

The certification program uses assessment instruments that are derived from the job/practice analysis and that are consistent with generally accepted psychometric principles. The certification examinations will be based on a professional role delineation or job analysis. According to the National Commission for Certifying Agencies' Standards for the Accreditation of Certification Programs, a job analysis or role delineation study, is defined as any of several methods used singly or in combination to identify the performance domains and associated tasks, knowledge, and/or skills relating to the purpose of the credential and providing the basis for validation. A role is likewise defined as a more specific or narrower set of knowledge and skills than may be encompassed by the term 'profession' or 'occupation,' and may also be the focus of certification for a particular product or service.

This professional certification is the voluntary process by which a non-governmental entity grants a time-limited recognition and use of a credential to an individual after verifying that he or she has met predetermined and standardized criteria. It is the vehicle that a profession or occupation uses to differentiate among its members, using standards, sometimes developed through a consensus driven process, based on existing legal and psychometric requirements.

The Board shall be considered the qualified subject matter experts as it relates to the various assessment instruments. The Board shall review all aspects of the assessment instruments and provide direction to as to the recommended changes. The Board will request post examination analysis/statistic for each question to permit the evaluation of the appropriateness of the degree of difficulty.

5.2 Provincially Certified

The Board recognizes the requirement for the candidate to have completed the necessary educational criteria for the role as either a technologist or technician. The Canadian Council of Technicians and Technologists (CCTT) has the assessment instruments in place to complete this determination; therefore, the Candidate shall be a certified member, in good standing, of a provincial association of engineering technicians and technologists, recognized by the Canadian Council of Technicians and Technologists.

5.3 Application Form

The information obtained as part of the candidates application form (see Appendix A) shall allow The Board to assess the candidate's related clinical experience. The Board will approve any changes to the Application Form. The Board recognizes the requirement for the candidate to have a minimum of 3 years full time experience as a Biomedical Engineering or Dialysis Technologist/Technician in a clinical/hospital environment, OR Candidates, who are graduates of a recognized BMET post-secondary school program, accredited by the Canadian Technology Accreditation Board (CTAB), and/or recognized by The Board, will be allowed to count a maximum of 1 year internship period as part of the 3 year requirement.

5.4 Examinations - BMET & Dialysis

The Board approves the examination content, based on their expert knowledge of the professional role of a certified biomedical engineering technologist or technician, as part of the development of the assessment instruments. The examination may include, but may not be limited to, questions covering topics listed below.

5.4.1. BMET Examination

The Board approves and confirms that the listed examination content is consistent with job analysis and the defined body of knowledge required for the role of a certified biomedical engineering technologist or technician:

Anatomy & Physiology (multiple-choice):

A. Systems - Respiratory, Gastrointestinal, Nervous, Circulatory, Musculoskeletal, Endocrine
B. Organs - Heart, Lungs, Liver, Kidneys, Brain, Gallbladder, Pancreas
C. Blood - Components, Metabolism
D. Terminology

Electronics (multiple-choice):

A. Transducers
B. Calculations and Conversions - Hex/Decimal/Binary
C. Devices - Passive, Active, Digital
D. Circuits - Operational Amplifier, Power Supplies, Common Base/Emitter/Collector Transistor Circuits
    1. E AC Power - Transformer, Distribution
E. Test Equipment
F. Batteries
G. Terminology

Medical Instrumentation (multiple-choice):

A. Monitoring Systems - ECG, EEG, Blood Pressure, Pulse Oximetry, Fetal Monitor, Telemetry
B. Portable Equipment - Infusion Devices, Syringe Pumps, PCA Pumps, Hypo/Hyperthermia, Vacuum Units
C. Life Support Equipment - Defibrillators, Dialysis, Anesthesia Machines, Critical Care Ventilators, Balloon Pumps, Perfusion Pumps
D. Therapeutic Equipment - Infant Warmers, Ultrasound Therapy
E. Laboratory Equipment - Centrifuges, Water Baths, Analyzers
F. Diagnostic Imaging - Ultrasound, Radiographic/Fluoroscopy, MRI, CT, PET, Nuclear Medicine
G. Operating Room - Electro Surgical Generators, Minimally Invasive Video Systems/Suites, Lasers, Tourniquets, Sterilizers, Warmers, Endoscopy
H. Information Systems - Computers, Networks, Topology
I. Test Equipment - Electrical Safety, Defibrillator, Electro Surgical, Physiologic Simulators, Oscilloscopes, Meters
J. Terminology

Safety & Standards (multiple-choice):

A. Electrical - Micro/Marco-shock, Electrical Safety Testing
B. Chemical - Material Safety Data Sheet
C. Radiation Hazards - Light Spectrum, Types of Rays,
D. Biological - Universal Precautions
E. Fire - Class, Fire Extinguishers
F. Regulations, Codes and Standards
    1. CSA Standards
    2. Electromedical
    3. Laser Safety
    4. Low Pressure Connecting Assemblies (Medical Gases)
    5. Stability and Transport
    6. Canadian Electrical Code
    7. CCHSA Hospital Accreditation Standards
    8. Canadian Society For Transfusion Medicine (CSTM) Standards.
    9. Advancement of Medical Instrumentation (AAMI), HF 18, Electrosurgical Devices Standard
    10. Health Canada, Medical Devices Regulations (1998)

Troubleshooting (multiple-choice):

A. Electronic Component Level,
B. Block Level
C. Situational (i.e. User error, user training, applications)

Essays:

Pertaining to the practice and organizational management of Biomedical Engineering Programs.

5.4.2. cdt Examination

The Board has reviewed and approved the following examination content from the Critical and Supporting Competencies for the Dialysis certification examination.

