* **To solve for a distance use the following formula:**

$D\_{2}=\sqrt{\frac{I\_{1}xD\_{1}^{2}}{I\_{2}}} $ **D** = Distance  **I** = Intensity in Röntgens

* **To solve for Intensity use the following formula:**

$I\_{2}= \frac{I\_{1} x D\_{1}^{2}}{D\_{2}^{2}}$ $ $**D** = Distance  **I** = Intensity in Röntgens

* Iridium 192: 0.48 R/hr/ci @ 1M or 5.2 R/hr/ci @ 1’
* Iridium 192 Half-life is 73.83 (74) Days
* Cobalt 60: 1.30 R/hr/ci @ 1M or 14 R/hr/ci @ 1’
* Cobalt 60 Half-life is 5.247 years
* 1 R = 1000 mr 1M = 3.28 ‘ = 39.37” 1” = 2.54 cm, 1’ = 30.48 cm
* HVL Formula: Io = Original Intensity; Id = Desired intensity

$$Log[\frac{Io}{Id}]/Log2$$

1. We know that 1 ci of iridium 192 emits 5.2 R/hr @ 1ft. so a 2 ci source of IR 192 would emit how many R/hr @ 1ft?
2. We have 25 R/hr @ 12”, what is our intensity at 10 feet?
	1. Does the difference in units matter? Y or N?
	2. Write out the equation and Solve for our new intensity.
	3. ANSWER:
3. We have 37 R/hr @ 3M, what is our intensity at 75 feet?
	1. Are your units converted?
	2. What’s the intensity in mr/hr?
4. ANSWER:
5. We know that 1 ci of iridium 192 emits 5.2 R/hr @ 1ft. So a 75 ci source of IR 192 would emit how many R/hr @ 1ft?
6. Using a 75 ci source of IR 192 at 12”, Calculate the distance (D2) to the “safe for public dosage.”
	1. What is the Safe Public Dose?
	2. Show your work.
	3. Answer:
7. We have 199 mr/hr @72”, and our desired I2 is the safe to public radiation dosage.
	1. What is the safe for public Radiation Dose?
	2. How far do we need to be? Solve for (D2) in Feet.
8. We now have a 100 ci source of IR 192.
9. How many R/hr @1 ft? 520 R/hr
10. What is the “Caution: Radiation Area” working dosage?
11. Solve for D2 and assume I2 is the Caution dosage of:
12. Cobalt 60 emits 14 R/hr/ci @ 1ft.
13. How many R/hr is emitted at 1 ft. with a 100 ci source of Co 60? 1,400 R/hr
14. Solve for D2 and assume I2 is the public safe dosage of 2 mr/hr.
15. Cobalt 60 emits 14 R/hr/ci @ 1ft.
16. How many R/hr is emitted at 1 ft. with a 100 ci source of Co 60?
17. Solve for D2 and assume I2 is the “caution Radiation Work Area” dosage of 5mr/hr
18. We now have a 100 ci source of IR 192.
19. How many R/hr @1 ft?
20. Solve for D2 and assume I2 is the “caution Radiation Work Area” dosage of 5mr/hr.
21. Assuming a source has a ½ life of 20 years, how old would the source be in 3 half- lives?
	1. 20 years
	2. 40 years
	3. 60 years
	4. 120 years
22. If a radiographer has 60 mR at the surface of the exposure device, what would the reading be after 2 half- lives?
	1. 15 mR
	2. 40 mR
	3. 80 mR
	4. 10 mR
23. The use of 4 half-value layers will reduce the exposure by a factor of:
	1. 4 times
	2. 8 times
	3. 16 times
	4. 32 times
24. If a radiographer has 98 Ci of Ir-192, after 148 days how many Curies would be left?
	1. 49 Ci
	2. 22 Ci
	3. 12 Ci
	4. 24.5 Ci
25. A cobalt source has decayed from its original activity after 3 half-lives. Originally it was 88 Ci. Its current activity is:
	1. 44 Ci
	2. 22 Ci
	3. 11 Ci
	4. 8 Ci
26. A cobalt source of 73 Ci is exposed for a full 60 minutes. Assume a 14.0 R/Ci factor, shooting through a 3 half-value collimator. What would the restricted area be on the cold or collimated side of the collimator?
	1. 149 ft
	2. 162 ft.
	3. 211 ft
	4. 253 ft
27. A radiographer and assistant are standing in a 2 mR/hr field. What would the assistants total dose be after 4 hours?
	1. 2.0 mR
	2. 4.0 mR
	3. 6.0 mR
	4. 8.0 mR
28. You have 24 exposures to make. Your shot time is 5 min per exposure and you’re showing 30 mR/hr. What will your total dose be at the end of the shift?
	1. 30 mR
	2. 60 mR
	3. 120 mR
	4. 240 mR
29. A radiographer is receiving 100 mR at the crank assembly. The crank assembly is 25 ft in length. Where would the “ RADIATION AREA” sogn be posted?
	1. 111.8 ft
	2. 221.3 ft
	3. 343.7 ft
	4. 176.8 ft
30. A radiographer is receiving 100 mR/hr at the crank assembly. The crank assembly is 25 ft in length. How long will it take for the radiographer to receive a total dose of 50 mR?
	1. 30 min
	2. 60 min
	3. 90 min
	4. 120 min
31. Assume that 0.19 in. of lead is 1 half-value layer. How many half-value layers would you have with a sheet of lead 0.57” in thickness?
	1. 1 HVL
	2. 3 HVL
	3. 5 HVL
	4. 2 HVL
32. Assume 0.19” of lead is 1 half-value layer, and you have a total of 3 half-value layers of lead between you and 100 mR, what would your exposure rate be?
	1. 50 mR
	2. 25 mR
	3. 12.5 mR
	4. 33 mR
33. Assume 0.5 “ of steel equals 1 half-value layer for Ir-192. How many half-value layers would you have with 1.5” of steel?
	1. 3.28 HVL
	2. 3.0 HVL
	3. 3.05 HVL
	4. 0.328 HVL
34. Assuming 0.19” of lead is 1 HVL. A piece of lead 0.38” thick would reduce the exposure rate by:
	1. 25%
	2. 50%
	3. 75%
	4. 100%
35. A monitored person may receive up to 5,000 mR per year (5 R/year). What would be considered an excessive amount of radiation exposure to that individual?
	1. Exposures of more than 100 mR in one week
	2. Any exposure over 1,250 mR in a quarter
	3. Any unnecessary exposure to radiation
	4. Exposures of 500 mR/hr