


Parker, Bryan

From: Debbi Spykerman <debbi@cammenga.com>
Sent: Friday, September 20, 2013 10:19 AM
To: Parker, Bryan
Subject: RE: NRC renewal clarification items
Attachments: Notice of Sig. Chg. EricaJessica 2013.pdf

↳ CAMMENGA LTR DTD 09/19/13 w/ ATT 2. 

Hi Bryan,

Attached is the packet for the notice of change. I will send the attachment #2 separate as that may be way it didn't send.

Thanks,

debbi

From: Parker, Bryan [<mailto:Bryan.Parker@nrc.gov>]
Sent: Friday, September 20, 2013 8:40 AM
To: Debbi Spykerman
Subject: RE: NRC renewal clarification items

Thanks Debbi. I plan to finish up the renewal today, so it should go out to you next week sometime. Thanks again for the help with this.

Have a nice weekend.

Bryan

From: Debbi Spykerman [<mailto:debbi@cammenga.com>]
Sent: Thursday, September 19, 2013 2:58 PM
To: Parker, Bryan
Subject: RE: NRC renewal clarification items

Hey Bryan,

Sorry, I sent the wrong copy. Hope this is complete now.

Have a nice night.

Debbi

From: Parker, Bryan [<mailto:Bryan.Parker@nrc.gov>]
Sent: Thursday, September 19, 2013 3:10 PM
To: Debbi Spykerman
Subject: RE: NRC renewal clarification items

Thank you, Debbi. Question – am I missing a page?? I got 2 pages, but there is not a No. 5, which was the a request for survey and bioassay clarification.

If you have any questions, please let me know.

Thank you.
Bryan

Bryan A. Parker

Health Physicist
USNRC - Region III

bryan.parker@nrc.gov

678-828-7050

630-515-1078 (fax)



CAMMENGA AND ASSOCIATES, LLC.

2011 Bailey Street
Dearborn, MI 48124
Ph. (313) 914-7160
Fax (313) 914-7153

19 September 2013

Bryan Parker
Materials Licensing Branch
U. S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road
Lisle, IL 60532-4352

Subject: Designate Erica Bone as Authorized User
Designate Jessica Trevino as Authorized User
Remove Judy Emery as Authorized User

License No. 21-26460-01, Renewal, 2013

Dear Mr. Parker,

Cammenga Associates, LLC. Seeks to amend the material license referenced above as stated within the Significant Changes page. Cammenga requests that Judy Emery be removed from the License as an Authorized User, Erica bone and Jessica Trevino be added as an Authorized User.

Should there be any questions or comments, please do not hesitate to contact me at the number above, extension, or via e-mail.

Sincerely,



CAMMENGA AND ASSOCIATES, LLC.

Deborah Spykerman
Operations Manager
Radiation Safety Officer
debby@cammenga.com

Enclosures:

Enclosure 1 - Notice of Significant Changes

~~Attachment 1 - NRC Materials Possession License # 21-26460-01~~

Attachment 2 - Training/Test results.

CAMMENGA AND ASSOCIATES, LLC.

2011 BAILEY STREET
DEARBORN, MI 48124
PH (313) 914-7160
FAX (313) 914-7153

Notice of Significant Changes

19 SEPTEMBER, 2013

1. Authorized User, Judy Emery to be removed from the License. She has left the company.
2. CAMMENGA seeks approval of both Erica bone and Jessica Trevino as an Authorized User. Erica started with CAMMENGA in 2/28/2011 and Jessica in 1/16/2012 both as assemblers; and within a short period became known as a trusted and safety minded employee. As of 2011, Erica and Jessica under the direct supervision of Deborah Spykerman (Radiation Safety Officer), started to assist with radiation surveys, checking sealed source inventory in and out, as well as use of radiation detection equipment. To date, Erica and Jessica have received required training as well as completed a comprehensive examination, which Erica scored 97.5% and, Jessica scored 91%. Even as an Authorized User, Erica and Jessica will continue to be directly supervised by Deborah.

Jessica and Erica has authority to stop operations that they would consider unsafe. They also have the commitment of management to fulfill duties and responsibilities to ensure that radioactive materials are processed and used in a safe manner.

ATT. 2

CAMMENGA & ASSOCIATES, INC.
Examination for RSO/Radiation Test Technician/Authorized User

Exam#: RadTest #2
Instructor: Deborah Spykerman, Radiation Safety Officer

Date: 09-13-13

By signing below, I attest that all work on this exam was my own and that I was given an opportunity to review the results of the exam, including further clarification of any missed questions.

5

Jessica Inoué
Signature of Examinee

Score: 55 = 91 % (80% Required)

60 Points Total - Rad Test Technician / Authorized User
84 Points Total - Radiation Safety Officer

The following documents are supplied and may be used as a reference during this examination.

