NRRPT® NEWS

National Registry of Radiation Protection Technologists

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CONTACTS

Dave Biela, Chairman of the Board
(716) 942-4423 (w)
(716) 942-2097 (fax)
dave.biela@wves.org

DeeDee McNeill, Executive Secretary
(401) 637-4811 (w)
(401) 637-4822 (fax)
nrrpt@nrrpt.org

Bob Farnam, Newsletter Editor
(573) 676-8784 (w)
(573) 676-4484 (fax)
refarnam@cal.ameren.com

Chairman's Message

Dave Biela

I am on a plane flying to Jamaica as I am writing this and yesterday I spent the entire day in a light snow storm sitting in my deer stand in Western New York messing with a little buck, trying to see how many times I could make it come back to a doe call. You may ask what this has to do with the NRRPT. Both these events have put me in a really relaxed mood and have given me the opportunity to really think hard about what I wanted to write about in this article.

As anyone in the nuclear profession should know by now, despite the high un-employment in the U.S., the nuclear profession is booming. We have been talking for several years about the aging nuclear work force and how, in the next 10 years, about 60% of the work force will retire and there is <30% new people coming into the field. Recently, the government stimulus package has provided large sums of money to the Department of Energy to remediate their nuclear facilities quicker. This requires large numbers of Radiation Safety Technicians, Engineers, Health Physicists etc. This, added to the rate of retirement, leads to an excellent job market for nuclear professionals. Currently, the present stimulus package provides funds through about June, 2011. After this time, there is no guarantee as to what will happen, so this leads to my next point.

Take this opportunity to plan ahead for a job market that may not be as favorable as it is today and make yourself more marketable. If you are not a registered technician, take the time to study for and sit for the NRRPT exam, if you are all ready registered, go back to school to continue advancing yourself. If nothing else, do the best job you can wherever you are and no matter what you are doing. Learn from those around you and from the situations you may face. The purpose of the registry is to promote the training and advancement of technicians and this is what I am asking you to do. I want to also remind you that the Registry recently received a generous donation of $10,000.00/yr for the next five years from Cabrera Services to be used towards scholarships. If you are currently a registered technician and are going back to school for advancement within the Nuclear profession, go to the NRRPT web site at www.nrrpt.org and fill out an application for school assistance. Look to the future!

Sincerely,
Dave Biela
NRRPT, Chairman of the Board

2010 USA NRRPT Exam Dates

February 20, 2010 - Deadline for application: December 31, 2009

August 7, 2010 - Deadline for application: June 11, 2010

2010 Canadian NRRPT Exam Dates

February (TBA) 2010 - Deadline for application: December 31, 2009

Application Fee: $250
Retake Fee: $125
Late Fee: $50

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in the NRRPT News

Testing, testing...

By Todd Davidson

Last issue the following problem was published. The Solution is below.

Problem

Given that the effective half-life of I-131 is 7.5 days, what is the biological half-life of this radionuclide?

Solution

There are several things that must be known to solve this problem, first is the equation that relates T_{eff}, T_R, and T_B. The next thing that must be known is that T_R for I-131 is 8.05 days. To ensure that a trial and error method is not used, the equation for T_{eff} must be solved for T_B.

$$T_{eff} = \frac{T_R \times T_B}{T_R + T_B}$$

Multiply both sides of the equation by the quantity of $T_R + T_B$

$$T_{eff}\left(T_R + T_B\right) = T_R T_B$$

$$T_{eff} T_R + T_{eff} T_B = T_R T_B$$

Arrange it so T_B is only on one side of the equation.

$$T_{eff} T_R = T_R T_B - T_{eff} T_B$$

Factor T_B and isolate it.

$$T_{eff} T_R = T_B\left(T_R - T_{eff}\right)$$

$$T_B = \frac{T_{eff} T_R}{T_R - T_{eff}}$$

Substitute the given and known values for the effective half-life and the radiological half-life and the answer is straightforward.

$$T_B = \frac{(7.5 \times 8.05)days^2}{(8.05 - 7.5)days} = \frac{60.3}{0.55} days = 110 days$$

It may be useful to convert to the equation that relates the effective decay constant with the radiological decay constant and the biological decay constant.