Critical Competencies

1. Water Treatment for Dialysis

a) need for water purification in dialysis

b) classification of potable water contaminants

c) evaluation of feed water quality

d) system components: purpose, method of operation, rationale for specific location in the system, maintenance, testing and troubleshooting for the following

i. particle/depth filtration
ii. carbon filtration
iii. water softener
iv. deionisation
v. reverse osmosis
vi. UV irradiation
vii. ultra filters at point of use

e) distribution systems: importance of system configuration (direct vs indirect feed loops), piping layout to improve water velocity and decrease dead lags, selection of materials, methods of installation, calculation of velocity required

f) disinfection and cleaning: methods used (heat, chemical, ozone), concentrations and contact times required for effective disinfection, rinsing protocols, testing for residual and reason for testing

g) water quality monitoring

i. chemical (pH, conductivity, resistivity, total hardness, free and total chlorine, iron)
ii. physical (% rejection and % recovery, silt density index, empty bed contact time, pressures)
iii. microbiological (bacterial and endotoxin testing)

2. Dialysis Membrane Technology

a) principles of permeability and containment of cellular components in blood

b) membrane materials: cellulose based (modified and unmodified), synthetic materials (PS, PA, PAN, PMMA etc.), additional coatings example Vit E

c) manufacturing technologies: melt spinning, solution spinning

d) definition of clearance and dialysance, differences invitro and invivo

e) influencing factors: temperature, pressure, pore size, convective transport

f) dialyser designs: plate and hollow fibre, changes in fibre geometry and membrane structure

g) dialyser flow dynamics: co-current vs counter-current flow

h) requirements on housing and potting material

i) bio-compatibility of dialyser membranes, thrombogenicity, complement activation, first use syndrome, cytokine release

j) methods of sterilization and impact on thrombogenicity

3. Basic Principles of Dialysis:

a) fluid compartments in the body: intracellular, intravascular, interstitial

b) diffusion: diffusion coefficient (in free solution and across a semi-permeable membrane), resistance of surface layers, influence of molecular weight, membrane thickness, pore size/distribution, membrane area, KoA, clearance of water soluble vs fat soluble molecules

c) filtration: pressure/filtrate flow relation, sieving coefficient and flux

d) osmosis: definition and understanding

e) ultrafiltration: definition and understanding of ultrafiltration, application

f) electrical charge

g) hi-flux and lo-flux dialysers (definition, brief explanation)

h) concentration of small (urea, creatinine, urate), middle (B12, LMW heparin, heparin, insulin) and large molecules (myoglobin, albumin, haemoglobin, cytochrome C) in blood

i) absolute cut-off for molecule- clearance: 10,000 Daltons (lo- flux dialysis) and 80,000 Daltons (hi-flux dialysis)

4. Haemodialysis System Components

I. Extra-corporeal blood circuit: (excluding dialysers)

a) thrombogenicity of different materials, sterilization of blood lines

b) protective filters: transducer protector

c) safety devices: air detector, clamps

d) infusion pumps (ie. heparin): calculation of infusion rates, mathematical conversion between ml/hour and IU/hour

e) blood pumps: types (occlusive, non-occlusive)

f) blood pump problems: haemolysis, pressure conditions, turbulence related to excess flow, measure of actual vs indicated blood flow

g) special applications: neonatal and paediatric

II. Concentrates for haemodialysis:

a) bicarbonate concentrates:

b) acid concentrates: acetic/citric acid etc.

c) other electrolytes currently used: additive spikes (phosphate, potassium, magnesium, calcium

d) dry concentrates: dilution ratios

e) bacteriostatic properties

f) devices for reconstitution of concentrates & delivery systems

g) individualized dialysate prescriptions and batch systems

III. Haemodialysis Machine Hydraulic Systems:

a) **UF Control systems:** balancing chambers and flow sensors

b) **Dialysate delivery systems design:** volumetric systems, conductometric (servo) feed-back systems

c) **Motors, pumps, valves, regulators, deaeration devices and relief valves:**

d) **Probes and sensors:** temperature, conductivity, pH, and ultrafiltration (UF), arterial and venous pressure monitoring systems

e) **Flow equalizers, heaters, heat exchangers end-stroke-sensors, and one way/check valves:**

f) **Bypass function:** purpose, criteria for activation, calibration

g) **UF measurement:** ultrafiltration rate, transmembrane pressure, ultrafiltration characteristics, impact of plasma proteins, pressure conditions along a dialyser, ultrafiltration measurement principles (closed circuit - intermittent, continuous), reverse ultrafiltration

h) **Dialysate solutions:** conductivity, temperature, precipitation risks and remedies, pH monitoring, safety mechanisms for detection of wrong concentrates

i) **Hydraulic Troubleshooting:** principles of problem identification, , , -- troubleshooting, maintenance, calibration repair and, documentation

j) **Specialized Systems:** Sorbent dialysis systems

k) **Cleaning &** disinfection of hydraulic components

5. Dialysis Electrical and Electronic Systems

a) power distribution: AC -120V, DC, , 5V, 12V and 24V devices - location and rationale for each type of device

b) battery backup and alarm systems

c) principles of electrical safety: ground fault interruption

d) principles of operation of sensory and control devices

e) principles of electronic troubleshooting

f) proper handling of static sensitive devices: PCBs, integrated circuits etc.

g) interference by radio emitting devices, ie., cell phones, other electronic devices

h) line isolation

6. Computer Systems in Dialysis

a) standards and software protocols

b) input devices, output devices

c) local area networks (LANs) and wide area networks (WANs), machine interface

d) dialysis specific software options: renal data management packages, treatment data base

e) criteria for purchasing decisions: type of PC, operating system, CPU, memory, use of expansion slots and COM/LPT ports

f) software implementation strategies: Local IT consultation

7. Haemodialysis On-line technologies

a) continuous blood volume monitoring , including automated UF control

b) access flow and recirculation measurements

c) blood temperature and thermal balance monitoring and control

d) ionic dialysance

e) urea concentration and dialysis dose monitoring

f) total pool dialysate collection - aliquot method

g) blood pressure monitoring

8. Safety Standards and Directives

a) overview of standards organisations and scope of their activities (CSA, AAMI, IEEC, etc.)