- A. Title 10 Code of Federal Regulations Parts 0 - 50
- B. Title 49 Code of Federal Regulations Parts 173.421 - 173.423
- C. Materials License 21-26460-01 Amendment #11
- D. Materials License 21-26460-02E Amendment #6

This examination is intended for both Radiation Safety Officer Candidates and Radiation Test Technician candidates. Questions indicated with an asterisk (*) are intended for RSO Candidates only.

1. State the recommended actions that should be taken in the event that a tritium vial is broken or cracked. State both worker and RSO/Rad Test Tech actions. (5 points)

- worker
1. Stop breathing
 2. Move away from area
 3. alert co-workers & notify RSO or RTT
 4. go wash hands
 5. Return to area until told by RSO or RTT
 6. give urine sample after first void

- RSO/RTT
1. locate & remove Broken vial. place in container w/water lid
 2. decontaminate the area
 3. test the area
 4. Release & give permission for workers to come back

2. Define each of the following areas and state how often each must be surveyed for contamination. (3 points)

- A. Restricted Area . A. Restricted area is where commenga has access control over individuals to exposure to radiation and it's surveyed weekly.
- B. Unrestricted Area B. unrestricted area is where commenga doesn't have to monitor individuals from the exposure of radiation. It's surveyed quarterly.

3. What is the posting requirement for each restricted area/room? (1 point)

A radioactive sign should be in the entrance of every restricted area.

4. What are the four principal ways that tritium can enter the body? (2 points)

- absorption
- injection
- inhalation
- ingestion

5. *State the title and part of the code of federal regulations that contain the requirements for the following: (3 points)
- A. Posting of notices to workers, instructions to workers, employee protection, et all
 - B. Occupational dose limits, survey and posting requirements, waste disposal requirements, and records
 - C. Department of Transportation requirements for shipments of instrument and articles

6. *What actions required by the Department of Transportation (DOT) must be completed prior to shipment of a package of compasses offsite? Assume the package contains 50 compasses. (2 points)

7. What is the maximum non-fixed (removable) radioactive surface contamination on the external surface of a compass shipment package? (1 point)

o 220 dpm

8. True/False If false explain why (1 point)
Cammenga's shipping license allows them to ship vials as well as completed compasses containing six or more vials each to the general public.

o False - because cammenga is only license to ship completed compasses.

9. What actions are required to be taken upon receipt of a shipment of vials? (Assume 3200 sets - 120 mCi per set) (5 points)

o within 3 hours of receipt, do a contamination test to insure there aren't damaged or high. If damaged contact carrier. Also after test is done unpack in the proper way. Do an inventory of it and then secure them away.

10. True/False If false explain why (1 point)
The Internal Performance Assessment (IPA) background scintillation vial, the tritium scintillation vial, and the Carbon-14 scintillation vial should each be tested (analyzed) each time other samples are being tested on the scintillation detector or in the case of a group of samples, after the group of samples has been tested.

• TRUE

11. What is the purpose of counting the IPA scintillation standards? (1 point)

• TO INSURE that it's working properly.

12. How would you know if the tritium counting efficiency of the TR-1600 may be out of specification? (1 point)

• When reading the printout sheet, you would be able to tell.

It would print out a warning

13. What should be done if an H-3 efficiency problem (or other potential problem) existed with the TR-1600? (1 point)

• CONTACT THE MANUFACTURER OF THE TR-1600.

14. Using Attachment #1, answer the following questions. (11 points)

A. What is the background count time?

• 10

B. What is the sample count time?

• 5

C. If the TR-1600 detected a problem with a particular sample, how could you tell from the printout?

• A letter would appear on the flag column.

~~XXXXXXXXXX~~

D. If the samples 15 through 23 are restricted area contamination survey samples, are all of them within the limits set forth in the material license? Identify if all are within the limits, and explain why or why they are not within the limits. • No, #20 is 1407.96 and it

should be 1,000 cpm or under.

E. If samples 2 through 14 are unrestricted area contamination survey samples, are all of them within the limits set forth in the materials license? Identify if all are within the limits, and explain why or why they are not within the limits. # 2, 6, 7, and 10 are above the 220cpm

F. True/False The background cpm is automatically subtracted from each of the test samples listed in Attachment 1. TRUE

G. If samples 2 through 23 are contamination survey samples on shipment boxes, are all of them within the DOT limits? Identify if all are within the limits, and explain why or why they are not within the limits.

• # 2, 6, 7, 10, and 14 are not within the limit because they are above 220 cpm

#20

H. If samples 2 through 23 are compass wipe test samples, are all of them within the limits set forth in the materials license? Identify if all are within the limits, and explain why or why they are not within the limits.

No, # 10 & 14 are not because they are above 900 dpm.

#20

I. How much cocktail is added to a contamination survey sample vial? How much water is added?

5 ml cocktail & 5 ml water.

J. Does the printout indicate an operation problem with the TR-1600?

Explain. Yes, because there is a letter B for BKG on the flag column.