$$\lambda_{eff} = \lambda_R + \lambda_B$$

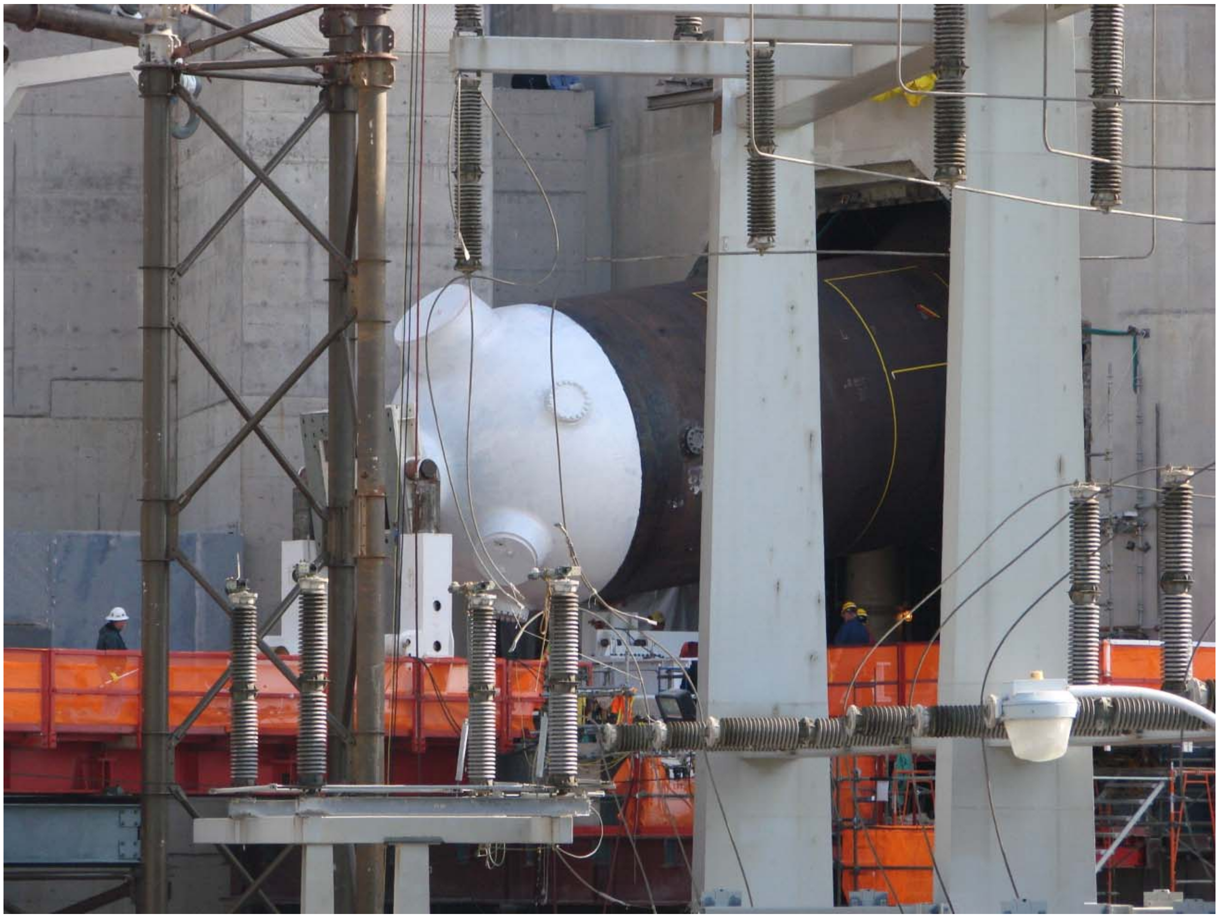
When presented in this way, it is readily apparent which of the processes, radiological or biological, is more important to the overall removal from the body.

