Supplemental Test Items to accompany OpenStax *Chemistry*. Note that not all chapters of OpenStax *Chemistry* have accompanying test items. Building on the community-oriented nature of OpenStax resources, we invite you to submit items to be considered for future inclusion.

Chapter 01: Essential Ideas

1. A 0.150 kg metallic block measures 25.0 mm in length, 43.0 mm in width, and 19 .0 mm in height. What is the density of the metallic block in g/cm^3? (Outcome # 3) (DOK 2)
    A. 7.34 x 10^{-6} g/cm^3
    B. 7.34 x 10^{-3} g/cm^3
    C. 7.34 g/cm^3*
2. An object with a mass of 0.255 kg and density of 2.89 g/cm^3 measures 34 mm in length and 46 mm in width. What is the height of the object? (Outcome # 3) (DOK 3)
    A. 5.6 cm*
    B. 5.6 x 10^{-2} cm
    C. 7.2 x 10^{-4} cm
3. How would you determine the density of an irregular object? (Outcome # 3) (DOK 3)
    A. It would be impossible to determine the mass of the object without more information.
    B. D = m/v, so measure the mass of the object using a balance. Then to find volume, measure the height, width, and length using an appropriate measuring tool.
    C. D = m/v, so measure the mass of the object using a balance. Then to find volume, fill a graduated cylinder with a known amount of water and immerse the object in the water. The amount of displaced water is the volume in cm^3 or mL.*
4. What is the base unit for length in the metric system? (Outcome # 6) (DOK 1)
    A. m*
    B. km
    C. mm
5. What is the base unit for mass in the metric system? (Outcome # 6) (DOK 1)
    A. kg
    B. g*
    C. mg
6. What is the base unit for volume in the metric system? (Outcome # 6) (DOK 1)
    A. L*
    B. mL
    C. dL
7. It is important that scientists use units that are understood on a global level. These units are referred to as SI units which stands for _____. (Outcome # 6) (DOK 1)
    A. standard international units

B. standard intercontinental units
C. international system of units*

8. Convert 18.50 ft to the SI unit for length. (Outcome # 6) (DOK 2)
   A. 563.9 cm
   B. 5.639 m*
   C. 0.005639 km
9. An experimental mouse weighs about 4.41×10^{-2} lbs. What would the weight be in the SI unit for mass? (Outcome # 6) (DOK 2)
   A. 20.0 g
   B. 0.0200 kg*
   C. 20,003 mg
10. Accuracy is defined as how close a measured value comes to a _____. (Outcome # 6) (DOK 1)
    A. core value
    B. fixed value
    C. true value*
11. Precision is defined as how _____ the measured values are to one another. (Outcome # 6) (DOK 1)
    A. common
    B. reproducible*
    C. accurate
12. An experiment requires you to make several measurements. Based on the values in the table below, what would be the best statement that represents the data set if the true value is 0.2135? (Outcome # 11) (DOK 2)

Trial A	Trial B	Trial C
0.2139	0.2893	0.2135
0.2130	0.3210	0.2134
0.2133	0.2999	0.3712
0.2135	0.2998	0.3715

    A. The measurements in Trial A are accurate and precise, Trial B is neither accurate nor precise, and Trial C is accurate however, not precise.
    B. The measurements in Trial A are accurate and precise, Trial B is neither accurate nor precise, and Trial C is precise however, not accurate.
    C. The measurements in Trial A are accurate and precise, Trial's B and C are neither accurate nor precise.*
13. An experiment requires you to make several measurements. Based on the values in the table below, what would be the best statement that represents the data set if the true value is 2.73? (Outcome # 11) (DOK 2) (Paired item 1)

Trial A	Trial B	Trial C
2.73	3.00	2.77
3.05	3.03	2.79
3.09	2.99	3.31
2.44	3.01	2.05

A. The measurements in Trial B are precise, however, not accurate. Trial's A and C are neither accurate nor precise.*
B. The measurements in Trial B are accurate, however, not precise. Trial's A and C are neither accurate nor precise.
C. The measurements in Trial's A, B, and C are neither accurate nor precise.

