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/cm3? (Outcome # 3) (DOK 2)
2. 7.34 x 10-6 g/cm3
3. 7.34 x 10-3 g/cm3
4. 7.34 g/cm3\*
5. An object with a mass of 0.255 kg and density of 2.89 g/cm3 measures 34 mm in length and 46 mm in width. What is the height of the object? (Outcome # 3) (DOK 3)
6. 5.6 cm\*
7. 5.6 x 10-2 cm
8. 7.2 x 10-4 cm
9. How would you determine the density of an irregular object? (Outcome # 3) (DOK 3)
10. It would be impossible to determine the mass of the object without more information.
11. 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.
12. 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 cm3 or mL.\*
13. What is the base unit for length in the metric system? (Outcome # 6) (DOK 1)
14. m\*
15. km
16. mm
17. What is the base unit for mass in the metric system? (Outcome # 6) (DOK 1)
18. kg
19. g\*
20. mg
21. What is the base unit for volume in the metric system? (Outcome # 6) (DOK 1)
22. L\*
23. mL
24. dL
25. 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)
26. standard international units
27. standard intercontinental units
28. international system of units\*
29. Convert 18.50 ft to the SI unit for length. (Outcome # 6) (DOK 2)
30. 563.9 cm
31. 5.639 m\*
32. 0.005639 km
33. An experimental mouse weighs about 4.41 x 10-2 lbs. What would the weight be in the SI unit for mass? (Outcome # 6) (DOK 2)
34. 20.0 g
35. 0.0200 kg\*
36. 20,003 mg
37. Accuracy is defined as how close a measured value comes to a \_\_\_\_\_. (Outcome # 6) (DOK 1)
38. core value
39. fixed value
40. true value\*
41. Precision is defined as how \_\_\_\_\_ the measured values are to one another. (Outcome # 6) (DOK 1)
42. common
43. reproducible\*
44. accurate
45. 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 |

1. The measurements in Trial A are accurate and precise, Trial B is neither accurate nor precise, and Trial C is accurate however, not precise.
2. The measurements in Trial A are accurate and precise, Trial B is neither accurate nor precise, and Trial C is precise however, not accurate.
3. The measurements in Trial A are accurate and precise, Trial’s B and C are neither accurate nor precise.\*
4. 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 |

1. The measurements in Trial B are precise, however, not accurate. Trial’s A and C are neither accurate nor precise.\*
2. The measurements in Trial B are accurate, however, not precise. Trial’s A and C are neither accurate nor precise.
3. The measurements in Trial’s A, B, and C are neither accurate nor precise.
4. Which of the following would be considered a chemical change? (Outcome # 9) (DOK 1)
5. a rusting nail\*
6. melting ice
7. crushing an aluminum can
8. Which of the following would be considered a physical change? (Outcome # 9) (DOK 1)
9. digesting food
10. burning paper
11. boiling water\*
12. A salt water solution is classified as what type of matter? (Outcome # 9) (DOK 1)
13. homogeneous mixture\*
14. heterogeneous mixture
15. pure substance
16. How many significant figures are in 0.0000401 kg? (Outcome # 5) (DOK 1)
17. 3\*
18. 7
19. 2
20. How many significant figures are in 0.20 L? (Outcome # 5) (DOK 1) (Paired item 1)
21. 3
22. 1
23. 2\*
24. Express 1.40 x 10-3 L in decimal notation. (Outcome # 5) (DOK 1)
25. 0.00140 L\*
26. 0.0014 L
27. 0.001 L
28. What is the answer for the following calculation: (1.249 - 0.0234) x 139.37? (Outcome # 5) (DOK 2)
29. 170.812
30. 170.8\*
31. 170.81
32. What is the SI unit for mass? (Outcome # 7) (DOK 1)
33. kilogram\*
34. gram
35. milligram
36. What is the SI unit for length? (Outcome # 7) (DOK 1)
37. meter\*
38. kilometer
39. millimeter
40. What is the SI unit for temperature? (Outcome # 7) (DOK 1)
41. Celsius
42. Fahrenheit
43. kelvin\*
44. How many grams of iron are in 350 mg of iron? (Outcome # 7) (DOK 1)
45. 3.50 g
46. 0.350 g\*
47. 35.0 g
48. The prefix milli- in the metric system represents a factor of \_\_\_\_\_. (Outcome # 7) (DOK 1)
49. 103
50. 10-3\*
51. 1/10-3
52. The prefix kilo- in the metric system represents a factor of \_\_\_\_\_. (Outcome # 7) (DOK 1)
53. 103\*
54. 10-3
55. 1/103
56. The prefix nano- in the metric system represents a factor of \_\_\_\_\_. (Outcome # 7) (DOK 1)
57. 109
58. 10-6
59. 10-9\*
60. An explanation for the collection of observations is considered a \_\_\_\_\_. (Outcome # 10) (DOK 1)
61. theory\*
62. law
63. hypothesis
64. A statement about mass always being conserved in a chemical reaction is an example of a \_\_\_\_\_. (Outcome # 10) (DOK 1)
65. hypothesis
66. theory
67. law\*
68. The scientific method involves various techniques which allow researchers to investigate scientific questions through \_\_\_\_\_ and \_\_\_\_\_. (Outcome # 10) (DOK 1)
69. analysis and observations
70. observations and experimentation\*
71. analysis and predictions
72. Why has Galileo been called the father of modern science? (Outcome # 10) (DOK 1)
73. because he made observations and conducted experiments\*
74. because he discovered electrochemical cells
75. because he was a philosopher
76. List the basic steps of the scientific method process in the order they must be carried out. (Outcome # 10) (DOK 1)
77. observation, hypothesis, prediction, experimentation, and conclusion\*
78. hypothesis, observation, prediction, experimentation, and conclusion
79. prediction, observation, hypothesis, experimentation, and conclusion
80. Which of the following is not part of the scientific method process? (Outcome # 10) (DOK 1)
81. observation
82. prediction
83. discussion\*
84. Which of the following would be a good example of an observation in the scientific method process? (Outcome # 10) (DOK 2)
85. a researcher watching a chemical reaction
86. a researcher watching a chemical reaction and noting color and temperature changes\*
87. a researcher setting up a chemical reaction in a flask and allowing it to stir for 2 hours