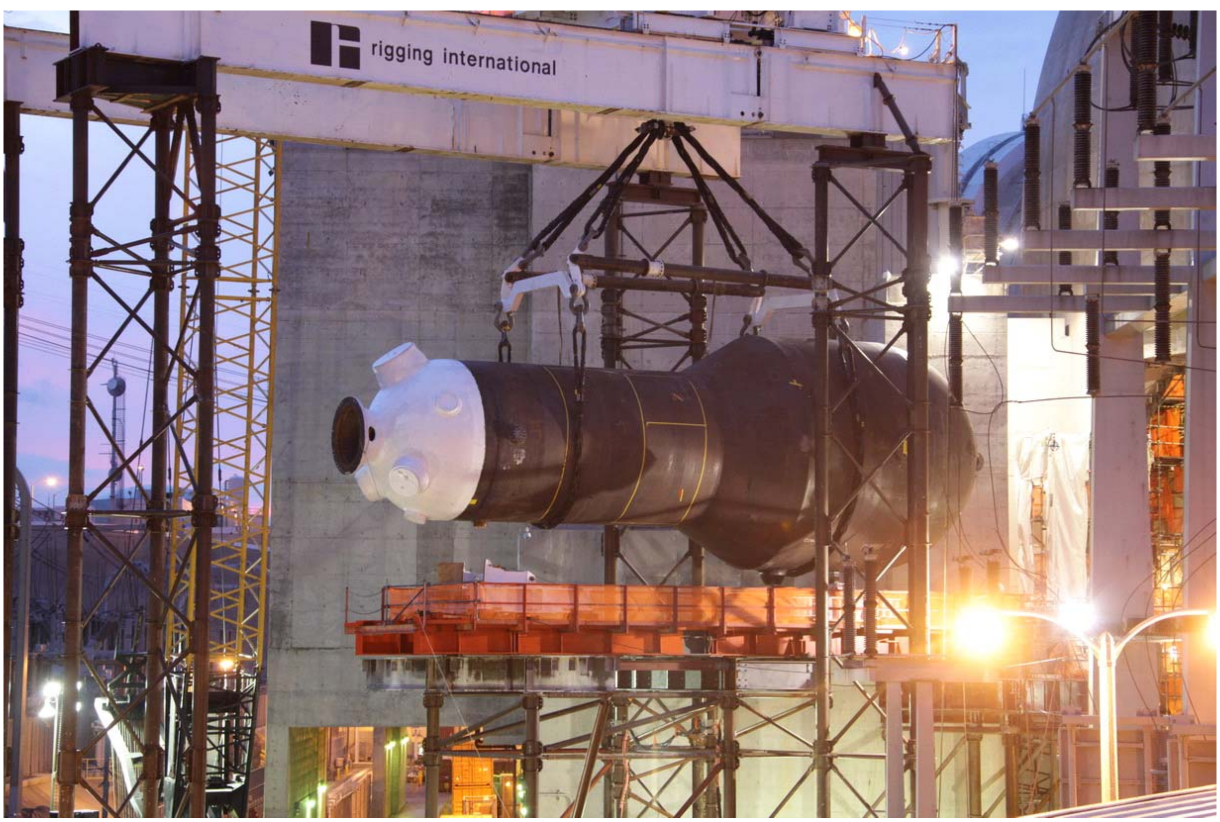
Now, for some advice on taking timed, multiple choice exams such as the NRRPT or Part I of the ABHP test. Each question is equally weighted in the exam. The exams are timed such that you have a short, finite amount of time to work on each problem. You may come across a problem such as the one above, and find it tempting to work your way through the problem in order to solve it. Instead skip any problem that you need to use a calculator on until you have completed all the non-calculational problems. This will help in two ways. First, the amount of problems that require a calculator is small, around 10% or less. Next, you will save the battery on your calculator, since you are focused on performing calculations that you have already solved except for the last bit of calculator work. It truly is not worth your precious time to solve problems that require a calculator on your first round through the test. Instead answer all the questions that you know, and set aside the questions that you have to calculate or reason your way through until the end.

SONGS' Unit 2 Steam Generator Replacement

Built by Mitsubishi Heavy Industries, the steam generators weigh more than 640 tons each and are the second largest steam generators in operation in the United States, second only to those at Arizona's Palo Verde Nuclear Generating Station. The generators measure 65 feet in length. A 28x28 opening was constructed above the existing equipment hatch to accommodate removal of the (2) old steam generators and installation of the new ones. The pictures below illustrate the removal of one of the old steam generators (E088), November 2009. The old steam generators will be transported to the decommissioned Unit 1 Industrial area where they will be further segmented and prepared for shipment and disposal.

The Unit 3 steam generators will be replaced with new steam generators in 2010. Both Units 2 and 3 have been in operation for 25 years and generate approximately 2,200 megawatts of power and serve 1.5 million average Southern California homes.





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A General Review of Health Physics Calculations

By Augustinus Ong

These questions and answers were published in the Summer 2009 issue. There were mistakes in question/answer numbers 1, 2, 3 & 4. Please see the corrections highlighted below:

(1) What is the activity of a sample containing **5×10^{-9} mole P-32 atoms?** The half-life of P-32 is 14.3 days.

ANS: $A = \lambda N$ $\quad t_{1/2}$ = (14.3 days) (1440 min/day)

λ = ln 2 / (14.3 days)(1440 min/day)

N = (5×10^{-9} mol)(6.022×10^{23} atoms/mol)

A = [ln 2 / / (14.3 days)(1440 min/day)] x
[(5×10^{-9} mol)(6.022×10^{23} atoms/mol)]

A = ?

