

**Registration form**

**Water Chemistry CEU Training Course \$150.00  
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start and finish dates:** \_\_\_\_\_

*You will have 90 days from this date in order to complete this course*

**List number of hours worked on assignment must match State requirement.** \_\_\_\_\_

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

*I have read and understood the disclaimer notice on page 2. Digitally sign XXX*

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*Please circle/check which certification you are applying the course CEU's/PDH's.*

Wastewater Collection \_\_\_\_\_ Wastewater Treatment \_\_\_\_\_ Distribution \_\_\_\_\_

Water Treatment \_\_\_\_\_ Other \_\_\_\_\_

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I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

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## Water Chemistry Answer Key

Name \_\_\_\_\_

Phone# \_\_\_\_\_

You are solely responsible that this course is accepted for credit by your State. **No refunds.** Did you check with your State agency to ensure this course is accepted for credit?

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What is the course approval number, if applicable? \_\_\_\_\_

PA DEP Students are required to complete the original version of the text. \_\_\_\_\_

Please initial

*You can use Adobe Acrobat DC to complete your assignment.*

*Please circle, underline, bold or X only one correct answer*

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| 1. A B C D E F  | 16. A B C D E F | 31. A B C D E F |
| 2. A B C D E F  | 17. A B C D E F | 32. A B C D E F |
| 3. A B C D E F  | 18. A B C D E F | 33. A B C D E F |
| 4. A B C D E F  | 19. A B C D E F | 34. A B C D E F |
| 5. A B C D E F  | 20. A B C D E F | 35. A B C D E F |
| 6. A B C D E F  | 21. A B C D E F | 36. A B C D E F |
| 7. A B C D E F  | 22. A B C D E F | 37. A B C D E F |
| 8. A B C D E F  | 23. A B C D E F | 38. A B C D E F |
| 9. A B C D E F  | 24. A B C D E F | 39. A B C D E F |
| 10. A B C D E F | 25. A B C D E F | 40. A B C D E F |
| 11. A B C D E F | 26. A B C D E F | 41. A B C D E F |
| 12. A B C D E F | 27. A B C D E F | 42. A B C D E F |
| 13. A B C D E F | 28. A B C D E F | 43. A B C D E F |
| 14. A B C D E F | 29. A B C D E F | 44. A B C D E F |
| 15. A B C D E F | 30. A B C D E F | 45. A B C D E F |

46. A B C D E F      78. A B C D E F      110. A B C D E F  
47. A B C D E F      79. A B C D E F      111. A B C D E F  
48. A B C D E F      80. A B C D E F      112. A B C D E F  
49. A B C D E F      81. A B C D E F      113. A B C D E F  
50. A B C D E F      82. A B C D E F      114. A B C D E F  
51. A B C D E F      83. A B C D E F      115. A B C D E F  
52. A B C D E F      84. A B C D E F      116. A B C D E F  
53. A B C D E F      85. A B C D E F      117. A B C D E F  
54. A B C D E F      86. A B C D E F      118. A B C D E F  
55. A B C D E F      87. A B C D E F      119. A B C D E F  
56. A B C D E F      88. A B C D E F      120. A B C D E F  
57. A B C D E F      89. A B C D E F      121. A B C D E F  
58. A B C D E F      90. A B C D E F      122. A B C D E F  
59. A B C D E F      91. A B C D E F      123. A B C D E F  
60. A B C D E F      92. A B C D E F      124. A B C D E F  
61. A B C D E F      93. A B C D E F      125. A B C D E F  
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63. A B C D E F      95. A B C D E F      127. A B C D E F  
64. A B C D E F      96. A B C D E F      128. A B C D E F  
65. A B C D E F      97. A B C D E F      129. A B C D E F  
66. A B C D E F      98. A B C D E F      130. A B C D E F  
67. A B C D E F      99. A B C D E F      131. A B C D E F  
68. A B C D E F      100. A B C D E F      132. A B C D E F  
69. A B C D E F      101. A B C D E F      133. A B C D E F  
70. A B C D E F      102. A B C D E F      134. A B C D E F  
71. A B C D E F      103. A B C D E F      135. A B C D E F  
72. A B C D E F      104. A B C D E F      136. A B C D E F  
73. A B C D E F      105. A B C D E F      137. A B C D E F  
74. A B C D E F      106. A B C D E F      138. A B C D E F  
75. A B C D E F      107. A B C D E F      139. A B C D E F  
76. A B C D E F      108. A B C D E F      140. A B C D E F  
77. A B C D E F      109. A B C D E F      141. A B C D E F