K. Could Attachment 1 have been the results of testing a batch of urine samples? Explain. **NO, because they used protocol #2 instead of 1. There is no background for urine, and the time is 60 minutes instead of 5.**

15. Using Attachment #2, answer the following questions. (6 points)

A. Which of the following samples are background samples?

• None

B. Which, if any, of the samples appear(s) to be higher than normal?

• #10 appears to be higher than 500
+ #9

C. When would a workers urine test results be considered reason for concern or backup testing? • If it appears to be higher than 500.

D. What is the normal sample volume for a urine sample?

• 10ml

E. What is the normal cocktail volume for a urine sample?

• 10ml

F. What is the sample count time?

• 60 minutes

16. Using Attachment #3, answer the following question. (4 points)

If samples 2 through 42 are vial diffusion testing samples, are all of the samples within the limits set forth in the materials license? If not, identify those that are not and explain why. Assume 5 ml sample and 5 ml cocktail per sample.

• #10, 21, 32 are not because they are above 11,100 dpm

17. Using Attachment #4, answer the following question. (4 points)

If samples 2 through 48 are completed compass diffusion testing samples, are all of the samples within the limits set forth in the materials license? If not, identify those that are not and explain why. Assume 10 ml cocktail per sample.

• #12, 15, 26, 33, 34 are not within the limit because they exceed over the ~~3000~~ 3,200 dpm limit.

18. A urine sample should be taken following a broken vial incident: (1 point)

- A. Immediately
- B. Within one hour
- C. After the worker has voided at least once and within one day
- D. Within one week

19. *What is ALARA? (1 point)

20. *Answer the following sample calculation problems. (2 points)

A. A 5 ml sample is counted on the TR-1600 for H-3 and the result is the 12,500 dpm. Calculate the uCi/ml concentration of H-3 in the sample.

B. If the 5 ml sample above was taken from a total volume of 3 liters, how many total uCi are in the 3 liters?

21. *A 10 ml sample is taken from 5 liters of waste water. When the sample is counted, the results are 5,500,000 dpm. Can all 5 liters be released to the sanitary sewer assuming 1000 liters/month water usage to the sanitary sewer? Explain your reasoning. (3 points)

22. *Name two NRC locations that the state of Michigan works with. State what each location is responsible for? (5 points)

23. True/False If false explain why (1 point)

The water used during decon activities or during routine cleanup activities need not be accounted for as wastewater.

False, the water used for 3h activities should be accounted for wastewater.

24. How many H-3 vials are required to be tested for diffusion out of each lot? (1 point)
 • all
25. How many compasses are required to be tested for diffusion out of each lot? (assume a gov. lot of 3,200) (1 point) • 125
26. How many compasses are required to be wipe tested for contamination out of each lot? (assume a gov. lot of 3,200) (1 point)
 • normally 125
27. *When calculating organ uptake of tritium, is using HT or HTO the preferred method to calculate, and why? (2 points)
28. *What records of information with regards to decommissioning are required to be maintained at Cammenga? (3 points)
29. What is the maximum H-3 possession limit at Cammengas, 100 Aniline Ave., Suite 258, Holland, MI 49424? (1 point)
 • 14,000 curies
30. *What is the biological half-life of tritium? (1 point)
31. How often must a physical inventory of all H-3 sources be conducted? (1 point)
 • every 6 months
32. True/False If false explain why (1 point)
 In the absence of the Radiation Safety Officer, a qualified Rad Test Technician/Authorized User may perform training for restricted area workers.
 • False, only a RSO is qualified to perform training on workers who are in restricted areas.
33. What is the minimum frequency for the performance of urinalysis of restricted area workers? (1 point)
 • monthly

34. *Explain what "rem" is? (2 points)

35. State the minimum frequency for which contamination surveys are required for the following areas: (3 points)

A. Unrestricted areas

• quarterly

B. Restricted areas

• weekly

C. H-3 Recycling areas

• daily if in use every day

36. True/False If false explain why (1 point)

Recycled H-3 vials that pass diffusion leak testing will be shipped back to the manufacturer mb microtec of Switzerland. Since the shipment destination is overseas, all that is required is to place the vials in a strong container and ship to Switzerland in the mail.

False, Cammenga is not authorized to ship out vials. Manufacturer would have to be contacted if they needed to be shipped.

