

(1) Logarithms and Earthquakes

The formula Richter used to define the magnitude of an earthquake is

$$M = \log\left(\frac{I}{I_o}\right)$$

I = intensity of the earthquake being measured;

I_o = intensity of a reference earthquake;

M = number used to measure the intensity of an earthquake.

Example 1

The Alaska earthquake of 1964 had a magnitude of 8.5 on the Richter scale. How many times more intense was the Alaska earthquake than a moderately destructive earthquake which has a magnitude of 6.0?

Let I_A be the intensity of the earthquake in Alaska

I_M be the intensity of a moderate

(2) Logarithm and Sound

The formula used to compare sound is

$$L = 10 \log\left(\frac{I}{I_o}\right)$$

I = intensity of the sound being measured;

I_o = intensity of the sound at the threshold of hearing

L = Loudness of sound measured in decibels (=1/10 of a bel).

Example 2

A sound is 1000 times more intense than a sound you can just hear. What is the measure of its loudness in decibels?

Example 3

How many more times intense is the sound of normal conversation (60 dB) than the sound of a whisper (30 dB)?

(3) Logarithms and Chemistry

Chemists define the acidity of a liquid on a p^H scale. The formula is

$$p^H = -\log[H^+]$$

p^H =acidity of a liquid

H^+ =concentration of the hydrogen ion in moles/litre.

Example 4

Find the pH of a swimming pool with a hydrogen ion concentration of 6.1×10^{-8} mol/L.

Example 5

The pH of a fruit juice is 3.10. What is the hydrogen ion concentration of the fruit juice?

Homework

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Logarithmic Application Review