

**Laboratory Quality Control, Statistics, and Measurement Uncertainty Post
Assessment Answer Key**

1. Which of the following is an element in a quality assurance plan?
 - a. control charts
 - b. quality control plan
 - c. human resource directives
 - d. data quality objectives

Answer: B

2. The laboratory mission statement defines the _____ for the laboratory.
 - a. location and destination
 - b. safety and quality objectives
 - c. purpose and place
 - d. responsibilities and opportunities

Answer: C

3. Laboratory safety is incorporated into the quality assurance plan by _____.
 - a. a specific section that describes all the safety measures
 - b. providing the general rules for laboratory safety
 - c. completely deferring to another program
 - d. making an overall statement of the safety objectives

Answer: D

4. A laboratory quality control program ensure data is accurate, consistent, and _____.
 - a. reliable
 - b. within strict guidelines
 - c. releasable
 - d. true

Answer: A

5. A laboratory quality control program is made of _____ and processes.
 - a. analyses
 - b. data
 - c. procedures
 - d. programs

Answer: C

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6. Standards used in a laboratory quality control program are _____.

- a. calibrated by external sources
- b. used for duplicate analysis
- c. error free
- d. certified when purchased

Answer: D

7. One method used as part of a laboratory quality control program is _____.

- a. Data manipulation
- b. trained personnel
- c. multiple repeats
- d. internal assessments

Answer: B

8. Quality Control samples are _____.

- a. analyzed separately
- b. included with every batch of samples
- c. analyzed with greater care
- d. reviewed and approved by an external team

Answer: B

9. The mean value for a data set is also called the _____ value.

- a. average
- b. centerline
- c. zero sigma
- d. neutral

Answer: A

10. The mean for the following set of data is?

21.2, 24.6, 18.7, 20.3, 26.8, 19.5, 21.5, 18.5

- a. 19.9
- b. 21.9
- c. 20.8
- d. 21.4

Answer: D

11. The standard deviation of a data set determines its _____.
- a. average
 - b. reproducibility
 - c. precision
 - d. accuracy

Answer: C

12. Standard deviation is calculated for _____.
- a. method blanks
 - b. QC samples
 - c. Duplicate samples
 - d. Matrix spike samples

Answer: B

13. What is the standard deviation for the following set of data?
125.3, 139.6, 132.7, 127.6, 142.3, 138.1, 129.6, 134.5, 131.4
- a. 5.69
 - b. 4.94
 - c. 5.13
 - d. 5.26

Answer: A

14. Which of the following can cause inconsistent results?
- a. human error
 - b. instrument malfunctions
 - c. procedure issues
 - d. all the above

Answer: D

15. The confidence levels of a data set are calculated directly from the _____.
- a. mean
 - b. percent spike recovery
 - c. standard deviation
 - d. relative percent deviation

Answer: C

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16. In a normal distribution, _____ of all data is expected to fall within the 3σ limit.

- a. 99.7%
- b. 95%
- c. 99.9%
- d. 86%

Answer: A

17. _____ is when samples are analyzed together.

- a. Grouping
- b. Batching
- c. Linking
- d. None of the above

Answer: B

18. Method blanks are used to check for _____.

- a. procedure compliance
- b. analysis accuracy
- c. reagent quality
- d. cross-contamination

Answer: D

19. The relative percent deviation (% RPD) is used to determine _____.

- a. cross-contamination
- b. reagent quality
- c. procedure compliance
- d. precision

Answer: D

20. If two analyses return results of 86.4 and 95.3, what is the relative percent deviation (% RPD)?

- a. 0.095
- b. 9.5
- c. 0.098
- d. 9.8

Answer: C

21. In a matrix spike, a _____ has a known amount of analyte added to it.
- sample
 - method blank
 - duplicate
 - QC sample

Answer: A

22. A low matrix spike recovery may be indicative of _____.
- chemistry problems
 - poor technique
 - instrument malfunction
 - all the above

Answer: D

23. What is the percent spike recovery for the following set of data?

Original Sample Result – 164.4 ug/g

Spike Sample Result – 193.5 ug/g

Spike Amount Added – 30 ug/g

- 0.97
- 1.03
- 1.00
- 0.0

Answer: A

24. Which of the following are plotted and tracked on quality control charts?

- Original Sample
- Duplicate sample
- QC sample
- Standard deviation

Answer: C

25. Which of the following error types is expected?

- trend
- systematic
- shift
- random

Answer: D

26. Any error outside of _____ is unacceptable.

- a. 2σ
- b. 3σ
- c. 10%
- d. 5%

Answer: B

27. Two consecutive points of data between _____ and _____ place analytical method "out of control".

- a. the mean, 2σ
- b. 1σ , 2σ
- c. the mean, 1σ
- d. 2σ , 3σ

Answer: D

28. Systematic error is _____.

- a. predictable
- b. impossible to eliminate
- c. not constant
- d. none of the above

