The Canadian Society of Clinical Perfusion

La Société Canadienne de Perfusion Clinique

cscp.ca

NATIONAL CERTIFICATION EXAM
Candidate Manual

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GENERAL INFORMATION:

PURPOSE OF CSCP NATIONAL EXAMINATION

- Accredited and standardized testing that helps ensure competency of each perfusionist that wishes to practice within Canada.
- Highlights knowledge gaps which are then conveyed to the educational programs in order to update curriculum as demographics and clinical practice continue to evolve.

THE ACE COMMITTEE

- Accreditation, Competency and Examination Committee
- Five or six CSCP certified members representing both pediatric and adult clinical perfusion practice from all regions across Canada.
- Responsible for:
    - Producing, invigilating and scoring the examination
    - Updating references cited for examination questions
    - Managing the examination question bank
    - Ensuring regulatory standards are upheld
    - Maintaining the integrity and standardization of the perfusion community within Canada

EXAMINATION INFORMATION:

GENERAL INFORMATION

- Applications will only be accepted for the current examination year.
- Application deadline is July 1st of the year a candidate plans on challenging the examination. *Applications sent after July 1st will not be accepted. No exceptions*.
- Should a candidate choose to cancel their registration for an examination, they must do so 30 days prior to the examination date. Where extenuating circumstances apply, a candidate may cancel their registration for an examination within 30 days of the examination date; a $200.00 CAD administrative fee will apply.
- All requests or questions must be sent in writing to the CSCP National Office: info@cscp.ca

ELIGIBILITY

- All applicants must have graduated from an accredited perfusion program.
- All applicants must be associate members in good standing of the CSCP.
- Full detailed eligibility criteria can be found at www.cscp.ca

APPLICATION PROCESS

- Application process is available on the CSCP website. Official transcripts from the educational program where they completed their perfusion education for an application to be complete.
- If a candidate's transcripts are not yet available when submitting their application, the candidate MUST submit an official letter from the educational program stating their successful completion of the program. Official transcripts must be submitted as soon as they become available and must be submitted by a September 30 deadline or the candidate will not be eligible to write the examination.
- Candidates are responsible for the accurate completion of their CSCP application form. Should a candidate's personal information change after submitting the application form to the CSCP, the candidate must notify the CSCP immediately. If a candidate fails to comply, the CSCP will not be responsible for any communications not received by the candidate.
- Once the application is accepted by the CSCP the candidate's information, including name, address, email is shared with ProctorU/Measure so they can create a profile and book the candidates test location.

EXAMINATION DELIVERY

- The examination will be administered online via ProctorU/Measure in testing centers near the candidate's home, as it is identified on their application.
- The exam will be in late October/early November. The exact date confirmed by August 1st.
- ProctorU/Measure is responsible for booking and communicating exam locations/start times with candidates.
- Information regarding accessing the testing center will be communicated by ProctorU/Measure.
- Some travel may be required, pending availability of local partnered testing centers. Candidates are responsible for costs associated with all travel.
- It is recommended that each candidate confirms their booking with the specific test center the week before the exam to ensure the correct start time and any specific rules that center has.

INSTRUCTIONS FOR CANDIDATES

- The examination consists of 175 multiple choice questions. Both individual patient and case-based patient questions will be asked.
- Each candidate will have 4 hours to complete the examination.
- No breaks will be scheduled during the examination. Candidates are allowed to step away from the exam for health breaks (ie washroom/snack) but their time does not stop during these breaks.
- The examination is available in both French and English. All candidates will have access to both languages.
- Candidates are expected to be at the examination location 20 minutes prior to the examination start time (or longer if it is required by the individual testing site, which will be communicated by ProctorU)