Protocol #: 2 Name: 3H DPM U-G 31-Dec-07 18:05
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 5.00 QIP = tSIE/AEC ES Terminator = Count
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
14	1	10.00	18.90		202.	6	B
14	2	5.00	54.70	207.33	236.	12	
14	3	5.00	43.10	172.47	224.	14	
14	4	5.00	48.90	193.63	226.	14	
14	5	5.00	53.50	204.65	234.	12	
14	6	5.00	47.50	2180.09	236.	11	
14	7	5.00	48.90	188.33	232.	12	
14	8	5.00	58.50	223.67	234.	9	
14	9	5.00	59.10	217.44	242.	10	
14	10	5.00	58.50	225.61	232.	12	
14	11	5.00	54.10	206.84	234.	14	
14	12	5.00	54.10	3224.10	217.	16	
1	13	5.00	50.50	193.71	233.	13	
1	14	5.00	53.90	194.17	247.	10	
1	15	5.00	47.50	4175.62	241.	12	
1	16	5.00	68.70	252.67	242.	12	
1	17	5.00	68.50	248.64	246.	10	
1	18	5.00	54.30	198.05	244.	8	
1	19	5.00	48.30	182.71	236.	13	
1	20	5.00	56.90	217.92	233.	15	
1	21	5.00	56.10	1207.93	241.	10	
1	22	5.00	49.50	188.78	234.	9	
1	23	5.00	53.30	199.90	238.	12	
1	24	5.00	56.90	215.83	235.	11	
2	25	5.00	57.50	244.91	212.	18	
2	26	5.00	55.70	3220.03	227.	14	
2	27	5.00	59.30	242.60	220.	10	
2	28	5.00	60.50	250.89	217.	12	
2	29	5.00	48.90	202.23	218.	12	
2	30	5.00	68.90	1267.83	230.	11	
2	31	5.00	64.90	259.30	224.	15	
2	32	5.00	58.30	227.39	229.	11	
2	33	5.00	51.50	6211.97	219.	13	
2	34	5.00	31.50	125.16	226.	18	
2	35	5.00	37.50	146.79	229.	15	
2	36	5.00	42.50	160.96	236.	17	
2	37	5.00	38.30	155.38	221.	16	
2	38	5.00	43.90	170.13	231.	11	
2	39	5.00	38.50	153.98	224.	14	
2	40	5.00	43.70	163.83	238.	15	
2	41	5.00	46.30	5178.48	232.	11	
2	42	5.00	37.90	153.07	222.	20	
2	43	5.00	40.10	153.38	231.	14	
2	44	5.00	42.90	166.69	230.	18	
2	45	5.00	39.30	3154.57	228.	14	
2	46	5.00	34.50	126.51	243.	21	
2	47	5.00	41.70	154.10	241.	15	
2	48	5.00	30.30	3103.96	260.	15	

Protocol #: 2
 Name: 3H DPM U-G
 31-Dec-07 06:45
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 5.00 QIP = tSIE/AEC ES Terminator = Count
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
					198.	7	B
1	1	10.00	10.20				
1	2	5.00	53.40	233.90	207.	3	
1	3	5.00	2.20	9.90	202.	6	
1	4	5.00	9.60	45.33	193.	6	
1	5	5.00	21.60	99.07	198.	8	
1	6	5.00	104.60	466.36	203.	2	
1	7	5.00	62.80	295.53	194.	1	
1	8	5.00	9.80	43.36	205.	8	
1	9	5.00	41.00	171.12	216.	3	
1	10	5.00	211.20	1153.32	192.	4	
1	11	5.00	0.80	3.91	187.	18	
11	12	5.00	2.00	9.81	187.	15	
11	13	5.00	4.60	19.52	213.	18	
11	14	5.00	27.80	140.97	181.	4	
11	15	5.00	35.80	155.82	208.	8	
11	16	5.00	6.40	25.70	224.	13	
11	17	5.00	3.00	12.66	214.	14	
11	18	5.00	1.20	5.94	185.	2	
11	19	5.00	3.40	17.15	182.	6	
11	20	5.00	280.80	1407.96	183.	2	
11	21	5.00	3.40	12.53	242.	18	
11	22	5.00	43.60	175.21	223.	4	
11	23	5.00	1.80	7.83	208.	22	

SYSTEM NORMALIZED

C14 IPA DATA PROCESSED - 17-Jan-2000 15:10

C14 Eff (0-156 keV) = 97.21 %

H3 IPA DATA PROCESSED - 17-Jan-2000 15:12

H3 Eff (0-18.6 keV) = 64.68 %

BKG IPA DATA PROCESSED - 17-Jan-2000 16:12

Bkg (0-18.6 keV) = 21.88 cpm

Bkg (0-156 keV) = 28.23 cpm

C14 E²/B (1-156 keV) = 608.09H3 E²/B (1-18.6 keV) = 208.80

Protocol #: 1 Name: Urin 31-Dec-07 17:44
Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.50
Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Time = 60.00 QIP = tSIE/AEC ES Terminator = Count
john's test program
Conventional DPM
Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
13	1	60.00	23.17	164.24	139.	38	
13	2	60.00	23.60	164.21	141.	12	
13	3	60.00	58.95	468.58	128.	62	
13	4	60.00	27.25	279.00	107.	51	
13	5	60.00	17.92	255.09	86.1	26	
13	6	60.00	18.22	292.59	80.1	18	
13	7	60.00	25.92	351.66	88.6	39	
13	8	60.00	28.60	333.82	97.6	12	
13	9	60.00	67.43	673.78	108.	4	
13	10	60.00	20.35	3146.75	137.	12	
13	11	60.00	18.28	279.68	82.4	12	
13	12	60.00	15.90	273.38	77.1	24	