Answer: A

29. Trends are usually _____.

- a. subtle
- b. downward
- c. abrupt
- d. upward

Answer: A

30. Trends are defined as data that moves in the same direction for _____ or more points.

- a. 3
- b. 5
- c. 7
- d. 9

Answer: C

31. A shift in data is also known as.

- a. adjustment
- b. bias
- c. change
- d. none of the above

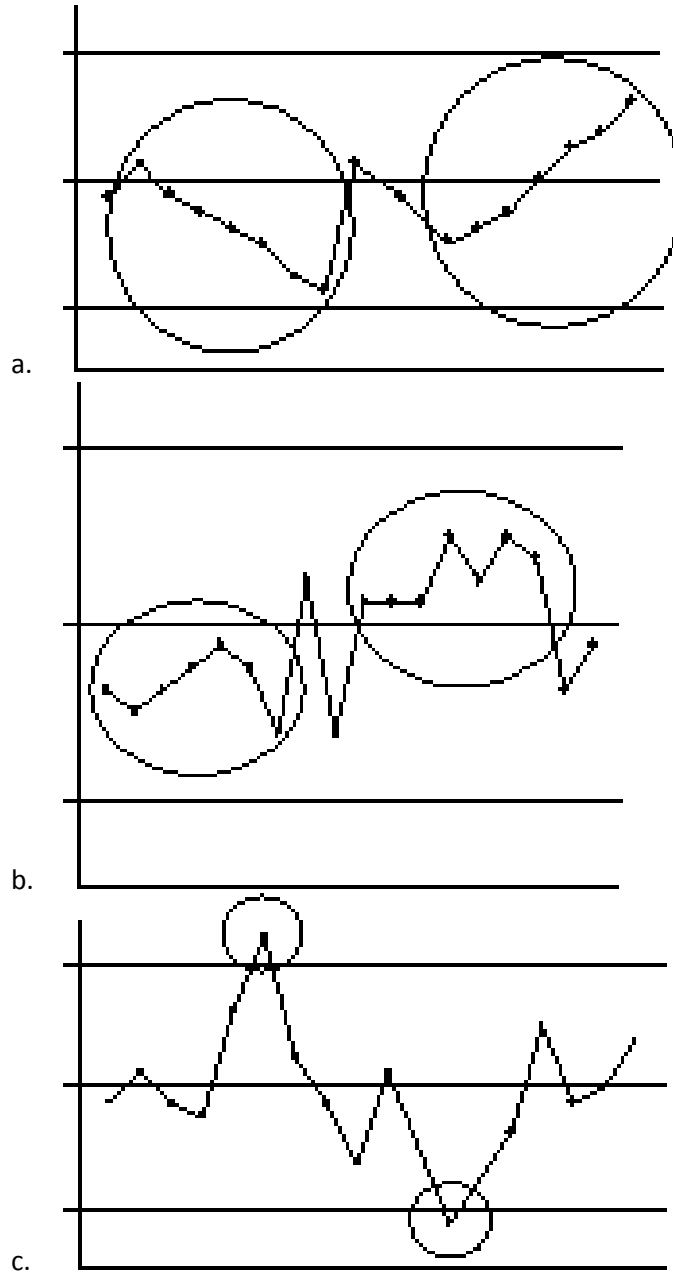
Answer: B

32. A shift in data usually occurs _____.

- a. over time
- b. regularly
- c. after procedure changes
- d. abruptly

Answer: D

33. Which of the following charts represents a shift?



Answer: B

34. Training for laboratory technicians should include:

- a. Classroom and on-the-job training
- b. Classroom and practice time
- c. Required reading and practice time
- d. On-the-job training only

Answer: A

35. On-the-job training for laboratory technicians should include:

- a. Guided completion
- b. Independent performance
- c. Observation
- d. All the above

Answer: D

36. Scientists and chemists can use laboratory technicians for _____.

- a. method validation
- b. research
- c. reagent selection
- d. results calculation

Answer: A

37. Measurement uncertainty for radiochemistry analysis is calculated differently because _____.

- a. laboratory technicians are usually not proficient
- b. procedures do not always work
- c. reagents are changed frequently
- d. samples are not consistent

Answer: D

38. Which of the following is NOT included in a radiochemistry error calculation?

- a. Instrument error
- b. Counting error
- c. Radioactive half-life
- d. Equipment malfunction

Answer: D

39. _____ can contribute greatly to a radiochemistry uncertainty calculation.
- Short count times
 - High energy coefficients
 - Low instrument efficiencies
 - High sample count rates

Answer: A

40. Radiochemistry counting instruments have inherent errors from _____.
- operator error
 - radioactive decay uncertainties
 - shielding
 - radioactive decay particles

Answer: B

41. In what area can a laboratory focus to improve uncertainty values?
- Reducing background levels
 - Increasing sample activity
 - Limiting human performance errors
 - Change customer requirements to suit lab needs.

Answer: C