- Government issued photo ID is required to sign into the examination.
- If a candidate is less than 30 minutes late, they will be allowed to proceed with the exam, but no extra time will be allotted to make up for their tardiness.
- If a candidate is more than 30 minutes late, they forfeit their seat and are no longer eligible to write the examination. No reimbursements will be given to a candidate who is late.
- The exact examination location and time will be articulated to all eligible candidates well in advance of the examination date.
- All personal belongings will be secured by the testing site. Electronic devices are prohibited during the examination and must be powered off and stored away with other belongings. (Including, but not limited to, smart watches, cellphones, tablets, programable calculators…etc)
- Snacks are permitted during the examination, if allowed at the testing center. Candidates are responsible for checking the policies of the testing center to which they are assigned.
- Only basic function calculators are allowed. Programmable calculators are not permitted. If the candidate does not bring their own basic function calculator, one is available online within the exam platform.
- Paper and Pen or an erasable whiteboard are permitted to take notes during the exam. The staff of the center will confiscate the notes and ensure the whiteboard is clean prior to allowing the candidate to leave the testing center.
- Washroom breaks will be permitted as needed on an individual basis. The security of these breaks is monitored by the testing center staff. Candidates will not have access to their belongings during breaks. No additional time beyond the 4 hours will be allotted to those who require washroom breaks.
- Candidates are asked to fill in an evaluation form upon completion of the examination. These forms provide valuable feedback that is utilized to improve the examination and experience. Additional time will be provided at the end of the examination to complete the evaluation.
- Candidates are expected to adhere to the principles of intellectual and academic honesty during the examination.

EXAM PREPARATION

- Candidates should review the exam blueprint, competency profile and reference list when preparing for the exam.
- All content in the reference list is testable.
- Relying on notes from school lectures is not sufficient preparation.

RESULTS DELIVERY

- All candidates will receive their results by email within 30 days of writing the examination. Results will also subsequently be sent by registered mail.
- Results will state whether a candidate passed or failed. Candidates who fail will also be provided with a performance profile to highlight competencies that the candidate answered strongly, as well as the competencies that the candidate answered poorly.

EXAMINATION PILOT QUESTIONS

- Up to 5 questions on each exam are qualified as pilot questions. They are designed to gain statistical information on preparedness on certain topics. Following statistical analysis of the exam results, these questions may or may not be counted towards the overall score.

EXAMINATION SAMPLE QUESTIONS

1. What are the effects of Milrinone (Primacor)?
   a. Decreased SVR, increased PVR, decreased CO
   b. Increased SVR, decreased PVR, increased CO
   c. Increased SVR, increased PVR, decreased CO
   d. Decreased SVR, decreased PVR, increased CO

Competency Profile Classification: Planning & Clinical Decision Making 05 (PDM05)
Cognitive Domain Classification: Knowledge/Comprehension (K/C)
Reference: Hensley, 5th Edition, page 44

2. A patient who has A negative blood can receive which of the following blood products?
   a. A negative RBCs, A negative platelets, AB plasma
   b. A positive RBC's, A positive platelets, AB plasma
   c. O negative RBC's, AB positive platelets, A plasma
   d. O positive RBC's, AB negative platelets, A plasma

Competency Profile Classification: Clinical Practice 19(CP19)
Cognitive Domain Classification: Application (AP)
Reference: Canadian Blood Services, Chapter 9: Blood Administration, Table 1 and Table 2.

3. The pressure drop across a patient's ECMO oxygenator has increased from 30 mmHg to 150 mmHg over a period of one hour. What is likely to have caused this and what is the recommended solution?
   a. Hypovolemia; give volume
   b. Arterial cannula obstruction; reposition cannula
   c. Clot in the oxygenator; change ECMO circuit
   d. Shunting; reduce amount of bridge flow

Competency Profile Classification: Clinical Practice 22 (CP22)
Cognitive Domain Classification: Critical Thinking (CT)
Reference: ELSO Red Book, 5th Edition, page 71.

CSCP POLICY AND PROCEDURE:

ACADEMIC DISHONESTY

- Copying another candidate's answers.
- Utilizing unauthorized resources; smart gadgets, cheat sheets.