SYSTEM NORMALIZED

C14 IPA DATA PROCESSED - 17-Jan-2000 15:10
C14 Eff (0-156 keV) = 97.21 %
H3 IPA DATA PROCESSED - 17-Jan-2000 15:12
H3 Eff (0-18.6 keV) = 64.68 %
BKG IPA DATA PROCESSED - 17-Jan-2000 16:12
Bkg (0-18.6 keV) = 21.88 cpm
Bkg (0-156 keV) = 28.23 cpm
C14 E^2/B (1-156 keV) = 608.09
H3 E^2/B (1-18.6 keV) = 208.80

CAMMENGA & ASSOCIATES, INC.
Examination for RSO/Radiation Test Technician/Authorized User

Exam#: RadTest #2
Instructor: Deborah Spykerman, Radiation Safety Officer

Date: 9-13-13

By signing below, I attest that all work on this exam was my own and that I was given an opportunity to review the results of the exam, including further clarification of any missed questions.

Erica Bone
Signature of Examinee

- 15

Score: 58.5 = 97.5% (80% Required)

60 Points Total - Rad Test Technician / Authorized User
84 Points Total - Radiation Safety Officer

The following documents are supplied and may be used as a reference during this examination.

- A. Title 10 Code of Federal Regulations Parts 0 - 50
- B. Title 49 Code of Federal Regulations Parts 173.421 - 173.423
- C. Materials License 21-26460-01 Amendment #11
- D. Materials License 21-26460-02E Amendment #6

This examination is intended for both Radiation Safety Officer Candidates and Radiation Test Technician candidates. Questions indicated with an asterisk (*) are intended for RSO Candidates only.

1. State the recommended actions that should be taken in the event that a tritium vial is broken or cracked. State both worker and RSO/Rad Test Tech actions. (5 points)
- Worker - 1. Stop breathing. 2. Push away from broken vial. 3. Alert Co-workers 4. Alert RSO or RTT. 5. Wash hands
6. Give urine sample 7. Wait ~~to be~~ for area to be released.
- RSO/RTT - 1. Locate, contain and remove vial. 2. Decontaminate the area. 3. Test the area for contamination
4. Release area back to worker.

2. Define each of the following areas and state how often each must be surveyed for contamination. (3 points)

- A. Restricted Area
B. Unrestricted Area

A. Restricted area is controlled and surveyed for contamination weekly.

B. Unrestricted area is not controlled and surveyed quarterly.

3. What is the posting requirement for each restricted area/room? (1 point)

A yellow radioactive sign.

4. What are the four principal ways that tritium can enter the body? (2 points)

1. Absorption
2. Inhalation
3. Ingestion
4. Injection

5. *State the title and part of the code of federal regulations that contain the requirements for the following: (3 points)
 - A. Posting of notices to workers, instructions to workers, employee protection, et all
 - B. Occupational dose limits, survey and posting requirements, waste disposal requirements, and records
 - C. Department of Transportation requirements for shipments of instrument and articles

6. *What actions required by the Department of Transportation (DOT) must be completed prior to shipment of a package of compasses offsite? Assume the package contains 50 compasses. (2 points)

7. What is the maximum non-fixed (removable) radioactive surface contamination on the external surface of a compass shipment package? (1 point)

~~220 dpm~~ 220 dpm - Cammenga self imposed

8. True/False If false explain why (1 point)

Cammenga's shipping license allows them to ship vials as well as completed compasses containing six or more vials each to the general public.

False. Cammenga's license allows only completed compasses to be shipped. ~~to the~~

9. What actions are required to be taken upon receipt of a shipment of vials? (Assume 3200 sets - 120 mCi per set) (5 points)

Inspect for damage on the box
 Secure within 3 hours of receiving vials
 Test the box/boxes. If something is damaged
 Contact the carrier + MB Microtec
 Inventory vials.

10. True/False If false explain why (1 point)

The Internal Performance Assessment (IPA) background scintillation vial, the tritium scintillation vial, and the Carbon-14 scintillation vial should each be tested (analyzed) each time other samples are being tested on the scintillation detector or in the case of a group of samples, after the group of samples has been tested.

True

11. What is the purpose of counting the IPA scintillation standards? (1 point)

To make sure the machine is functioning properly.

12. How would you know if the tritium counting efficiency of the TR-1600 may be out of specification? (1 point)

It would print out a warning.

13. What should be done if an H-3 efficiency problem (or other potential problem) existed with the TR-1600? (1 point)

Contact a person to come fix the machine the manufacturer.

14. Using Attachment #1, answer the following questions. (11 points)

A. What is the background count time?

10 minutes.

B. What is the sample count time?

~~10 minutes~~ 5 minutes.

