Respiratory Safety 195

When the workplace atmosphere is contaminated and contains less than 19.5% oxygen, an atmosphere-supplying respirator must be used to provide breathable air through a protective mask. One type, a self-contained breathing apparatus (SCBA), is used when workers have short-term exposure or need to escape from an environment that is immediately dangerous to life and health (IDLH). Depending on its design, the SCBA can provide from 30 minutes to 4 hours of air.

EXAMPLE 1:

If a self-contained breathing apparatus (SCBA) is used for two hours and twenty-eight minutes, and it is designed to provide 4 hours of air, how much time will be left before the tank is empty?

SOLUTION:

The time remaining on the SCBA is the difference between 4 hours and 2 hours 28 minutes.

$$\begin{array}{l} \quad 4 \text{ hr} \\ -\ 2 \text{ hr } 28 \text{ min} \end{array}$$

Borrow 1 hour from the 4 hours and rewrite as 3 hr 60 min.

$$\begin{array}{l} \quad 3 \text{ hr } 60 \text{ min} \\ -\ \ 2 \text{ hr } 28 \text{ min} \\ \hline \quad 1 \text{ hr } 32 \text{ min} \end{array}$$

The SCBA should have 1 hr 32 min remaining before the tank runs out of air.

EXAMPLE 2:

A SCBA with a small air tank provides 30 minutes of air. Sixteen minutes of the air is used. What percent of the air remains in the tank?

SOLUTION:

When working a percent problem, it is helpful to identify each part of the problem so the values can be substituted correctly into the general percent formula.

Amount = Rate x Base

A = R x B

The base (B) is the whole or original amount the problem is based on. For this problem, the base is the 30 minutes of air that the tank provides.

The rate (R) is part of the base in percent form. In this problem, the percent is the unknown.

Rate (R) = ??

The amount (A) is the numerical part of the base that the rate also represents. Since this problem is asking for the percent of air that remains in the tank, that amount must be calculated from the given information.

Amount (A) = 30 - 16 = 14 minutes remaining A

= R x B

14 min = R x 30 min

Solve the formula by dividing out the 30.

$$R = \frac{14 \text{ min}}{30 \text{ min}} = .\overline{46}$$

Change the decimal form to a percent by multiplying by 100 which moves the decimal point two places to the right.

R = $.\overline{46}$ x 100 = $46.\overline{6}$ or 47% (to the nearest percent)

Approximately 47% of the air remains in the tank.

EXERCISES:

1. A self-contained breathing apparatus (SCBA) is used in a contaminated workplace atmosphere during three short intervals of time: 22 minutes, 25 minutes and 38 minutes.

   a. How much total time has the SCBA been used? Write the answer in hours and minutes.

   b. If the SCBA provides three hours of air, how much time could the SCBA be used before it runs out of air?

2. A worker enters a contaminated workplace atmosphere at 6:30 a.m. with a SCBA and leaves the area at 8:10 a.m.

   a. How long did the worker use the SCBA?

   b. Was the worker getting close to running out of air if the tank provides 2 hours of air?

3. A SCBA that provides four hours of air is used for three hours and 24 minutes.

   a. What percent of its air was used?

   b. What percent of its air still remains?