If a candidate is suspected of academic dishonesty, the following procedure will be followed:

1. The invigilators will communicate the incident to ACE committee chair overseeing the exam.
2. The suspected candidate(s) may or may not be allowed to complete the examination.
    a. This will depend on the degree of the infraction.
3. The suspected candidate(s) will be notified that they have been suspected of academic dishonesty.
4. If the academic dishonesty included unauthorized materials, said materials will be confiscated; this includes smart devices.
5. The ACE committee chair will fill out a "Notification of Academic Dishonesty Form" and will submit this to the Board of Directors within one day of the incident.
6. The Board of Directors will notify the candidate(s), in writing, of the repercussions within fourteen (14) days of receiving notice of the infraction.
7. The candidate(s) may appeal this decision to the Board of Directors.

ACCOMMODATION FOR SPECIAL NEEDS

- Candidates with special needs may request special accommodations and arrangements to write the examination. The examination must still be written on the same examination date as all other candidates.
- If a candidate requires accommodation for a physical, cognitive or other special need, they must complete the special accommodation application form (attached below) and submit this form to the CSCP when applying for the exam. All application and request forms **must be submitted to the CSCP by July 1st** of the year the candidate wants to challenge the examination.
    - Requests made after July 1st will not be granted.
- All requests for special accommodations must be supported with written verification of the nature and extent of the candidate's special needs from a licensed regulated health professional.
    - The individual's conditions which require special accommodation does not need to be explained, only what specific accommodations are required as they differ from the exam conditions described above.
    - The document must be written within the calendar year of the exam application.
- The Board of Directors may request to contact the health professional to confirm or clarify details listed on the form.
- Documentation from the educational institution that the candidate attended is required to confirm the ongoing need for accommodation.
- All special accommodation requests are subject to approval by the CSCP Board of Directors on a case by case basis.
- Candidates will be notified by telephone or email what the Board of Directors has decided. A formal letter will follow.
- Subject to review by the CSCP Board of Directors, candidates with approved special accommodations may incur additional charges depending on the nature of the accommodation.
- Criteria taken into account by the CSCP Board of Directors when requests for accommodation are considered include:
    - The needs of the candidate.
    - Preservation of the integrity of the examination.
    - The ability of the CSCP to provide appropriate resources.
- No accommodation request will be granted which jeopardizes the integrity and/or validity of the examination.

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914 Adirondack Road, London, Ontario, CANADA N6K 4W7
t: 1.888.496.2727 f: 1.866.648.2763 e: info@cscp.ca

Special Accommodation Application Form

Print or type all information

Surname First Name Middle Initial

Mailing Address

Apt. # City

Province/State Country Postal Code/Zip

Phone Number Email Address

Please indicate the school where the candidate received their Clinical Perfusion Education:

If similar special accommodations were provided by this educational facility, also submit confirmation of this from the school's special accommodation office.

Description of accommodations required:

Health care provider signature **Name(printed)** **date**

Title **Registration/license number** **province**

Signature of candidate Date

SUBMIT TO: CSCP National Office, 914 Adirondack Rd. London, ON. N6K 4W7 info@cscp.ca

cscp.ca

REFERENCE RANGES, CALCULATIONS AND TERMS:

BLOOD GASES

ADULT BLOOD GAS REFERENCE RANGE			
Parameter	Arterial Range	Venous Range	Units
pH	7.35-7.45	7.30-7.40	
pCO_2	35-45	40-50	mmHg
pO_2	80-100	35-40	mmHg
HCO_3^-	22-26	22-26	mmol/L
Base Excess	-2 to +2	-2 to +2	mEq/L
SO_2	93-97	70-75	%

Reference: "Egan's Fundamentals of Respiratory Care, 9th Ed." Wilkins, Stoller, Kacmarek 2009

BLOOD CHEMISTRY

ADULT BLOOD CHEMISTRY REFERENCE RANGE		
Parameter	Range	Units
Calcium (serum) Total	2.18-2.58	mmol/L
Calcium (serum) Ionized	1.05-1.30	mmol/L
Chloride	98-106	mmol/L
Cholesterol	< 5.2	mmol/L
LDL	< 3.37	mmol/L
HDL	> 0.9	mmol/L
Creatinine (Female)	50-90	µmol/L
Creatinine (Male)	70-120	µmol/L
Glucose (Fasting)	3.3-5.8	mmol
Magnesium	0.75-0.95	mmol/L
Osmolarity	280-300	mmol/kg
Potassium	3.5-5.0	mmol/L
Sodium	135-145	mmol/L
Urea Nitrogen (BUN)	2.5-8.0	mmol/L
Lactate	0.5-2.2	mmol/L

