CANADIAN REGISTRATION BOARD OF OCCUPATIONAL HYGIENISTS

ROHT (Registered Occupational Hygiene Technologist) Examination Handbook

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Section 1 – ROHT Examination Eligibility

Eligibility for the ROHT examination is based on having one of the following combinations of academic qualifications and professional experience:

1. Five years experience in occupational hygiene or related experience subsequent to receipt of a high school diploma.

    a. Completion of a community college occupational hygiene technology program may be accepted as equivalent to up to 2 years of experience.

    b. Completion of a community college program in a related science or engineering field may be accepted as equivalent to up to 1 year of experience.

    c. Completion of an equivalent of 2 years of a university undergraduate program of related sciences or engineering courses may be accepted as equivalent to up to 1 year of experience.

2. More than 50% of each year for which credit is claimed will be spent in occupational hygiene or closely related activities. Two references from ROH's or ROHT's or other similarly accredited persons must be provided.

Section 2 – ROHT Examination Format

The ROHT examination is a one day written examination consisting of multiple choice, short answer, and essay questions. The examination is administered concurrently with the annual offering of the ROH examination, and is a similar format to the ROH examination. There are two sessions, the first in the morning, and the second in afternoon. Both sessions run for a maximum duration of 3.5 hours.

Session 1 – Short Answer/Essay

This section consists of 2 full length essay questions and approximately 25 short answer/essay questions. Essay and short answer questions are individually weighted according to difficulty. All questions must be answered. Point form answers are not acceptable.

Session 2 – Multiple Choice

This section consists of approximately 150 multiple choice questions, all of equal value. The multiple choice section is designed to test factual and technical knowledge

of candidates. The short answer/essay section, in addition to testing breadth and depth of factual and technical knowledge, enables an assessment of problem solving and written communication skills.

Section 3 – Areas of Competency

Candidates for the ROHT examination are expected to be familiar with a broad range of occupational hygiene topics:

Basic Background Science

General concepts of chemistry, physics, mathematics, anatomy, physiology and biology as they relate to the discipline of occupational hygiene.

Regulations, Standards, Guidelines

General understanding of occupational health, safety and hygiene legislation in at least one Canadian jurisdiction. Understanding of relevant industry standards and guidelines from various sources (e.g. CSA, ANSI, NIOSH, ACGIH, ASHRAE).

Hazard Recognition and Effects

Understanding of general concepts of toxicology as well as potential health effects of chemical, physical, biological and ergonomic hazards in the workplace. This includes recognition of routes and symptoms of exposure.

Evaluation

Detailed understanding of the types of field instruments required for assessment as well as knowledge of exposure limits, analytical methods and related hygiene calculations.

Control

Understanding of the types and effectiveness of engineering, administrative and personal controls used to manage workplace hazards. Knowledge of ventilation calculations will also be required.

Miscellaneous

Understanding of training strategies, program and policy development, labour relations issues, related safety principles and statistical calculations.

Section 4 − Examination Preparation

Candidates should consider their knowledge and experience within the areas of competency listed below. This process may assist candidates in identifying their strengths and weaknesses, and enable them to suitably focus their efforts during examination preparation. Some examples of representative sample questions (multiple choice and short answer/essay style) and a listing of useful references in occupational
hygiene are provided.

Sample Multiple Choice Questions:

1. The compound hexane is an:
   a) alkane
   b) alkene
   c) olefin
   d) none of the above

2. Which instrument uses chemiluminescence?
   a) LEL detector
   b) Mercury detector
   c) Halide detector
   d) Ozone detector

3. The pressure in a container is 5 psi at 0 degrees Celsius. The cylinder is allowed to warm up to 60 degrees Celsius. What is the new pressure in the gas cylinder?
   a) 10 psi
   b) 6 psi
   c) 3 psi
   d) 20 psi

Sample Short Answer Questions

1. Classify the following three products under WHMIS:
   · Oxygen
   · Hydrogen Sulfide
   · Sodium Hydroxide

In each case, specify the hazard symbol(s), the class designation(s), and the name(s) of each class. Briefly describe the hazards and normal precautions associated with the handling of each product.