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| 142. A B C D E F | 163. A B C D E F | 184. A B C D E F |
| 143. A B C D E F | 164. A B C D E F | 185. A B C D E F |
| 144. A B C D E F | 165. A B C D E F | 186. A B C D E F |
| 145. A B C D E F | 166. A B C D E F | 187. A B C D E F |
| 146. A B C D E F | 167. A B C D E F | 188. A B C D E F |
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| 152. A B C D E F | 173. A B C D E F | 194. A B C D E F |
| 153. A B C D E F | 174. A B C D E F | 195. A B C D E F |
| 154. A B C D E F | 175. A B C D E F | 196. A B C D E F |
| 155. A B C D E F | 176. A B C D E F | 197. A B C D E F |
| 156. A B C D E F | 177. A B C D E F | 198. A B C D E F |
| 157. A B C D E F | 178. A B C D E F | 199. A B C D E F |
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| 161. A B C D E F | 182. A B C D E F |                  |
| 162. A B C D E F | 183. A B C D E F |                  |

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**WATER CHEMISTRY  
CEU TRAINING COURSE**

**CUSTOMER SERVICE RESPONSE CARD**

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**PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.**

1. Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.

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## Water Chemistry CEU Training Course Assignment Answer Key

*The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit [www.ABCTLC.com](http://www.ABCTLC.com) and download the assignment and e-mail it back to TLC.*

You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to [info@tlch2o.com](mailto:info@tlch2o.com).

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your answer key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

### Drinking Water Standards

1. \_\_\_\_\_ is responsible for establishing maximum contaminant levels for drinking water?

- A. OSHA
- B. RCRA
- C. WHO
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. US Environmental Protection Agency
- F. None of the Above

2. Dissolved gases such as nitrogen, oxygen, radon, and methane can be classified as?

- A. Myriad organic compounds
- B. Inorganic compounds
- C. Metallics
- D. Ionic compounds
- E. Electron affinity (anions)
- F. None of the Above

3. Some of the metals can be hazardous to human health, and may be introduced into water either naturally or through?

- A. Myriad organic compounds
- B. Inorganic compounds
- C. Springs
- D. Ionic compounds
- E. Electron affinity (anions)
- F. None of the Above

4. Arsenic and aluminum can have a MCL of no more than?

- A. 4.0
- B. .002
- C. 1.3
- D. .015
- E. 10.0
- F. None of the Above

5. Lead's MCL?

- A. 4.0
- B. .002
- C. 1.3
- D. .015
- E. 10.0
- F. None of the Above

6. Mercury's MCL?

- A. 4.0
- B. .002
- C. 1.3
- D. .015
- E. 10.0
- F. None of the Above

7. Zinc, calcium, sodium, magnesium, potassium, and copper's MCL?  
 A. 4.0     D. .015  
 B. .002    E. 10.0  
 C. 1.3     F. None of the Above
8. Which of the following terms can be dangerous to human health even at low concentrations, and can be introduced to our water from a variety of sources, including old pipes and lead solder?  
 A. Crystallization compounds     D. Organometallic compounds  
 B. Inorganic salts                    E. Lead, mercury, and arsenic  
 C. Bad compounds                    F. None of the Above
9. Which of the following terms such as sodium, potassium, calcium, and magnesium are important to our overall health and well-being?  
 A. Myriad organic compounds     D. Ionic compounds  
 B. Other inorganic compounds     E. Other organic compounds  
 C. Metals                                F. None of the Above
10. Another class of inorganic compounds are known as negative ions. These include substances such as fluoride: which has an MCL of \_\_\_\_\_PPM (parts per million).  
 A. 4.0     D. .015  
 B. .002    E. 10.0  
 C. 1.3     F. None of the Above
11. Chloride and nitrate: MCL is \_\_\_\_\_ ppm.  
 A. 4.0     D. .015  
 B. .002    E. 10.0  
 C. 1.3     F. None of the Above
12. Nitrite's MCL is \_\_\_\_\_.  
 A. 4.0     D. 1.0  
 B. .002    E. 10.0  
 C. 1.3     F. None of the Above
13. Sulfate, phosphate, carbonate, and cyanide: MCL is \_\_\_\_\_  
 A. 2.0     D. .025  
 B. .002    E. 20.0  
 C. 0.2     F. None of the Above