Reference: Medical Council of Canada website:
http://apps.mcc.ca/Objectives_Online/objectives.pl?lang=english&loc=values

ENZYMES AND COAGULATION

ADULT ENZYMES AND COAGULATION REFERENCE RANGE		
Parameter	Range	Units
ALT	3-36	U/L
AST	0-35	U/L
Troponin (TnT)	< 0.01	µg/L
International Normalized Ratio (INR)	0.9-1.2	
Partial thromboplastin time (PTT)	28-38	Sec
Prothrombin Time (PT)	10-13	sec
Fibrinogen	1.8-4.0	g/L

Ref: Medical Council of Canada website:
http://apps.mcc.ca/Objectives_Online/objectives.pl?lang=english&loc=values

HEMATOLOGY

ADULT HEMATOLOGY REFERENCE RANGE			
Parameter	Male	Female	Units
Hemoglobin (Hb)	140-174	123-157	g/L
Hematocrit (HCT)	0.42-0.52	0.37-0.46	
Red Blood Cells (RBC)	4.4-5.7	4.0-5.2	x 10^{12}/L
White Blood Cell Count (WBC)	4-10	4-10	x 10^{9}/L
Platelet Count (Plt)	130-400	130-400	x 10^{9}/L

Ref: Medical Council of Canada website:
http://apps.mcc.ca/Objectives_Online/objectives.pl?lang=english&loc=values

HEMODYNAMICS

ADULT HEMODYNAMICS REFERENCE RANGE		
Parameter	Range	Units
Systolic Arterial Pressure (SBP)	100-140	mmHg
Diastolic Arterial Pressure (DBP)	60-90	mmHg
Mean Arterial Pressure (MAP)	65-100	mmHg
Pulmonary Artery Systolic Pressure (PAS)	15-30	mmHg
Pulmonary Artery Diastolic Pressure (PAD)	4-12	mmHg
Mean Pulmonary Artery Pressure (MPAP)	9-16	mmHg
Pulmonary Capillary Wedge Pressure (PCWP)	2-12	mmHg
Central Venous Pressure (CVP)	0-8	mmHg
Systemic Vascular Resistance (SVR)	900-1400	dynes·sec·cm^{-5}
Pulmonary Vascular Resistance (PVR)	150-250	dynes·sec·cm^{-5}
Stoke Volume (SV)	60-130	ml/beat
Heart Rate (HR)	60-100	bpm
Cardiac Output (CO) or Flow (Q)	4-8	LPM

Cardiac Index (CI)	2.5-4	L/min/m^2
O_2 Consumption (VO_2)	200-300	ml/min

PHYSIOLOGIC CALCULATIONS AND FORMULAS

Parameter	Formula
Cardiac Output (L/min)	CO = HR x SV
Cardiac Index (L/min/m^2)	CI = CO/BSA
Mean Arterial Pressure (mmHg)	MAP = DBP + 1/3(SBP-DBP)
Systemic Vascular Resistance (mmHg)	SVR = [(MAP-CVP)/CO] x 80
Pulmonary Vascular Resistance (mmHg)	PVR = [(MPAP-PCWP)/CO] x 80
O_2 Consumption Modified Fick (ml/min)	$VO_2 = (CaO_2 – CvO_2) \times Q$
Stroke Volume (ml)	SV = CO/HR
Oxygen Delivery DO_2 (ml/min)	$DO_2 = CaO_2 \times CO$
Arterial Oxygen Content CaO_2 (ml/dl)	$CaO_2 = (Hb \times 1.34 \times SaO_2) + (PaO_2 \times 0.003)$
Mixed Venous Oxygen Content CvO_2 (ml/dl)	$CvO_2 = (Hb \times 1.34 \times SvO_2) + (PvO_2 \times 0.003)$
Cerebral Perfusion Pressure CPP (mmHg)	CPP = MAP - CVP
Total Blood Volume TBV	TBV = Patient Weight (kg) x Blood Volume Factor (ml/kg)
Adult Male Blood Volume Factor	75 ml/kg
Adult Female Blood Volume Factor	70 ml/kg
Pediatric Blood Volume Factor	80 ml/kg
Body Surface Area BSA (m^2)	BSA = √ [(Height(cm) x Weight(kg)) / 3600]
Hematocrit HCT	HCT = RBC / TBV
Hematocrit on CPB	CPB HCT = (Patient HCT x TBV) / (TPV+TBV+Pre-CPB IV fluid)
Red Blood Cells Required	RBC Req. = [(TBV +TPV)x(Desired HCT)] – [(TBV x Patient HCT)]
Transmembrane Pressure	$TMP=(P^{in}+P^{out})/2+$ Negative effluent P
3/16 inch tubing	5.4 ml/ft
1/4 inch tubing	9.65 ml/ft
3.8 inch tubing	21.71 ml/ft
1/2 inch tubing	38.61 ml/ft