14. Which of the following would be considered a chemical change? (Outcome # 9) (DOK 1)
    A. a rusting nail*
    B. melting ice
    C. crushing an aluminum can
15. Which of the following would be considered a physical change? (Outcome # 9) (DOK 1)
    A. digesting food
    B. burning paper
    C. boiling water*
16. A salt water solution is classified as what type of matter? (Outcome # 9) (DOK 1)
    A. homogeneous mixture*
    B. heterogeneous mixture
    C. pure substance
17. How many significant figures are in 0.0000401 kg? (Outcome # 5) (DOK 1)
    A. 3*
    B. 7
    C. 2
18. How many significant figures are in 0.20 L? (Outcome # 5) (DOK 1) (Paired item 1)
    A. 3
    B. 1
    C. 2*
19. Express 1.40×10^{-3} L in decimal notation. (Outcome # 5) (DOK 1)
    A. 0.00140 L*
    B. 0.0014 L
    C. 0.001 L
20. What is the answer for the following calculation: (1.249 - 0.0234) x 139.37? (Outcome # 5) (DOK 2)
    A. 170.812
    B. 170.8*
    C. 170.81

21. What is the SI unit for mass? (Outcome # 7) (DOK 1)
    A. kilogram*
    B. gram
    C. milligram
22. What is the SI unit for length? (Outcome # 7) (DOK 1)
    A. meter*
    B. kilometer
    C. millimeter
23. What is the SI unit for temperature? (Outcome # 7) (DOK 1)
    A. Celsius
    B. Fahrenheit
    C. kelvin*
24. How many grams of iron are in 350 mg of iron? (Outcome # 7) (DOK 1)
    A. 3.50 g
    B. 0.350 g*
    C. 35.0 g
25. The prefix milli- in the metric system represents a factor of _____. (Outcome # 7) (DOK 1)
    A. 10^{3}
    B. 10^{-3}*
    C. $1/10^{-3}$
26. The prefix kilo- in the metric system represents a factor of _____. (Outcome # 7) (DOK 1)
    A. 10^{3}*
    B. 10^{-3}
    C. $1/10^{3}$
27. The prefix nano- in the metric system represents a factor of _____. (Outcome # 7) (DOK 1)
    A. 10^{9}
    B. 10^{-6}
    C. 10^{-9}*
28. An explanation for the collection of observations is considered a _____. (Outcome # 10) (DOK 1)
    A. theory*
    B. law
    C. hypothesis
29. A statement about mass always being conserved in a chemical reaction is an example of a _____. (Outcome # 10) (DOK 1)
    A. hypothesis
    B. theory
    C. law*

30. The scientific method involves various techniques which allow researchers to investigate scientific questions through _____ and _____. (Outcome # 10) (DOK 1)
    A. analysis and observations
    B. observations and experimentation*
    C. analysis and predictions
31. Why has Galileo been called the father of modern science? (Outcome # 10) (DOK 1)
    A. because he made observations and conducted experiments*
    B. because he discovered electrochemical cells
    C. because he was a philosopher
32. List the basic steps of the scientific method process in the order they must be carried out. (Outcome # 10) (DOK 1)
    A. observation, hypothesis, prediction, experimentation, and conclusion*
    B. hypothesis, observation, prediction, experimentation, and conclusion
    C. prediction, observation, hypothesis, experimentation, and conclusion
33. Which of the following is not part of the scientific method process? (Outcome # 10) (DOK 1)
    A. observation
    B. prediction
    C. discussion*
34. Which of the following would be a good example of an observation in the scientific method process? (Outcome # 10) (DOK 2)
    A. a researcher watching a chemical reaction
    B. a researcher watching a chemical reaction and noting color and temperature changes*
    C. a researcher setting up a chemical reaction in a flask and allowing it to stir for 2 hours
35. Which of the following would be a good example of an observation in the scientific method process? (Outcome # 10) (DOK 2) (Paired item 1)
    A. a physician observing a patient's reaction to some medication*
    B. a physician observing his watch
    C. a physician speaking with and observing a patient in an examination room
36. Which of the following would be good tools for making scientific observations during a chemical reaction? (Outcome # 10) (DOK 2)
    A. barometer, thermometer, scale
    B. thermometer, your eyes, clock*
    C. thermometer, your eyes, tape measure
37. Which of the following would be a good tool for making scientific observations after isolating a solid product from a chemical reaction? (Outcome # 10) (DOK 2)
    A. balance*