b) overview of government/health standards agencies (HPB), relevance of DIN numbers, procedure for reporting patient side effects to HPB

c) electrical installation (home and in-centre) and use of electricity in patient care areas

d) water treatment for dialysis (home and in-centre)

e) dialysers and haemofilters

f) re-processing of dialysers

g) medical equipment risk classification system

h) norms and regulations on waste disposal – environmental issues

i) environmental concerns: air quality issues, latex allergy, perfume induced sensitivities

j) guidelines for dialysis: CSN (Canadian Society of Nephrologists), K/DOQI (Kidney Dialysis Outcomes Quality Initiative)

k) Workplace Hazardous Materials Information System (WHMIS), MSDS

l) universal precautions

m) quality assurance of calibration equipment

n) referencing standards

Supporting Competencies

1. Renal Anatomy/Physiology & Pathology

a) **Structure of the nephron** - location, important sub-structures

b) **Function of kidneys:** excretion/secretion, acid-base regulation, electrolyte balance, fluid balance, blood pressure regulation, endocrine functions (Vitamin D synthesis, erythropoietin secretion, production of renal prostaglandins)

c) **Assessment of kidney function:** biochemical and morphological tests

d) **Overview of commonly used medical terminology**

e) **Overview of renal failure**

i. **acute renal failure:** description, causes , typical course of the disease, goals of treatment

ii. **chronic renal failure:** description, causes), typical course of the disease, goals of treatment

2. Dialysis Membrane Re-processing

a) high level disinfection vs. sterilisation methods: heat/citric acid, peracetic acid/hydrogen peroxide/acetic acid, formaldehyde, sodium hypochlorite

b) types of systems used: automated vs. manual systems: applications and limitations

c) processes related to re-processing cycle: rinsing, reverse UF, cleaning, testing dialyser performance (pressure testing, fibre bundle volume, in vitro Kuf), disinfection/sterilisation, storage, testing for presence, testing for residual after rinsing, patient identification

d) risks of re-processing

e) benefits of re-processing

f) CQI (continuous quality improvement) and QA (quality assurance) management: risk management strategies, statistical analysis of incidents, documentation and reporting

g) safety of public and hospital personnel: exposure to chemical agents

h) physical plant considerations: RO water supply, testing RO water for contamination, endotoxin testing, air exchanges, holding tanks, physical layout of re-processing unit

i) bio-compatibility of sterilisation methods, symptoms related to bio-incompatibility

3. Treatment Modalities

a) **Haemodialysis:** indications for treatment, selection criteria, overview of types (in-centre HD/acute HD, nocturnal/home hemodialysis, self-setup dialysis centers), routine vs. single needle dialysis, paediatric dialysis and complications of all treatment types

b) **Peritoneal Dialysis:** indications for treatment, selection criteria, function of the peritoneal membrane, access, complications related to treatment, types of treatment (CAPD, CCPD, IPD) types of cyclers, types of solutions

c) **Renal Replacement Therapies:**

- Haemofiltration, Haemodiafiltration, Haemoperfusion:
  i. differences from HD in configuration of blood and dialysate/substitution fluid circuits
  ii. bag and on-line systems with pre and post dilution
  iii. fluid balance control systems
  iv. warming systems for substitution fluids
  v. use of anticoagulation (monitoring activated clotting time - ACT)
- Slow continuous ultrafiltration (SCUF), continuous arterio-venous haemofiltration (CAVH), continuous veno-venous (CVVH), continuous veno-venous Haemodiafiltration (CVVHD) - slow low efficiency dialysis (SLED)
  i. principles of operation
  ii. indications for use
  iii. type of membrane used

d) **Renal Transplantation:** indications for transplantation, types of transplant, criteria for recipient selection, care of donor organ, complications of treatment

e) **Conservative Therapies:**

i. **Renal Therapeutic Nutrition:** basic knowledge of requirements and restrictions for protein, carbohydrates, fats, fluids, vitamins, minerals (Ca, Phosphorus, Potassium etc) assessment of protein catabolic rate (PCR)

ii. **Anaemia Management:** erythropoietin

iii. **Blood Pressure Management**

iv. **Diabetes Management**

4. **Assessment of Dialysis Adequacy**
   a) **Mathematical** formulas for calculating dialysis adequacy:
      i. Haemodialysis: Dialysis Index, Urea Kinetic Modelling, standard KT/V, PRU (percentage reduction of urea) equivalent renal clearance, dialysis product
      ii. Haemofiltration: PCR, clearance and Kt/V
      iii. PD: PET (peritoneal equilibration test)
   b) **Compartment models** and their use in RRT:
      i. Basics of compartment model mathematics (open and closed compartment systems)
      ii. Single-pool and multiple-pool kinetic models
      iii. First-order kinetics
      iv. differences for protein bound substances
   c) **Methods and devices** for measuring adequacy of dialysis:
      i. urea enzyme methods
      ii. Na substitution method for urea
      iii. aliquot method for pooled dialysate collection
5. **Access Assessment Techniques and Technologies**
   a) **Types of access:** fistula, vascular graft, catheters, other access devices
   b) **Evaluation of blood flow** through vascular access (Doppler techniques, ultrasonic techniques, blood flow dilution techniques)
   c) **Recirculation measurement** (concentration and dilution techniques),
   d) **Impact of recirculation** on dialysis efficiency (including cardiopulmonary recirculation theory)
6. **Anticoagulation**
   a) **Coagulation cascade:** review
   b) **Theory of anticoagulation:** indications, risks, methods of anticoagulation (systemic, extracorporeal heparinization, no heparinization - NS flushes)
   c) **Types of anticoagulants:** heparin, low molecular weight heparin, citrate, coumadin
   d) **Interpretation of coagulation times:** PT, PTT, INH, ACT **Device operation:** ACT devices
7. **Complications of Haemodialysis**
   a) **Complications related to the extra corporeal circuit:** air embolism, blood leak, exsanguinations
   b) **Complications related to the dialysate:** haemolysis, crenation
   c) **Complications related to the dialyser:** type 1 and 2 reactions
   d) **Complications related to the access:** thrombosis, stenosis, steal syndrome, aneurysm/ pseudo-aneurysm, access re-circulation, needle infiltration, access infection
   e) **Complications related to the therapy:** hyper/hypotension, cramps, nausea/vomiting, headache, chest and back pain, febrile reactions, pruritus, dialysis disequilibrium syndrome, arrhythmias, cardiac tamponade/pericarditis/arrest, hypoxemia, stroke
   f) **Complications related to long term exposure** to low level contaminants and chemicals used in dialysis treatment