C. If the TR-1600 detected a problem with a particular sample, how could you tell from the printout?

A warning would print

Would print a letter in flag column

- .5

- D. If the samples 15 through 23 are restricted area contamination survey samples, are all of them within the limits set forth in the material license? Identify if all are within the limits, and explain why or why they are not within the limits.

No. number 20 is too high. It reads 1407.96 dpm
the test requires 1000 dpm or less.
The rest of the samples pass.

- E. If samples 2 through 14 are unrestricted area contamination survey samples, are all of them within the limits set forth in the materials license? Identify if all are within the limits, and explain why or why they are not within the limits.

No. Number 10 is too high. The test requires
1000 dpm and this sample tests is over
1000 dpm. 2, 6, 7, 10 are above 2200 dpm

- F. True/False The background cpm is automatically subtracted from each of the test samples listed in Attachment 1.

True

- G. If samples 2 through 23 are contamination survey samples on shipment boxes, are all of them within the DOT limits? Identify if all are within the limits, and explain why or why they are not within the limits.

No. number 2, 6, 7, 10, 20 are too high. The test
requires 2200 dpm and these samples are all over
2200 dpm. Cammergen self imposed

- H. If samples 2 through 23 are compass wipe test samples, are all of them within the limits set forth in the materials license? Identify if all are within the limits, and explain why or why they are not within the limits.

No. Number 10 and 20 are too high. The test
requires 900 dpm and these two samples
are over 900 dpm.

- I. How much cocktail is added to a contamination survey sample vial? How much water is added?

5 ml cocktail
5 ml water

- J. Does the printout indicate an operation problem with the TR-1600? Explain.

No. A warning did not print out.

K. Could Attachment 1 have been the results of testing a batch of urine samples? Explain.

No. Urine has a Protocol #1 flag and does not have a background.

15. Using Attachment #2, answer the following questions. (6 points)

A. Which of the following samples are background samples?

None.

B. Which, if any, of the samples appear(s) to be higher than normal?

Number 9 and 10.

C. When would a workers urine test results be considered reason for concern or backup testing? When the test reads over 500dpm

D. What is the normal sample volume for a urine sample?

10ml

E. What is the normal cocktail volume for a urine sample?

10ml

F. What is the sample count time?

60 minutes

16. Using Attachment #3, answer the following question. (4 points)

If samples 2 through 42 are vial diffusion testing samples, are all of the samples within the limits set forth in the materials license? If not, identify those that are not and explain why. Assume 5 ml sample and 5 ml cocktail per sample.

No. Number 10, 21, 32 are too high. The limit is 11,100 dpm and these samples are over 11,100 dpm.

17. Using Attachment #4, answer the following question. (4 points)

If samples 2 through 48 are completed compass diffusion testing samples, are all of the samples within the limits set forth in the materials license? If not, identify those that are not and explain why. Assume 10 ml cocktail per sample.

No. Number 15, 33, 41 are too high. The limit is 3700 dpm and these samples are over 3700 dpm.

18. A urine sample should be taken following a broken vial incident: (1 point)
- A. Immediately
 - B. Within one hour
 - C. After the worker has voided at least once and within one day
 - D. Within one week
19. *What is ALARA? (1 point)
20. *Answer the following sample calculation problems. (2 points)
- A. A 5 ml sample is counted on the TR-1600 for H-3 and the result is the 12,500 dpm. Calculate the uCi/ml concentration of H-3 in the sample.
 - B. If the 5 ml sample above was taken from a total volume of 3 liters, how many total uCi are in the 3 liters?
21. *A 10 ml sample is taken from 5 liters of waste water. When the sample is counted, the results are 5,500,000 dpm. Can all 5 liters be released to the sanitary sewer assuming 1000 liters/month water usage to the sanitary sewer? Explain your reasoning. (3 points)
22. *Name two NRC locations that the state of Michigan works with. State what each location is responsible for? (5 points)
23. True/False If false explain why (1 point)
The water used during decon activities or during routine cleanup activities need not be accounted for as wastewater.

False. All water used for decon activities and clean up need to be accounted as waste water.

24. How many H-3 vials are required to be tested for diffusion out of each lot? (1 point) *All vials.*
25. How many compasses are required to be tested for diffusion out of each lot? (assume a gov. lot of 3,200) (1 point)
125 compasses
26. How many compasses are required to be wipe tested for contamination out of each lot? (assume a gov. lot of 3,200) (1 point)
125 compasses
27. *When calculating organ uptake of tritium, is using HT or HTO the preferred method to calculate, and why? (2 points)
28. *What records of information with regards to decommissioning are required to be maintained at Cammenga? (3 points)
29. What is the maximum H-3 possession limit at Cammenga, 100 Aniline Ave., Suite 258, Holland, MI 49424? (1 point) *2011 Bailey Str.*
480,000 sources not to exceed 5 millicuries each
30,000 sources not to exceed 100 millicuries
50,000 sources not to exceed 250 millicuries.
30. *What is the biological half-life of tritium? (1 point)
31. How often must a physical inventory of all H-3 sources be conducted? (1 point)
Every 6 months.
32. True/False If false explain why (1 point)
In the absence of the Radiation Safety Officer, a qualified Rad Test Technician/Authorized User may perform training for restricted area workers.
False. Only the RSO is qualified to train restricted area workers.
33. What is the minimum frequency for the performance of urinalysis of restricted area workers? (1 point)
Once a month.