2. What is the diameter of a circular duct (in inches) if Q = 4000 cfm and the velocity pressure is 2.55" wg? Show all calculations in your answer.

3. The laboratory reports 130 micrograms of toluene desorbed from a charcoal tube. The sampling period was 15 minutes at a flow rate of 75 ml/min. What was the ambient concentration of toluene in ppm? Show all steps used in calculating your answer (assume MW = 92)

Sample Essay Question

Your company has recently moved into a newly renovated section of a high rise office building in downtown Calgary. Within a few weeks your department started to receive a number of complaints from building occupants. General complaints include eye and upper airway irritation, headaches, nausea, and stuffy building air. Some of the data processing group are also complaining of sore necks and wrists.

You suspect there may issues with indoor air quality in the building, and possibly some work station ergonomic issues with the data processing group. Map out a strategy for how you would assess each of these situations. In your answer briefly discuss the sources of information would you target to assist with problem analysis; the sampling protocol you would recommend (if any); and, subject to your findings, the principal control measures you would expect to include as part of your final report to management.

Section 5 – Examination Grading Process

The CRBOH Administrative Office (i.e. the Registrar) is responsible for ALL contact with examination candidates. This includes receipt of application forms, review and decision making regarding eligibility, examination location(s)/date/time/ and selection of proctors. The Administration Office assigns each candidate a Candidate Identification Number. In order to ensure that marking is carried out "blind", Examination Committee members do not have access to these identifiers.

The ROHT examination is marked by the ROHT Examination Committee. Multiple choice questions are marked by the Chair of the Examination Committee. The short answer/essay questions are marked independently by at least two members of the

Committee. The results are collated by the Chair and any anomalies or inconsistencies are reviewed. The minimum grade necessary to pass the ROHT examination is as follows:

Section 1 – Short Answer/Essay 50%
Section 2 – Multiple Choice 50%
Overall Combined Score 60%

The Chair of the Examination Committee forwards the results to the Registrar who in turn provides these to the Board of Directors with the recommendation from the Committee as to which candidates should be granted a pass or fail. All pass/fail recommendations from the Committee are subject to final approval by the Board of Directors.

Section 6 – Useful References in Occupational Hygiene

The following is a list of reference material to assist the candidate in preparing for the examination. Candidates are encouraged to use the most current editions available. This list is not intended to be complete or exhaustive. This list does not contain common Journals used in the field of occupational hygiene.

Manuals

1. Handbook of Chemistry & Physics
2. ACGIH Air Sampling Instruments
3. ACGIH Industrial Ventilation: A Manual of Recommended Practice
4. NIOSH Guide to Industrial Respiratory Protection
5. NIOSH Manual of Analytical Methods
6. NIOSH Occupational Exposure: Sampling Strategy Manual

Regulations, Standards, Guidelines

1. Occupational Health & Safety Legislation (Acts & Regulations) within at least one Canadian jurisdiction (provincial, territorial, federal), including WHMIS and TDG
2. TLVs: Threshold Limit Values and Biological Exposure Indices

Texts

1. Accident Prevention Manual for Industrial Operations; national safety council
2. Air Monitoring Instrumentation; C.J. Maslansky and S.P. Maslansky
3. Air Sampling Instruments, ACGIH
4. AIHA Noise and Hearing Conservation Manual
5. Building Air Quality; U.S. EPA and NIOSH
6. Bioaerosols: Assessment and Control: ACGIH Bioaerosols Committee;J. Macher
7. Casarette and Doull's Toxicology: The Basic Science of Poisons; C.D.Klaassen
8. Chemical Hazards of the Workplace; Proctor & Hughes
9. Ergonomics Design for People at Work, Volumes 1 and 2; Eastman KodakCompany
10. Fundamentals of Industrial Hygiene; B.A. Plog and T. Hogan
11. In-Plant Practices for Job Related Health Hazards Control, Volumes 1 and 2;L.V. Cralley and L.J. Cralley
12. Industrial Hygiene Management; J.T. Garrett, L.J. Cralley and L.V. Cralley
13. Modern Industrial Hygiene; J.L. Perkins
14. Noise and Noise Control; M.J. Crocker and F.M. Kessler
15. Practical Loss Control Leadership; F.E. Bird and G.L. Germain
16. Recognition of Health Hazards in Industry: A Review of Materials andProcesses; W.A. Burgess
17. The Dose Makes the Poison: A Plain Language Guide to Toxicology; M.A.Ottoboni