8. **Applied Chemistry**
   a) **Basic principles:** ions and molecules, principles related to pH, molecular weight, calculations
   b) **Application of principles of conductivity to dialysate solution:** analysis of solutions pre-treatment and safety considerations
   c) **Molecular structure and function of molecules in blood:** sugars, lipids, electrolytes, amino acids, blood proteins, hormones, enzymes and immunoglobulins
   d) **Normal electrolyte levels:** normal values, acceptable values in CKD
9. **Applied Microbiology**
   a) Chain of infection
   b) Pathogens in the dialysis environment: common and multiple resistant organisms, characteristics of the organism
   c) Symptoms of infection: local and systemic
   d) Methods to control spread of infection by hospital personnel
   e) Aseptic technique
   f) Category specific and disease specific isolation
   g) Universal precautions
   h) Controlling contamination of dialysis equipment & water treatment system
10. **Professional Practice**
   a) Criteria for professional practice: due diligence, advanced knowledge, on-going education
   b) Confidentiality and consent
   c) Professional self regulation: (code of conduct), responsibilities for reporting incompetence or malpractice
   d) Roles of professional associations: provincial/national engineering technology associations, Canadian Association of Nephrology Nurses and Technologists (CANNT)
   e) Standards of Technical Practice for CANNT
   f) Cultural and gender sensitivity

5.5 Composition of Examination Assessment Instrument

The Board acquires examination questions from the certified membership body. A sub team of The Board is established to review the various sections of the exam and refresh the questions using accepted psychometric principles. The questions are reviewed to ensure:

- That they are consistent with job analysis and the defined body of knowledge (Section 5.4).
- Those questions related to Safety & Standards specifically are worded consistently with the related section in the standard or regulation.
- That there is not a double negative in the question.
- That the answer can be derived without the use of multiple complex formulas.
- That the question is at the appropriate degree of difficulty.
- That the answer is not so obvious that the candidate can guess and be consistently correct.
- That there is only one correct answer.
- That there are no duplicated questions.
- That there is not a bias to any specific area of the role that would provide an unfair weighting of the examination results.

5.6 Study Guide

The Board shall have a study guide available of sample questions for the candidate to review. The questions will be similar in structure to those in the examination with answers provided for reference. The question bank may be used as the source of a question in the Study Guide on condition that the question is not used within the current exam.

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The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians

Le Jury Canadien D'Accréditation en Génie Biomédical et Dialyse Pour Les Technologues et Les Techniciens

Appendix A

INFORMATION AND APPLICATION FORM FOR BIOMEDICAL ENGINEERING AND DIALYSIS TECHNOLOGIST AND TECHNICIAN CERTIFICATION

(CANADA)

Thank you for your interest in the Canadian Biomedical Engineering and Dialysis Technology Certification Programme. In this document you will find programme information, eligibility requirements, examination format, application procedure, and the table of fees.

Introduction

The International Certification Commission (ICC) has a membership, which provides broad representation of relevant members of the health care community. It includes representatives from engineering, medical, industrial, and government groups and agencies. It supervises the certification of biomedical engineering technologists and technicians, clinical engineers, and other related specialists through the organization of examining boards.

As guided by the International Certification Commission, the Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians (The Canadian Board) considers that a biomedical engineering technologist or technician is a person knowledgeable in the theory of operation, the underlying physiologic principle, and the practical, safe, clinical application of biomedical equipment. His/her capabilities may include installation, calibration, inspection, preventative maintenance, repair, modification, design and development of general biomedical and related technical equipment, and in equipment control, safety and maintenance.

As guided by the International Certification Commission, the Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians (The Canadian Board) considers that a Dialysis technologist or technician is a person knowledgeable in the principles of dialysis and utilizes technical, scientific and clinical knowledge in operating and maintaining dialysis equipment so that the long-term outcomes of the patient are optimized and complications reduced. The dialysis technologist assumes primary responsibility for medical devices used in the delivery of renal replacement therapies, including but not limited to: dialysis machines, reprocessing equipment, water treatment equipment, artificial kidneys and blood lines, and the setup of dialysis equipment in and off unit, including home installations. Additionally, the dialysis technologist may assume responsibilities for medical devices not strictly related to the Nephrology Program in the hospital, encompassing special therapies such as: continuous arterio-venous haemofiltration (CAVH) and apheresis. The role of the dialysis technologist also includes the teaching of staff and individuals with renal failure, the development and maintenance of quality assurance programs with reference to the activities listed above, administrative and research activities appropriate to the specialty.

Eligibility

The basic eligibility requirement for being examined for biomedical engineering or dialysis certification is the candidate's registration with their provincial association as a certified engineering technologist (CET or Applied Science Technologist (AScT)) or technician (CTech) as recognized by The Canadian Council of Technicians and Technologists (CCTT), with a minimum number of years of related experience.

5. A certified member, in good standing, of a provincial association of engineering technicians and technologists, recognized by the Canadian Council of Technicians and Technologists.
6. The candidate shall have a minimum of 3 years practical experience as a biomedical engineering, or dialysis technologist or technician in a clinical/hospital environment, OR Candidates, who are graduates of a recognized biomedical post-secondary program, accredited by the Canadian Technology Accreditation Board (CTAB), and/or recognized by The Board, will be allowed to count a maximum of 1-year internship period as part of the 3-year requirement.
7. It is not necessary that the candidate be currently employed by a hospital, but it is required that the candidate have the above experience.