34. *Explain what "rem" is? (2 points)

35. State the minimum frequency for which contamination surveys are required for the following areas: (3 points)

A. Unrestricted areas

Quarterly

B. Restricted areas

Weekly

C. H-3 Recycling areas

Daily when in use.

36. True/False If false explain why (1 point)

Recycled H-3 vials that pass diffusion leak testing will be shipped back to the manufacturer mb microtec of Switzerland. Since the shipment destination is overseas, all that is required is to place the vials in a strong container and ship to Switzerland in the mail.

False. We have to contact mb microtec and get directions and certification to ship them back.

Protocol #: 2 Name: 3H DPM U-G 31-Dec-07 06:45
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 5.00 QIP = tSIE/AEC ES Terminator = Count
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
1	1	10.00	10.20		198.	7	B
1	2	5.00	53.40	233.90	207.	3	
1	3	5.00	2.20	9.90	202.	6	
1	4	5.00	9.60	45.33	193.	6	
1	5	5.00	21.60	99.07	198.	8	
1	6	5.00	104.60	466.36	203.	2	
1	7	5.00	62.80	295.53	194.	1	
1	8	5.00	9.80	43.36	205.	8	
1	9	5.00	41.00	171.12	216.	3	
1	10	5.00	211.20	1153.32	192.	4	
1	11	5.00	0.80	3.91	187.	18	
11	12	5.00	2.00	9.81	187.	15	
11	13	5.00	4.60	19.52	213.	18	
11	14	5.00	27.80	140.97	181.	4	
11	15	5.00	35.80	155.82	208.	8	
11	16	5.00	6.40	25.70	224.	13	
11	17	5.00	3.00	12.66	214.	14	
11	18	5.00	1.20	5.94	185.	2	
11	19	5.00	3.40	17.15	182.	6	
11	20	5.00	280.80	1407.96	183.	2	
11	21	5.00	3.40	12.53	242.	18	
11	22	5.00	43.60	175.21	223.	4	
11	23	5.00	1.80	7.83	208.	22	

SYSTEM NORMALIZED

C14 IPA DATA PROCESSED - 17-Jan-2000 15:10

C14 Eff (0-156 keV) = 97.21 %

H3 IPA DATA PROCESSED - 17-Jan-2000 15:12

H3 Eff (0-18.6 keV) = 64.68 %

BKG IPA DATA PROCESSED - 17-Jan-2000 16:12

Bkg (0-18.6 keV) = 21.88 cpm

Bkg (0-156 keV) = 28.23 cpm

C14 E²/B (1-156 keV) = 608.09H3 E²/B (1-18.6 keV) = 208.80

Protocol #: 1 Name: Urin 31-Dec-07 17:44
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.50
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 60.00 QIP = tSIE/AEC ES Terminator = Count
 john's test program
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
13	1	60.00	23.17	164.24	139.	38	
13	2	60.00	23.60	164.21	141.	12	
13	3	60.00	58.95	468.58	128.	62	
13	4	60.00	27.25	279.00	107.	51	
13	5	60.00	17.92	255.09	86.1	26	
13	6	60.00	18.22	292.59	80.1	18	
13	7	60.00	25.92	351.66	88.6	39	
13	8	60.00	28.60	333.82	97.6	12	
13	9	60.00	67.43	673.78	108.	4	
13	10	60.00	20.35	3146.75	137.	12	
13	11	60.00	18.28	279.68	82.4	12	
13	12	60.00	15.90	273.38	77.1	24	