88. Which of the following would be a good example of an observation in the scientific method process? (Outcome # 10) (DOK 2) (Paired item 1)
89. a physician observing a patient's reaction to some medication\*
90. a physician observing his watch
91. a physician speaking with and observing a patient in an examination room
92. Which of the following would be good tools for making scientific observations during a chemical reaction? (Outcome # 10) (DOK 2)
93. barometer, thermometer, scale
94. thermometer, your eyes, clock\*
95. thermometer, your eyes, tape measure
96. 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)
97. balance\*
98. clock
99. tape measure
100. What can be used to measure the mass of an object? (Outcome # 10) (DOK 1)
101. balance\*
102. tape measure
103. caliper
104. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3)
105. a researcher considers that the more sunlight a green plant receives, the larger the plant will grow\*
106. a researcher wonders amount the effect of more sunlight on green plant growth
107. a researcher watches as a green plant exposed to more sunlight grows over a period of 1 month
108. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3) (Paired item 1)
109. a clinician confirms that taking a vitamin every day will decrease the level of tiredness in people
110. a clinician tells a patient that taking a vitamin every day, may decrease the level of tiredness in people
111. a clinician contemplates that taking a vitamin every day, may decrease the level of tiredness in people\*
112. Which of the following would be a good example of a hypothesis in the scientific method process? (Outcome # 10) (DOK 3) (Paired item 2)
113. 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\*
114. a botanist adds 20 mL of water to his plants on a daily basis and he notices a healthy growth
115. 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
116. Once a hypothesis has been established, it can be tested by conducting an \_\_\_\_\_. (Outcome # 10) (DOK 1)
117. observation
118. experiment\*
119. analysis
120. Which statement is correct about the scientific method process? (Outcome # 10) (DOK 1)
121. after testing a hypothesis, a conclusion can be drawn on whether it will be accepted or rejected\*
122. after testing an observation, a conclusion can be drawn on whether it will be accepted or rejected
123. after testing a conclusion, it can be predicted whether a hypothesis will be accepted or rejected
124. Why is chemistry considered a central science? (Outcome # 10) (DOK 1)
125. because it is a core course required for most majors in college
126. because it is the fundamental science for many other disciplines\*
127. because it is very important in medicine
128. What is applied research? (Outcome # 10) (DOK 1)
129. it deals primarily with solving practical real-world problems\*
130. it deals primarily with solving practical laboratory problems
131. it deals primarily with the fundamentals of science that may result in future applications
132. What is basic research? (Outcome # 10) (DOK 1)
133. it deals primarily with solving practical real-world problems
134. it deals primarily with the fundamentals of science that may result in future applications\*
135. it deals primarily with solving practical laboratory problems
136. Which of the following is an example of applied research? (Outcome # 10) (DOK 2)
137. a researcher tries to develop a new anti-cancer drug\*
138. a researcher tries to extract a newly found natural product from plants to study its medicinal properties
139. a researcher studies a hormone and its prospect as a cell signaling molecule
140. Which of the following is an example of applied research? (Outcome # 10) (DOK 2) (Paired item 1)
141. a researcher tries to extract a newly found natural product from plants to study its medicinal properties
142. a researcher tries to study the effect of a new drug on HIV-inhibition\*
143. a researcher studies a hormone and its prospect as a cell signaling molecule
144. Which of the following is an example of basic research? (Outcome # 10) (DOK 2)
145. a researcher tries to study the effect of a new drug on HIV-inhibition
146. a researcher tries to develop a new anti-cancer drug
147. a researcher studies a hormone and its prospect as a cell signaling molecule\*
148. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1)
149. carbon monoxide is poisonous
150. acids are sour and bases are bitter\*
151. an iron nail rusts
152. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1) (Paired item 1)
153. water freezes at 273.15 K\*
154. carbon monoxide is poisonous
155. an iron nail rusts
156. Which is of the following is an example of a physical property? (Outcome # 10) (DOK 1) (Paired item 2)
157. lead forming lead oxide in the presence of air
158. the color of paint\*
159. digestion
160. Which is of the following is an example of a chemical property? (Outcome # 10) (DOK 1)
161. water boils at 100 °C
162. acids are sour and bases are bitter
163. an iron nail rusts\*
164. Which is of the following is an example of a chemical property? (Outcome # 10) (DOK 1) (Paired item 1)
165. water boils at 100 °C
166. carbon monoxide is poisonous\*
167. a copper penny weighs 3.00 g
168. The following is an example of a chemical change. (Outcome # 10) (DOK 1)
169. cutting paper
170. burning paper\*
171. folding paper
172. The following is an example of a chemical change. (Outcome # 10) (DOK 1) (Paired item 1)
173. shredding paper
174. decomposing waste\*
175. dissolving sugar
176. 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)
177. yes, doctors can cure all patients
178. yes, doctors can cure some patients with natural remedies
179. no, doctors cannot cure all patients and regardless of treatment, some patients still remain ill and die\*