8. The applicant shall submit the names of at least 5 references for the biomedical engineering technologist/technician, 3 references for the dialysis technologist/technician. These references must be health care professionals who are familiar with the individual's competence in the following areas:

    a. Technical ability

    b. Clinical experience interfacing with physicians

    c. Clinical experience interfacing with nursing staff

    d. And 2 others who have knowledge of the candidate's work experience.

    Note: If a physician reference (b) is not available, include an additional nursing reference (c).

    The names of references are requested on the application form. Confidential questionnaires will be sent to the referees by the Secretariat. These forms are returned directly to the Secretariat.

Certification Process

The process is as follows:

10. Upon receipt of completed application form and fee, the candidate will receive a receipt of payment, which will indicate that the candidate's file has been activated.

11. The Secretariat will send out reference requests to the references indicated on the candidate's application form.

12. Upon receipt of these completed references, the candidate's file is directed to the Board of Examiners for review. The Board will determine if the candidate meets the requirements for examination, or if additional information, or further study is required.

13. When the Secretariat has been advised of the candidate's acceptance for examination, a proctor will be appointed to oversee the written examination. The proctor will be a qualified examiner in the candidate's city/town, or as close as possible. The candidate shall have made arrangements with the proctor and written the exam within two (2) years of the acceptance date.

14. BMET examination candidates will be given eight (8) hours to complete the BMET examination. The use of hand-held scientific calculator (no calculators that allow text storage or formulation(s)) and one 7.6 cm by 12.7 cm card with formulas is allowed for the BMET examination. The card shall only contain formulas (no text) on both sides and shall have a font size of not less than 8 pitch. Calculators that are included as part of cellular phones, or other electronic communication devices will not be permitted. The formula card must be handed in together with the completed exam.

Dialysis examination candidates will be allowed three (3) hours to complete the dialysis examination. The use of a scientific calculator is permitted. Calculators that are included as part of cellular phones, or other electronic communication devices will not be permitted. No cue cards or other aids are permitted for dialysis examination candidates.

15. Upon successful completion of the written examination, the Board will advise the candidate of the results. The Board then makes its recommendation to the International Certification Commission, and a Certificate will be issued.

16. If the BMET candidate has not achieved a passing mark on the BMET exam, he/she will be given a time period to study in the area(s) of weakness, and then be given the opportunity to rewrite a supplementary examination that focuses on this area.

17. If the dialysis candidate is not successful on the exam, the entire examination can be re-written.

18. The candidate's Certificate is sent to the Canadian Board Chairman for signature and the candidate will be consulted as to whether he/she wishes it to be sent to their supervisor for presentation, or directly to him/herself.

Examination

The purpose of the examination process is to measure, in a standardized and unbiased manner, the ability of the candidate to apply the knowledge and skills in the role of a professional. Passing a certification examination establishes that the individual is minimally competent to work unsupervised in a given field or profession. The certification does not mean that an individual knows everything required to be considered an expert in a given field.

There is one exam in Canada for both biomedical engineering technologists and biomedical engineering technicians, (as determined by the candidate's provincial certification). Throughout this text the acronym "BMET" refers to both biomedical engineering technologists and technicians.

For dialysis certification, one examination is also used for both technologists and technicians (as determined by the candidate's provincial certification). Throughout this text the acronym "cdt" refers to both dialysis technologists and technicians.

Examination Content

The content of the examination is based on the following premises:

BMET Examination

The BMET must be able to communicate intelligently with physicians and other hospital staff members in matters involving the operation and patient interface of medical devices. Also, in order to fulfill his/her responsibilities in the area (e.g. in the area of safety and device performance), s/he must have a reasonable knowledge of anatomy and physiology. The knowledge should include familiarity with terminology and body functions/systems.

The BMET should possess a broad knowledge of equipment and laboratory instrumentation used in a clinical setting. His/her knowledge should include, but not be limited to, the theory of operation, clinical application, safety requirements, regulations and standards relating to physiological monitors, analytical laboratory instruments, vacuum and gas pressure vessels and controls, anaesthesia equipment, information systems interfaces, ventilators, imaging devices (including MRI, CT, PET, X-Ray and ultrasound), physiological instruments, electrosurgical units, lasers (YAG, CO2, etc), renal dialysis, non-invasive surgical instruments…..etc.

The BMET should be able to perform theoretical troubleshooting, using schematics, for equipment ranging from the simple fibre optic light source to the microprocessor based electromyography. The BME Technologist should also possess basic management and supervisory skills.

cdt Examination

The Dialysis technologist or technician is a person knowledgeable in the principles of dialysis and utilizes technical, scientific and clinical knowledge in operating and maintaining dialysis equipment so that the long-term outcomes of the patient are optimized and complications reduced. The dialysis technologist assumes primary responsibility for medical devices used in the delivery of renal replacement therapies, including but not limited to: dialysis machines, reprocessing equipment, water treatment equipment, artificial kidneys and blood lines, and the setup of dialysis equipment in and off unit, including home installations. Additionally, the dialysis technologist may assume responsibilities for medical devices not strictly related to the Nephrology Program in the hospital, encompassing special therapies such as: continuous arterio-venous haemofiltration (CAVH) and apheresis. The role of the dialysis technologist also includes the teaching of staff and individuals with renal failure, the development and maintenance of quality assurance programs with reference to the activities listed above, administrative and research activities appropriate to the specialty.

Examination Format

The BMET examination is divided into two parts. The first part is in multiple-choice format and includes five (5) sections that cover the topics of:

- Anatomy and Physiology
- Electronics
- Medical Instrumentation
- Troubleshooting
- Canadian and other recognized standards.

The second part contains Essay questions pertaining to the practice and organizational management of Biomedical Engineering Programmes.

The content of **the dialysis examination** covers the Critical and Supporting Competencies.

