QUIZ: Statistics: concepts and problems

1. To achieve an estimated percent standard deviation of 2%, _______ counts must be collected.
   a) 400
   b) 1,414
   c) 2,500
   d) 10,000

2. A measurement is made in which 2,500 counts are collected. There is a 95.5% probability that repeated measurements will yield between ______ and ______ counts.
   a) 2,400; 2,500
   b) 2,400; 2,600
   c) 2,450; 2,500
   d) 2,450; 2,550
   e) 2,500; 2,555

3. Answer True/False to the following statements:
   a) reliability depends upon agreement of observed value with true or actual value
   b) reliability depends upon reproducibility of measured values
   c) precision is a measure of both reliability and accuracy
   d) accuracy is a measure of both reliability and precision
   e) accuracy relates to agreement of observed and true values

4. The following series of measurements was made: 11, 10, 10, 11, 10.5. The standard deviation for these measurements using an (N-I) weighting is:
   a) 0.25
   b) 0.50
   c) 0.20
   d) 0.447

5. The count rate of a sample is 400,000 counts/minute. What is the % error involved in counting this sample?
   a) 0.0016 %
   b) 0.16 %
   c) 1.6%
   d) 0.2%
   e) none of the above
6. Consider the statistics formulae and statements below: mark each True or False

a) the mean value of a series of numbers = \[ \frac{\sum X_i}{n} \] where \( n \) = number of values
b) the mean value of a series of measurements always equals the median value
c) the standard deviation of a series of measurements is represented by the formula

\[
s = \pm \sqrt{\frac{\sum (X_i-\bar{X})^2}{N-1}}
\]
d) the curve above is skewed to the left.
e) For the Gaussian distribution, 78.3\% of all values will fall within \( \pm 1\sigma \) of the mean
f) The lower the number of \( \chi^2 \), the better the correlation between expected and measured values
g) “mean \( \pm 3\sigma \)” is used to set the normal range for lab values
h) The mode represents the middlemost value
i) The mean value of a series of numbers always equals the average value
j) for the Gaussian distribution, 95.5\% of all values will fall within \( \pm 2\sigma \) of the mean

7. A radioactive sample yields 8100 counts (including background). A background count of the same duration yields 1900 counts. The standard deviation of the difference between these counts is approximately:

a. 43.59  
b. 46.41  
c. 90  
d. 100  
e. 122.33

8. A three-minute observation is made from which the count rate is found to be 300 counts per minute. The standard deviation of this count rate is:

a. 30  
b. 14  
c. 17.3  
d. 10  
e. 9