Ref: Brodie, **The Manual of Clinical Perfusion,** 2nd ed., 1997, Glendale Medical

Gravlee, **CPB Principles and Practice**, 4th ed., Lippincott, Williams & Wilkins

ABBREVIATIONS AND SYMBOLS

- Any of these abbreviations or symbols may be present in the examination.

A			
a	arterial	AIDS	acquired immunodeficiency syndrome
A	alveolar	AP	anterior posterior
ABG	arterial blood gas	ALF	arterial line filter
ACLS	advanced cardiac life support	AR	aortic regurgitation
ACT	activated clotting time	ARDS	adult respiratory distress syndrome
ACS	acute coronary syndrome	AS	aortic stenosis
ADH	antidiuretic hormone	ASD	atrial septal defect
AG	anion gap	ATP	adenosine triphosphate
AI	aortic insufficiency	AV	atrioventricular
AICD	automated implantable cardioverter device	A-V	arterial venous
AVR	aortic valve replacement	ACP	antegrade cerebral perfusion
B			
BCLS	basic cardiac life support	BP	blood pressure
BE	base excess	BSA	body surface area
BMI	body mass index	BUN	blood urea nitrogen
C			
Ca^{++}	ionized calcium	COPD	chronic obstructive pulmonary disease
CABG	coronary arterial bypass graft	CPAP	continuous positive airway pressure
CaO_2	oxygen content of arterial blood	CPB	cardiopulmonary bypass
$C(a\text{-}v)O_2$	arterial to venous oxygen content difference	CPD	citrate phosphate dextrose
CHF	congestive heart failure	CPP	cerebral perfusion pressure
CI	cardiac index	CPR	cardiopulmonary resuscitation
Cl^-	chloride	CSCP	Canadian Society of Clinical Perfusion
cmH_20	centimeters of water pressure	CSF	cerebrospinal fluid
CNS	central nervous system	CT	computerized tomography
CO	cardiac output	CVA	cerebrovascular accident
CO_2	carbon dioxide	CvO_2	oxygen content of mixed venous blood
COHb or HbCO	carboxyhemoglobin	CVP	central venous pressure
COP	colloid oncotic pressure	CXR	chest x-ray
CEU	continuing education credits	cm	centimeter