The **critical** competencies are:

9. Water Treatment
10. Dialysis Membrane Technology
11. Basic Principles of Dialysis
12. Haemodialysis Systems Components
13. Dialysis Electrical and Electronic Systems
14. Computer Systems
15. Haemodialysis On-line Technologies
16. Safety Standards and Directives

The **supporting** competencies are:

11. Renal anatomy/physiology & pathology
12. Treatment modalities
13. Dialyser Re-processing
14. Assessment of Dialysis Adequacy
15. Access Assessment Techniques and Technologies
16. Anticoagulation & Coagulometric Technologies
17. Complications of Haemodialysis Treatment
18. Applied Chemistry
19. Applied Microbiology
20. Professional Practice

Examination Pass Mark

For the **BMET examination**, a minimum mark of 50% is required in each of the six (6) sections. 75% of the marks gained in the first five (5) sections, plus 25% of the mark gained in the essay section, will constitute the final mark attained. The final mark attained must equal or exceed 60%, with each of the six (6) sections receiving a mark of 50% or more, for a pass to be granted.

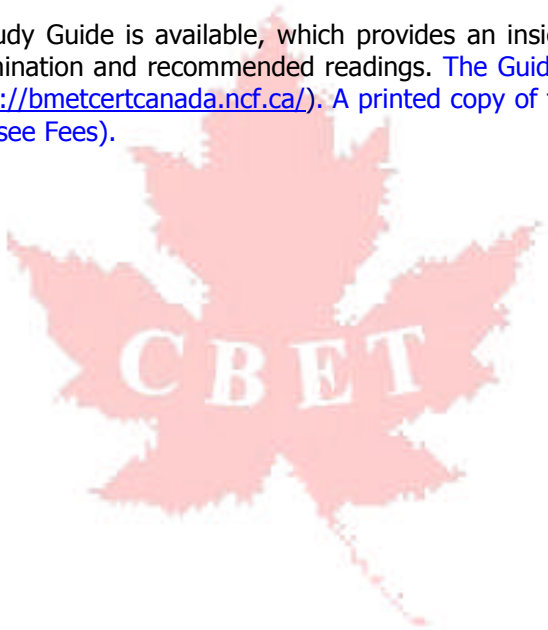
For the **cdt examination** a minimum mark of 70% is required for a pass to be granted.

Examination Location

The Board will also make every effort to provide examinations in a location that the candidate might easily access. The examination site should provide appropriate testing conditions including good lighting, large desk, lack of noise, and a nearby rest room. The examination date will be a mutually agreeable date between the candidate and the examination proctor or supervisor. The examination may begin no earlier than 0800 hours and no later than 1300 hours (full examination only).

Study Guide

A Study Guide is available, which provides an insight into the examination by means of a mini sample examination and recommended readings. The Guide may be downloaded at no cost from the Web page (http://bmetcertcanada.ncf.ca/). A printed copy of the Study Guide is available from the Secretariat for a fee (see Fees).



Application

A BMET Certification Application form must be completed. Curriculum Vitae are not acceptable in lieu of the completed form. This application form is directed to The Board Secretariat. The Secretariat will obtain the applicant's references and send the application together with the references to The Board of Examiners for review.

Application Review

The application will be reviewed by three (3) board members and they will decide whether or not the applicant is qualified to take the examination based upon the eligibility requirements. The applicant is then informed of his/her eligibility to take the examination.

If the Board does not recommend testing, the applicant is informed and s/he may choose to follow the appeal procedure.

Application Appeal Procedure

The Secretariat submits the candidate's application for review by the Chairperson of The Board. The Chairperson will undertake a review of the application that is consistent with the intent of the original application review.

Fees

Application (Examination) Fee

The application fee is subject to annual review. This fee is non-refundable after the candidate has been accepted for examination. The fee is to cover the cost of processing the candidate's application and one examination session (if the candidate is determined eligible to test for certification). If, after the receipt of references and review by the Board, it is decided that the candidate is not eligible for examination, the candidate's fee will be refunded, less an administration fee to cover costs to that point. The Examination Fee will be reviewed on an annual basis and adjusted as required to cover the costs associated with maintaining The Board.

Certification Renewal Fee

An annual renewal fee, for maintaining an active status as a Certified Biomedical Engineering Technologist/Technician or Dialysis Technologist/Technician is payable. Renewal Fees are due in the month of January immediately following successful completion of the examination and in January of each year thereafter. The renewal fee will be reviewed on an annual basis and adjusted as required to cover the costs associated with maintaining The Board. The Fee Schedule lists the amounts involved in the process.

Fee Schedule

EXAMINATION FEE	**$175.00**
REFUND (if not accepted for examination)	**$130.00**
SUPPLEMENTAL EXAM (per section for BMET, re-write for cdt)	**$60.00**
ANNUAL RENEWAL FEE	**$50.00**
ANNUAL RENEWAL FEE (retired status)	**$25.00**
STUDY GUIDE (Hard Copy)	**$20.00**

APPLICATION FORM FOR BMET/cdt CERTIFICATION

INSTRUCTIONS

To avoid delays in processing your application, fill out the application form clearly, accurately and completely.

Your eligibility for certification will be judged on:

- The information you provide on this application form
- The opinions of your references
- The results of your written examination

Be sure to:

- Sign the statement at the bottom of this page
- Include the examination fee (C$175) with your completed application
- **For the BMET examination** make cheques payable to : BMET CERTIFICATION CANADA
- **For the cdt examination** make cheques payable to : CANADIAN DIALYSIS CERTIFICATION COMMITTEE

Mail the completed application form to:

BMET Certification Canada
97 Pheasant Run Drive
Nepean, ON
K2J 2R3 Canada

CANDIDATE'S STATEMENT

I,(PRINT NAME)_____, certify that all information that I have entered on this application form, and any accompanying documents, is correct. I understand that any misrepresentation may result in the rejection of this application, or the revocation of any certificate issued as a result of this application. I am also aware that any certification that I may receive from the Certification Commission will not constitute, and shall not be construed as, a license. I authorize, and release from all liability, the Certification Board of Examiners (Canadian) in doing so, to make any enquiries that are necessary in ascertaining my eligibility for certification.

Signature of Applicant _____ Date _____

PERSONAL INFORMATION (PLEASE PRINT)

NAME: _____
(As you wish it to appear on your certificate)

Salutation: Miss ☐ Ms. ☐ Mrs. ☐ Dr. ☐ Mr. ☐ Check one only.