SYSTEM NORMALIZED

C14 IPA DATA PROCESSED - 17-Jan-2000 15:10

C14 Eff (0-156 keV) = 97.21 %

H3 IPA DATA PROCESSED - 17-Jan-2000 15:12

H3 Eff (0-18.6 keV) = 64.68 %

BKG IPA DATA PROCESSED - 17-Jan-2000 16:12

Bkg (0-18.6 keV) = 21.88 cpm

Bkg (0-156 keV) = 28.23 cpm

C14 E²/B (1-156 keV) = 608.09H3 E²/B (1-18.6 keV) = 208.80

Protocol #: 2 Name: 3H DPM U-G 31-Dec-07 11:52
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 5.00 QIP = tSIE/AEC ES Terminator = Count
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
1	1	10.00	12.60		163.3	21	B
1	2	5.00	420.40	1566.30	239.	3	
1	3	5.00	185.00	7746.60	215.	6	
1	4	5.00	163.00	615.84	236.	6	
1	5	5.00	244.20	939.68	232.	3	
1	6	5.00	172.00	698.02	221.	7	
1	7	5.00	218.80	891.90	221.	4	
1	8	5.00	311.60	1224.14	228.	3	
1	9	5.00	225.00	951.83	213.	15	
1	10	5.00	401.60	15713.70	229.	3	
1	11	5.00	144.00	559.10	230.	6	
1	12	5.00	296.20	1231.16	217.	3	
5	13	5.00	189.40	796.80	214.	4	
5	14	5.00	258.20	1062.53	219.	4	
5	15	5.00	196.20	787.26	224.	5	
5	16	5.00	376.80	1594.56	213.	3	
5	17	5.00	129.60	551.09	212.	6	
5	18	5.00	135.80	574.22	213.	7	
5	19	5.00	127.80	513.53	223.	23	
5	20	5.00	367.00	1534.81	216.	3	
5	21	5.00	360.40	14601.60	222.	3	
5	22	5.00	123.00	593.18	190.	7	
5	23	5.00	120.80	486.31	223.	9	
5	24	5.00	217.20	8553.10	228.	38	
10	25	5.00	126.80	505.20	225.	5	
10	26	5.00	109.40	463.72	213.	10	
10	27	5.00	104.00	457.61	206.	6	
10	28	5.00	110.60	473.62	211.	6	
10	29	5.00	127.60	542.71	212.	9	
10	30	5.00	98.60	384.38	230.	9	
10	31	5.00	112.20	474.71	213.	9	
10	32	5.00	387.80	13385.88	206.	10	
10	33	5.00	102.20	434.14	213.	7	
(missing vials)							
19	37	5.00	184.80	6548.10	231.	2	
19	38	5.00	469.80	2098.09	203.	2	
19	39	5.00	618.40	2668.18	209.	2	
19	40	5.00	724.20	3130.18	209.	2	
19	41	5.00	588.40	2616.19	204.	2	
19	42	5.00	1480.60	6604.45	203.	8	

Protocol #: 2 Name: 3H DPM U-G 31-Dec-07 18:05
 Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
 Time = 5.00 QIP = tSIE/AEC ES Terminator = Count
 Conventional DPM
 Nuclide 1 = 181904

PID	S#	TIME	CPMA	DPM1	tSIE	LUM	FLAG
14	1	10.00	18.90		202.	6	B
14	2	5.00	54.70	207.33	236.	12	
14	3	5.00	43.10	172.47	224.	14	
14	4	5.00	48.90	193.63	226.	14	
14	5	5.00	53.50	204.65	234.	12	
14	6	5.00	47.50	2180.09	236.	11	
14	7	5.00	48.90	188.33	232.	12	
14	8	5.00	58.50	223.67	234.	9	
14	9	5.00	59.10	217.44	242.	10	
14	10	5.00	58.50	225.61	232.	12	
14	11	5.00	54.10	206.84	234.	14	
14	12	5.00	54.10	3224.10	217.	16	
1	13	5.00	50.50	193.71	233.	13	
1	14	5.00	53.90	194.17	247.	10	
1	15	5.00	47.50	4175.62	241.	12	
1	16	5.00	68.70	252.67	242.	12	
1	17	5.00	68.50	248.64	246.	10	
1	18	5.00	54.30	198.05	244.	8	
1	19	5.00	48.30	182.71	236.	13	
1	20	5.00	56.90	217.92	233.	15	
1	21	5.00	56.10	1207.93	241.	10	
1	22	5.00	49.50	188.78	234.	9	
1	23	5.00	53.30	199.90	238.	12	
1	24	5.00	56.90	215.83	235.	11	
2	25	5.00	57.50	244.91	212.	18	
2	26	5.00	55.70	3220.03	227.	14	
2	27	5.00	59.30	242.60	220.	10	
2	28	5.00	60.50	250.89	217.	12	
2	29	5.00	48.90	202.23	218.	12	
2	30	5.00	68.90	1267.83	230.	11	
2	31	5.00	64.90	259.30	224.	15	
2	32	5.00	58.30	227.39	229.	11	
2	33	5.00	51.50	6211.97	219.	13	
2	34	5.00	31.50	125.16	226.	18	
2	35	5.00	37.50	146.79	229.	15	
2	36	5.00	42.50	160.96	236.	17	
2	37	5.00	38.30	155.38	221.	16	
2	38	5.00	43.90	170.13	231.	11	
2	39	5.00	38.50	153.98	224.	14	
2	40	5.00	43.70	163.83	238.	15	
2	41	5.00	46.30	5178.48	232.	11	
2	42	5.00	37.90	153.07	222.	20	
2	43	5.00	40.10	153.38	231.	14	
2	44	5.00	42.90	166.69	230.	18	
2	45	5.00	39.30	3154.57	228.	14	
2	46	5.00	34.50	126.51	243.	21	
2	47	5.00	41.70	154.10	241.	15	
2	48	5.00	30.30	3103.96	260.	15	