D			
D5W	5% dextrose in water	DIC	disseminated intravascular coagulation
DHCA	deep hypothermic circulatory arrest	DO_2	oxygen delivery
E			
ECC	extracorporeal circuit	EEG	electroencephalogram
ECG	electrocardiogram	EF	ejection fraction
ECLS	extracorporeal life support	ER	emergency room/department
ECMO	extracorporeal membrane oxygenation		
F			
FFP	fresh frozen plasma	FiO_2	fraction of inspired oxygen
FP	frozen plasma	Fr	French (sizes)
G			
g or gm	gram	GME	gaseous microemboli
GI	gastrointestinal	GFR	glomerular filtration rate
H			
Hgb or Hb	hemoglobin	HCT	hematocrit
		HIT	heparin induced thrombocytopenia
HbF	fetal hemoglobin	HIV	human immunodeficiency virus
Hbmet	methemoglobin	HLHS	hypoplastic left heart syndrome
HCO_3^-	bicarbonate	HR	heart rate
I			
IAB	intraaortic balloon	ICU	intensive care unit
IABP	intraaortic balloon pump	iu	international unit
IBW	ideal body weight	INR	international normalized ratio of prothrombin time
ICD	implantable cardioverter defibrillator	IVC	inferior vena cava
ICP	intracranial pressure		
K			
kg	kilogram	K^+	potassium
L			
L	litre	LSPV	left superior pulmonary vein
LAD	left anterior descending artery	LSVC	left superior vena cava
LA	left atrium	LV	left ventricle
LAP	left atrial pressure	LVAD	left ventricular assist device
LAFA	left atrial femoral artery (bypass)	LVEDP	left ventricular end diastolic pressure
LVEF	left ventricular ejection fraction		

LHB	left heart bypass	LVSV	left ventricular stoke volume
LPM	litres per minutes	LVSW	left ventricular stroke work
M			
MAC	minimum alveolar concentration	MR	mitral regurgitation
MAP	mean arterial pressure	MUF	modified ultrafiltration
Mg^{++}	magnesium	mmol	millimole
MV	mitral valve	mL	millilitre
MI	myocardial infarction	mg	milligram
MIS	minimally invasive surgery	mcg (µg)	microgram
mEq	milli-equivalent		
mmHg	millimetres of mercury pressure (torr)	MS	mitral stenosis
MVR	mitral valve replacement	MVr	mitral valve repair
N			
Na^{+}	sodium	NO_2	nitrogen dioxide
NaCl	sodium chloride	N_2O	nitrous oxide
NaHCO3	sodium bicarbonate	NS	normal saline
NO	nitric oxide		
O			
O_2	oxygen	OR	operating room
P			
P	pressure	PG	prostaglandin
P50	partial pressure of oxygen at 50% HbO2	pH	standardized hydrogen ion activity
PA	pulmonary artery	PRBC	packed red blood cells
P(A-a)O2	alveolar to arterial oxygen gradient	PT	prothrombin time
PAC	pulmonary artery catheter	PTT	partial thromboplastin time
PAP	pulmonary artery pressure	PV	pulmonary valve
PAWP	pulmonary artery wedge pressure	PR	pulmonary regurgitation
PCWP	pulmonary capillary wedge pressure	PVC	premature ventricular contraction
PDA	patent ductus arteriosus	PVR	pulmonary vascular resistance
PEEP	positive end expiratory pressure	PVRI	pulmonary vascular resistance index
PFO	patent foramen ovale		
Q			
Qs/Qt	shunted cardiac output ratio	Qt	total cardiac output
Qp	Pulmonary blood flow	Qs	Systemic blood flow
R			
RA	right atrium	RDS	respiratory distress syndrome
RAP	retrograde autologous priming	RPM	revolutions per minute
RBC	red blood cell	RV	right ventricle
RCA	right coronary artery	RVAD	right ventricular assist device
S			

SaO_2	arterial oxygen saturation	SVC	superior vena cava
STEMI	ST elevation myocardial infarction	SVR	systemic vascular resistance
SvO_2	venous oxygen saturation	SVRI	systemic vascular resistance index
T			
T	temperature	TPV	total prime volume
TGA	transposition of the great arteries	TR	tricuspid regurgitation
TEG	thromboelastography	TV	tricuspid valve
TMP	transmembrane pressure	TT	thrombin time
TOF	tetralogy of fallot	TRALI	Transfusion related acute lung injury
TEE	trans-esophageal echocardiogram	TVR	tricuspid valve replacement
V			
V/A	veno-arterial	Vol%	concentration (percent per volume)
VAVD	vacuum assisted venous drainage	VSD	ventricular septal defect
VO_2	oxygen consumption per minute	V/V	V/V veno-venous
VAD	ventricular assist device		
W			
WBC	white blood cell		
Z			
ZBUF	zero-balance ultrafiltration		