HOME ADDRESS:_____
Street City Province Postal Code

HOME TELEPHONE:_____ HOME E-MAIL:_____
Area Code Number

PRESENT EMPLOYER:_____

WORK ADDRESS: _____
Street City Province Postal Code

DEPARTMENT:_____ CURRENT POSITION:_____

WORK TELEPHONE:_____ WORK E-MAIL:_____
Area Code Number

NAME AND TITLE OF IMMEDIATE SUPERVISOR:_____

SEND PERSONAL LETTER MAIL TO: HOME ☐ WORK ☐

SEND PERSONAL ELECTRONIC MAIL (E-MAIL) TO: HOME ☐ WORK ☐

NAME OF PROVINCIAL ASSOCIATION OF TECHNICIANS/TECHNOLOGISTS WITH WHICH YOU ARE CERTIFIED:_____

DATE OF JOINING THIS ASSOCIATION:_____ MEMBERSHIP NUMBER:_____

TITLE:_____ CLASSIFICATION:_____
TECHNICIAN OR TECHNOLOGIST? C.E.T., A.Sc.T., ETC.

OFFICE USE ONLY

	NAME OF SCHOOL	LOCATION	PROGRAMME	FROM	TO	DEGREE
High School						
Technical Institute						
College						
Other						

BIOMEDICAL ENGINEERING/DIALYSIS EXPOSURE

During any part of your formal education, were you exposed to working in a biomedical engineering/Dialysis environment (internship), which was included in the curriculum?

☐ Yes ☐ No

If "Yes", please list dates, institution and a brief description of the work you performed:

_____

_____

Have you attended any major biomedical/dialysis conferences, seminars, or meetings sponsored by an accredited organization?

☐ Yes ☐ No

If "yes", please list:

Date Event Sponsor

_____

_____

_____

_____

_____

List your major disciplinary interests in the field of biomedical technology (e.g. Haematology, Respiration, Cardiology, etc..)

_____

_____

_____

_____

Upon successful completion of the Certification Examination process you may opt for your name to be listed on the ICC Web site as a Canadian Certified Biomedical Engineering/Dialysis Technologist/Technician.

I wish my name to be listed on the ICC Web site ☐ Yes ☐ No

Note that the default of "Yes" will be applied if you fail to complete this section.

EMPLOYMENT HISTORY

Dates			Start with your most recent employment and account for each year since High School. Include the name and location of your employers, titles of your positions and descriptions of your duties. If more space is required add a separate sheet.
From Mo. Yr.	To Mo. Yr.	Total Time Yrs. Mos.	

OUTSTANDING ACHIEVEMENTS

Attach a separate sheet to describe any outstanding achievements on your part that you feel the Board of Examiners should evaluate when considering your application. This could include publications, special projects, incident investigations, research projects, safety programmes, etc..

REFERENCES

For BMET and Dialysis applicants, list the names and contact information (PLEASE PRINT) of three (3) health care/engineering professionals who may be consulted for the purpose of providing references in the following areas:

a. technical ability
b. clinical experience interfacing with physicians
c. clinical experience interfacing with nursing staff
d. for BMET applicants only, add two (2) others, in the shaded area below, who have knowledge of your work experience

Note: If a physician reference (b) is not available, replace (b) with a second nursing reference (c)

Obtain permission to use the references that you provide and inform them that they will be requested to complete a questionnaire, which will be sent to them via e-mail (preferred) or surface mail.

REF. a NAME & TITLE:_____ POSITION_____
ORGANIZATION:_____
ADDRESS:_____
Street City Province Postal Code

TELEPHONE:_____ E-MAIL:_____
AREA CODE NUMBER

REF. b NAME & TITLE:_____ POSITION_____
ORGANIZATION:_____
ADDRESS:_____
Street City Province Postal Code

TELEPHONE:_____ E-MAIL:_____
AREA CODE NUMBER

REF. c NAME & TITLE:_____ POSITION_____
ORGANIZATION:_____
ADDRESS:_____
Street City Province Postal Code

TELEPHONE:_____ E-MAIL:_____
AREA CODE NUMBER

REF. d1 NAME & TITLE:_____ POSITION_____
ORGANIZATION:_____
ADDRESS:_____
Street City Province Postal Code

TELEPHONE:_____ E-MAIL:_____
AREA CODE NUMBER

REF. d2 NAME & TITLE:_____ POSITION_____
ORGANIZATION:_____
ADDRESS:_____
Street City Province Postal Code

TELEPHONE:_____ E-MAIL:_____
AREA CODE NUMBER

Appendix B

RELEASE OF INFORMATION

Requestor's Information:

I, (PRINT NAME)_____,

request the certification status of ,(PRINT NAME)_____,

for the purpose of

_____

_____

_____

I declare that I,(PRINT NAME)_____, will use this personal information in accordance with all applicable laws including the Protection of Personal Information and Electronic Documents Act (PIPEDA) of Canada and their applicable regulations.

NAME & TITLE:_____ POSITION_____

ORGANIZATION:_____

ADDRESS:_____

Street City Province Postal Code

Signature _____ Date _____

Member's Permission:

I, (PRINT NAME OF MEMBER)_____, give permission for The Canadian Board of Examiners for Biomedical Engineering and Dialysis Technologists and Technicians. to release personal information related to my certification to the above requestor.