B. clock
C. tape measure

38. What can be used to measure the mass of an object? (Outcome # 10) (DOK 1)
    A. balance*
    B. tape measure
    C. caliper
39. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3)
    A. a researcher considers that the more sunlight a green plant receives, the larger the plant will grow*
    B. a researcher wonders amount the effect of more sunlight on green plant growth
    C. a researcher watches as a green plant exposed to more sunlight grows over a period of 1 month
40. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3) (Paired item 1)
    A. a clinician confirms that taking a vitamin every day will decrease the level of tiredness in people
    B. a clinician tells a patient that taking a vitamin every day, may decrease the level of tiredness in people
    C. a clinician contemplates that taking a vitamin every day, may decrease the level of tiredness in people*
41. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3) (Paired item 2)
    A. a botanist adds 20 mL of water to his plants on a daily basis and he notices a healthy growth, therefore, he believes that adding 40 mL of water on a daily basis will enhance their growth further*
    B. a botanist adds 20 mL of water to his plants on a daily basis and he notices a healthy growth
    C. a botanist adds 20 mL of water to his plants on a daily basis and he notices a healthy growth, therefore, adding 40 mL of water on a daily basis will definitely enhance their growth further
42. Once a hypothesis has been established, it can be tested by conducting an _____. (Outcome # 10) (DOK 1)
    A. observation
    B. experiment*
    C. analysis
43. Which statement is correct about the scientific method process? (Outcome # 10) (DOK 1)

A. after testing a hypothesis, a conclusion can be drawn on whether it will be accepted or rejected*
B. after testing an observation, a conclusion can be drawn on whether it will be accepted or rejected
C. after testing a conclusion, it can be predicted whether a hypothesis will be accepted or rejected

44. Why is chemistry considered a central science? (Outcome # 10) (DOK 1)
    A. because it is a core course required for most majors in college
    B. because it is the fundamental science for many other disciplines*
    C. because it is very important in medicine
45. What is applied research? (Outcome # 10) (DOK 1)
    A. it deals primarily with solving practical real-world problems*
    B. it deals primarily with solving practical laboratory problems
    C. it deals primarily with the fundamentals of science that may result in future applications
46. What is basic research? (Outcome # 10) (DOK 1)
    A. it deals primarily with solving practical real-world problems
    B. it deals primarily with the fundamentals of science that may result in future applications*
    C. it deals primarily with solving practical laboratory problems
47. Which of the following is an example of applied research? (Outcome # 10) (DOK 2)
    A. a researcher tries to develop a new anti-cancer drug*
    B. a researcher tries to extract a newly found natural product from plants to study its medicinal properties
    C. a researcher studies a hormone and its prospect as a cell signaling molecule
48. Which of the following is an example of applied research? (Outcome # 10) (DOK 2) (Paired item 1)
    A. a researcher tries to extract a newly found natural product from plants to study its medicinal properties
    B. a researcher tries to study the effect of a new drug on HIV-inhibition*
    C. a researcher studies a hormone and its prospect as a cell signaling molecule
49. Which of the following is an example of basic research? (Outcome # 10) (DOK 2)
    A. a researcher tries to study the effect of a new drug on HIV-inhibition
    B. a researcher tries to develop a new anti-cancer drug
    C. a researcher studies a hormone and its prospect as a cell signaling molecule*
50. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1)
    A. carbon monoxide is poisonous
    B. acids are sour and bases are bitter*

C. an iron nail rusts

51. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1) (Paired item 1)
    A. water freezes at 273.15 K*
    B. carbon monoxide is poisonous
    C. an iron nail rusts
52. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1) (Paired item 2)
    A. lead forming lead oxide in the presence of air
    B. the color of paint*
    C. digestion
53. Which is of the following is an example of a chemical property? (Outcome # 10) (DOK 1)
    A. water boils at 100 °C
    B. acids are sour and bases are bitter
    C. an iron nail rusts*
54. Which is of the following is an example of a chemical property? (Outcome # 10) (DOK 1) (Paired item 1)
    A. water boils at 100 °C
    B. carbon monoxide is poisonous*
    C. a copper penny weighs 3.00 g
55. The following is an example of a chemical change. (Outcome # 10) (DOK 1)
    A. cutting paper
    B. burning paper*
    C. folding paper
56. The following is an example of a chemical change. (Outcome # 10) (DOK 1) (Paired item 1)
    A. shredding paper
    B. decomposing waste*
    C. dissolving sugar
57. A website claims that there is a natural cure for all cancers; however, doctors do not want to recommend natural remedies because it would make them obsolete. Is this statement logical? (Outcome # 10) (DOK 3)
    A. yes, doctors can cure all patients
    B. yes, doctors can cure some patients with natural remedies
    C. no, doctors cannot cure all patients and regardless of treatment, some patients still remain ill and die*