Workbooks

1. IAQ and HVAC Workbook; D.J. Burton
2. Industrial Ventilation Workbook; D.J. Burton
3. Occupational Health Workbook (formerly Industrial Hygiene Workbook); D.J. Burton

Section 7 − Useful Equations for CRBOH Examinations

i. General Practice and Statistics

$ppm = \dfrac{V_{contam}}{V_{air}} x\, 10^6$	$ppm = \dfrac{P_v}{P_{atm}} x\, 10^6$	$ppm = \dfrac{mg/\,m^3\ x\ 24.45}{m.w.}$	$\dfrac{P_1 V_1}{nRT_1} = \dfrac{P_2 V_2}{nRT_2}$
$LCL_{as} = \dfrac{TWA}{OEL} - SAE$		$pH = -\log_{10}[H^+]$	
$TLV_{mix} = \dfrac{C_1}{TLV_1} + \dfrac{C_2}{TLV_2} + ... + \dfrac{C_n}{TLV_n}$		$TLV_{mix} = \dfrac{1}{\dfrac{F_1}{TLV_1} + \dfrac{F_2}{TLV_2} + ... + \dfrac{F_n}{TLV_n}}$	
$\overline{X} = \dfrac{X_1 + X_2 + ... + X_n}{n}$		$SD = \sqrt{\dfrac{\sum(\overline{x} - x_i)^2}{n-1}}$	
$GSD = \dfrac{84.13\%tile\ value}{50\%tile\ value}$		$GSD = \dfrac{50\%tile\ value}{15.87\%tile\ value}$	
$SAE = 1.645\, CV_{total}$			

ii. Noise

$Lp = 20\left(\log \dfrac{P}{P_o}\right)$	$Lp_2 = Lp_1 + 20\log\left(\dfrac{d_1}{d_2}\right)$
$f_2 = \sqrt{2}\, f_1$	$f = \dfrac{(N)(RPM)}{60}$
$f = \dfrac{c}{\lambda}$	

iii. Ventilation

$Q = VA$	$V = 4005 \sqrt{VP}$ (imperial units) $V = 4.04 \sqrt{VP}$ (metric units)
$TP = VP + SP$	$VP_{ave} = (\dfrac{\sqrt{VP_1} + \sqrt{VP_2} + ... + \sqrt{VP_n}}{n})^2$
$N_{Changes} = \dfrac{60Q}{V_{room}}$	

iv. Radiation

$$I_2 = I_1 (\frac{d_1}{d_2})^2$$

v. Heat/ Cold Stress

$WBGT = 0.7\, t_{nwb} + 0.2\, t_g + 0.1\, t_{db}$	$WBGT = 0.7\, t_{nwb} + 0.3\, t_g$

vi. Constants

$gas\ constant, R = 8.314\, J/mole\ °K$	$molar\ vol\ at\ 25°C, 1\ atm = 24.45\, l$
$density\ of\ air = 1.2\, kg/m^3\ @\ 760\, mmHg,\ 21°C$	

vii. Conversions

$°F = 9/5\ (°C) + 32$	$°R = °F + 460$	$°K = °C + 273$	$1\ ft^3 = 28.32\, l$
$1\ atm = 14.7\ psi = 760\ mm\ Hg = 29.92\ in\ Hg = 33.93\ ft\ water = 1013.25\ mbar = 101,325\ pascals$			
$1\ ft^3 = 7.481\, U.S.gal$	$1\, l = 1.06\ qt$	$1\ inch = 2.54\, cm$	$1\ lb = 453.6\ gm$
$1\ gram = 15.43\ grains$	$1\ BTU = 1054.8\ joules = 0.293\ watt\ hr$		$1\ Gray = 100\ Rad$
$1\ Curie = 3.7\ x\ 10^{10}\ disint/\sec\ (Becquerel)$		$1\ Sievert = 100\ Rem$	
$1\ Tesla = 10,000\ Gauss$		$g = 981\ cm/\sec^2 = 32\ ft/\sec^2$	