(2) Acme Hospital specified the need to receive at least 10 mCi of I-131 by next Monday, 10 am. Upon receiving the order, the radiotracer supply company prepares the order on Friday, 10 am for immediate delivery. How much I-131 should be prepared to ensure the hospital receives the 10 mCi of activity on Monday?

ANS: $A = A_0 e^{-\lambda t}$ $\quad t_{1/2}$ = 8.04 days

λ = ln 2 / 8.04 days

$A_0 = A\, e^{[(\ln 2)(3\text{ days})] / (8.04\text{ days})}$

A_0 = ?

(3) For a emitter of 1.5 MeV gamma photons, what percentage of the photons would be absorbed by a lead shield of 3 cm thick?

ANS: $I = I_0 e^{-\mu x}$ $\quad \mu = 0.592\text{ cm}^{-1}$ (absorption coefficient for lead at 1.5 MeV)

I / I_0 = fraction transmitted

$I / I_0 = e^{-(0.592\text{ cm}^{-1})(3\text{ cm})}$ = ?

$1 - I / I_0$ = fraction absorbed = ?

(4) Calculate the resolving time, τ, for a G/M monitor that gives the following gross counting rates:

Source 1	7000 cpm
Source 2	3000 cpm
Sources 1 + 2	9000 cpm
Background	50 cpm

ANS: $t = (R_1 + R_2 – R_{1,2} – R_b) / (R^2_{1,2} – R^2_1 – R^2_2)$

$t = (7000 + 3000 – 9000 – 50)\ cpm / (9000^2 – 7000^2_1 – 3000^2_2)\ cpm^2$

$t = ?$

2010 NRRPT Sustaining Dues

Ask your fellow registered member -- have you paid your 2010 dues?

It's time to pay your 2010 sustaining dues! If you haven't paid yet, please submit to the Executive Secretary's office as soon as possible!

Continued from page 5

Professional Pool

By Todd Davidson

Before we get to the focus of this article, please note that any specific problem that you may be facing at your place of business can be shared with a professional pool of your fellow practitioners.

- If you have a problem you would like to ask, please send an email to the NRRPT website with the words "Professional Pool problem" in the subject line.

- If you have a response to the problems presented, please send an email to the NRRPT website with an indication in the subject line that it is a response and include the date of the newsletter where the original problem was published.

Problem

With the increase in the amount of computerized tomography (CT) scans in the last twenty years, how much has the average dose to the population increased?

Responses

For many years in the radiation protection community, particularly while training radiation workers, we have used a value of 360 mrem as the average annual dose to a person in the United States. This value was published in NCRP report 94. Sadly, those days are gone. The reason for sadness is because those of us who give training and have small imaginations do not have to think very long to make a mnemonic device that relates 360 to the amount of days in a year.

There has been a large increase in the amount of CT scans over the last twenty years. This has caused the annual dose to the average person in the US to increase from 360 to 620 mrem. The percentages listed in the table below were taken from NCRP report 160.

Percentages of Annual Dose to the Average Person in the US

Radon	37%
Industrial	<0.1%
Occupational	<0.1%
Consumer	2%
Conv. radiography and fluoroscopy	5%
Interventional fluoroscopy	7%
Nuclear medicine	12%
Computed tomography	24%
Terrestrial	3%
Internal	5%
Space	5%

The increase in dose from CT scans from the early 1980s to 2006 is from 16 mrem to 147 mrem. What does this mean? From a practical standpoint in radiation protection, there aren't many changes that need to be made. The training materials for radiation workers should be changed, and the changes should refer to NCRP 160 and the summary therein.

The author would like to state that although this was not a problem submitted to the professional pool, it was a problem that was recently encountered by the author. For those interested in helpful references, feel free to contact me.

NRRPT Board & Panel Meeting

The next NRRPT Board and Panel Meeting will be held January 23-26, 2009 in conjunction with the HPS Mid-Year Meeting in Albuquerque, NM. All NRRPT members are welcome and encourage to attend. For more information regarding the NRRPT Board and Panel Meeting, please contact DeeDee McNeill at nrrpt@nrrpt.org or 401-637-4811.

Southern California Edison

Jim Madigan, RPM
P.O. Box 128
San Clemente, CA 92672
(949) 368-7780
james.madigan@sce.com

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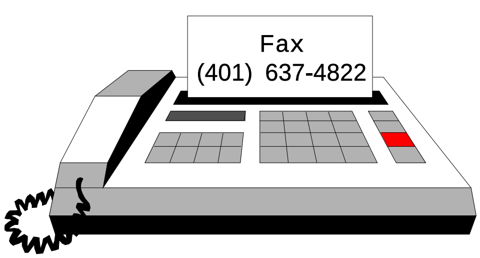

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