

Solutions

2.1 B $\gamma=1/\text{sqrt}(1)=1$.

Compare the rejected options: 0; infinite. Use the stated model and conditions.

2.2 A Calibration bias shifts readings from the true value.

Compare the rejected options: sample count; the definition of velocity. Use the stated model and conditions.

2.3 10. $\text{sqrt}(6^2+8^2)=10$.

2.4 False. A biased instrument can give tightly clustered wrong readings.

3.1 $\sigma_N = \sqrt{N} = 20$ counts, relative uncertainty $1/\sqrt{N} = 0.05$. Half that relative uncertainty needs four times N, hence four times the interval. Repetition reduces random counting uncertainty, not constant calibration bias. Award absolute uncertainty, relative uncertainty, time factor and bias distinction.