NAME & TITLE:_____ POSITION_____

ORGANIZATION:_____

ADDRESS:_____

Street City Province Postal Code

Signature _____ Date _____

Released Information (for office use only):

- ☐ Certified Member in Good Standing
- ☐ Certification lapsed
- ☐ No record of Canadian Certification

Signature _____ Date _____

(PRINT NAME)_____

Appendix C

GUIDELINES FOR EXAMINATION PROCTORS AND EXAMINATION SUPERVISORS

1. The examination site should provide appropriate testing conditions including good lighting, large desk, lack of noise, and a nearby rest room
2. To protect the security of the examination, the examinee should be closely monitored by the proctor who must remain at all times in the examination room, or in an adjacent room where security can still be adequately maintained. The proctor may appoint a replacement supervisor to substitute from time to time if necessary (provide name(s) to the Secretariat)
3. The examination may begin no earlier than 0800 hours and no later than 1300 hours (full examination only)
4. The examinee will be given up to eight (8) hours (full examination), or two (2) hours (supplemental examination), as required, to complete the BMET examination. The examinee may only leave the room to go to the rest room. Lunch break may be taken in the room, if the examinee desires, and he/she may be advised to bring a lunch. At the discretion of the proctor, the candidate may go out to lunch with the proctor, after the examination papers have been appropriately secured.

   Three (3) hours are given for the dialysis examination. Because of this concentrated period of time, no food is permitted in the room, unless medically necessary. Beverages may be brought in provided they are in a closed container.
5. The examination proctor or supervisor must maintain appropriate security of the examination documents at all times. If the security of the examination is compromised in any way, or if there is a suspicion that the security of the examination has been compromised, please inform the BMET Board Secretariat at once at the number shown below.
6. The proctor or supervisor must ask each examinee entering the room for personal photographic identification. A driver's licence, birth certificate or Company I.D. card are acceptable.
7. The proctor should confirm that the examinee's full name matches that printed on each page of the examination.
8. The BMET examinee may bring a hand held calculator and/or list of equations to the BMET examination. The list should be on a paper or card no larger than 7.6 cm by 12.7 cm and should contain equations, not words. Both sides of the paper or card can be used for listing. The dialysis examinee may not use any cue cards for the dialysis examination.
9. The examinee must not have any form of communicating device (cell telephone, Blackberry, pager, camera etc.) on his person whilst writing the examination.
10. The examinee should clearly mark answers in the boxes provided on the multiple-choice section of the examination in pencil.
11. For the full BMET examination, the proctor should emphasize that there are two essay questions to be answered, after the completion of the multiple-choice section.
12. The proctor or supervisor may not answer any technical questions concerning the examination, but may answer questions about examination procedures.
13. All pages of the exam, including any allowed list of equations, plus any additional sheets of paper requested by the examinee, must be collected by the proctor and placed into the addressed envelope provided prior to mailing.
14. Note that proctors and supervisors will not be eligible to take the BMET examination for four (4) years from the date of the examination supervised or proctored.
15. Call the BMET BOARD SECRETARIAT if you have any questions about proctoring or supervising the BMET Certification Examination. Telephone: (613) 823-9447 (0900 – 1700 EST)

Appendix D

BMET CERTIFICATION EXAMINATION SCORING SHEET

60 % is the minimum for overall pass. 75% of the mark will be from Part I (multiple-choice sections) of the exam and 25% from Part II (essays).
For Part I, 1 point is given for each correct answer and 0 for an incorrect answer, or no answer.
A minimum score of 50% per section area and essay questions must be attained.

CANDIDATE'S NAME: **Name** Exam No: **000** Exam Date : **Date**

Name of 1st marker :	Name	Name of 2nd marker :	Name

PART I

SEC	MULTIPLE CHOICE	Q'S	PASS MARK	# CORRECT		# WRONG		% CORRECT		PASS=P REWRITE=X	
				Marker 1	Marker 2	Marker 1	Marker 2	Marker 1	Marker 2	Marker 1	Marker 2
1	Anatomy & Physiology	1-21	11/21								
2	Basic Electronics	22-44	12/23								
3	Medical Instrumentation	45-69	13/25								
4	Safety & Standards	70-95	13/26								
5	Troubleshooting	96-117	11/22								
TOTALS										**A =**	

NOTE : A = THE FINAL % SCORE OF PART 1 OF THE EXAM. BOTH MARKERS' SCORES MUST AGREE BEFORE A SCORE CAN BE GIVEN

SIGNATURE OF 1st MARKER :		SIGNATURE OF 2nd MARKER :	

PART II

ESSAY	MARK	SIGNATURE 1ST MARKER	MARK	SIGNATURE 2ND MARKER	AVG
ESSAY #1 = Q	/10		/10		/10
ESSAY #2 = Q	/10		/10		/10
TOTAL	/20		/20	**% MARK B=**	/20

MULTIPLE CHOICE (PART I)		**ESSAYS (PART II)**		**FINAL MARK**	
[(SCORE A)	**x 0.75]**	**+ [(SCORE B)**	**x 0.25]**	**=**	**%**

Date Examination Marked : 1st Marker_____ 2nd Marker_____

RECOMMENDATION : _____

Appendix E

CDT CERTIFICATION EXAMINATION SCORING SHEET

CANDIDATE'S NAME: **name** Exam No: **000** Exam Date : **date**

Name of 1st marker :	1st marker	Name of 2nd marker :	2nd marker

Total Score Attainable	**Score Attained**		**% CORRECT**		**PASS=P FAIL=X**
	Marker 1	Marker 2	Marker 1	Marker 2	

NOTE : BOTH MARKERS' SCORES MUST AGREE BEFORE A PASS OR FAIL RESULT CAN BE GIVEN.

AT LEAST 70% OF THE TOTAL SCORE ATTAINABLE MUST BE ACHIEVED FOR A PASS TO BE GRANTED.

SIGNATURE OF 1st MARKER :		SIGNATURE OF 2nd MARKER :	

Date Examination Marked : 1st Marker_____ 2nd Marker_____

RECOMMENDATION : _____

Appendix F

PROCTOR SIGN OFF SHEET.

I _____ will make every effort to preserve the integrity of the examination process by keeping the exam package sealed until examination time, keeping the exam stored securely at all times, not reproducing any part of the examination, returning all examination materials and additional papers to The Board secretariat via courier or registered mail. Additionally, I will inform The Board secretariat, in writing, if there was any concern that the integrity of the examination was breached during the period of my control. As a proctor, I understand my role and will not make any effort to mark or grade the candidate's exam unless specifically requested from The Board.

_____ _____

Signature Date