









$$\text{CONTAMINATION LEVEL (Bq/cm}^2\text{)} = \frac{S - B}{E \times A \times T \times F}$$

Where:

S = Sample count rate (cpm or cps)

B = Background count rate (cpm or cps)

E = Detector efficiency (e.g. if 50% efficiency, E = 0.50)

A = Area wiped (100 cm<sup>2</sup>) or detector area in cm<sup>2</sup>

T = 60 sec/min if count rate in cpm

T = 1 if count rate in cps

F = 0.1 (e.g. 10%) is collection factor for area wiped (indirect monitoring or wipe test)

Net count rate (cpm or cps) = Sample count rate (cpm or cps) – Background count rate (cpm or cps)

Detector efficiency = Net count rate (cpm) /Known activity (dpm)

1 microcurie (μCi) = 2.2 x 10<sup>6</sup> disintegrations per minute (dpm)

Detector efficiency = Net count rate (cps)/Known activity (dps)

1 Becquerel (Bq) = 1 disintegration per second (dps)

1 microcurie (μCi) = 37 kilobecquerel (kBq) = 37000 becquerel (Bq)

Non-fixed contamination in all areas, rooms or enclosures where unsealed nuclear substances are used or stored does not exceed 3 Bq/cm<sup>2</sup>.

**Problem:**

You have taken a swipe for unsealed H-3 and S-35 contamination in your designated radiation room. The liquid scintillation counter print out shows a sample count rate of 940 cpm for the swipe of the fume hood in 100 cm<sup>2</sup>. The minimum detector efficiency is 50% and the background count rate is 40 cpm. What is the contamination level in Bq/cm<sup>2</sup>?

**Solution:**

$$\text{Contamination level (Bq/cm}^2\text{)} = \frac{940 \text{ cpm} - 40 \text{ cpm}}{0.5 \times 100 \text{ cm}^2 \times 60 \text{ sec/min} \times 0.1}$$

Therefore, the contamination level is 3.0 Bq/cm<sup>2</sup>.

Also, if you know the contamination limit in Bq/cm<sup>2</sup> and the counter print out shows in cpm then you can calculate a net count rate in cpm equal to the known contamination limit using the contamination level formula above.

**Problem:** The contamination limit is 3 Bq/cm<sup>2</sup>, 50% detector efficiency (as a conservative approach for most unsealed nuclear substances used), 100 cm<sup>2</sup> wiped area and 10% collection efficiency. What is the net count rate in cpm equal to 3 Bq/cm<sup>2</sup>?

**Solution:**

$$\text{Net count rate (cpm)} = 3 \text{ Bq/cm}^2 \times 0.5 \times 100 \text{ cm}^2 \times 60 \text{ sec/min} \times 0.1$$

Therefore, the net count rate equal to 3 Bq/cm<sup>2</sup> is 900 cpm.