### **Inorganic Chemistry**

14. Inorganic chemistry is the study of the synthesis and behavior of?  
 A. Myriad organic compounds     D. Ionic compounds  
 B. Inorganic compounds            E. Inorganic and organometallic compounds  
 C. Non-life                              F. None of the Above
15. Which of the following terms has applications in every aspect of the chemical industry—including catalysis, materials science, pigments, surfactants, coatings, medicine, fuel, and agriculture?  
 A. Crystallization                    D. Organometallic chemistry  
 B. Inorganic salts                    E. Lead, mercury, and arsenic  
 C. Electrically neutral              F. None of the Above

### Key Concepts

16. According to the text, many inorganic compounds are ionic compounds, consisting of \_\_\_\_\_ joined by ionic bonding.

- A. Myriad organic compounds
- B. Inorganic compounds
- C. Some metals
- D. Cations and anions
- E. Electron affinity (anions)
- F. None of the Above

17. In any salt, the proportions of the ions are such that the electric charges cancel out, so that the bulk compound is \_\_\_\_\_.

- A. A shiny crystal
- B. An inorganic salt
- C. Electrically neutral
- D. A sub-discipline of organometallic chemistry
- E. Electrically positive
- F. None of the Above

18. The ions are described by their oxidation state and their ease of formation can be inferred from the ionization potential (for cations) or from the electron affinity (anions) of the \_\_\_\_\_.

- A. Myriad organic compound
- B. Inorganic compound
- C. Metal
- D. Ionic compound
- E. Anions
- F. None of the Above

19. \_\_\_\_\_ are the sulfates and the halides.

- A. Nitrates
- B. Oxides, the carbonates
- C. Electrically neutral cations
- D. Sub-discipline of organometallic chemistry like
- E. Sulfites
- F. None of the Above

20. Many inorganic compounds are characterized by high melting points. Inorganic salts typically are poor conductors in the \_\_\_\_\_.

- A. Myriad
- B. Inorganic compound mixture
- C. Process
- D. Ionic compound
- E. Solid state
- F. None of the Above

21. Another important feature of inorganic salts is their solubility in water, e.g?

- A. And ease of crystallization
- B. Inorganic salts
- C. Electrically neutral
- D. Sub-discipline of organometallic chemistry
- E. Ionic compound
- F. None of the Above

22. According to the text, with redox reactions one reactant, the oxidant, lowers its \_\_\_\_\_ and another reactant, the reductant, has its oxidation state increased. The net result is an exchange of electrons.

- A. pH
- B. Redox state
- C. Oxidation state
- D. Ionic count
- E. Electron affinity (anions)
- F. None of the Above

23. \_\_\_\_\_ can occur indirectly as well, e.g., in batteries, a key concept in electrochemistry.

- A. Crystallization
- B. Inorganic salts
- C. Electrically neutral charges
- D. Electron exchange
- E. Regeneration
- F. None of the Above

24. Which of the following terms does the HSAB theory take into account with polarizability and size of ions?

- A. Supramolecular coordination chemistry
- B. Classical coordination compounds
- C. Inorganic compounds
- D. Grouping by their structural similarities
- E. Organometallic chemistry
- F. None of the Above

25. Soil may contain iron sulfide as pyrite or?

- A. Often similar reactivity
- B. Coordination complexes
- C. Nitrate
- D. Man-made inorganic compounds
- E. Nature-made inorganic compounds
- F. None of the Above

26. \_\_\_\_\_ are found multitasking as biomolecules: as electrolytes (sodium chloride), in energy storage (ATP) or in construction? Inorganic compounds are also found multitasking as biomolecules: as electrolytes (sodium chloride), in energy storage (ATP) or in construction (the polyphosphate backbone in DNA).

- A. Supramolecular coordination chemistry
- B. Classical coordination compounds
- C. Inorganic compounds
- D. Grouping compounds
- E. Organometallic chemistry
- F. None of the Above

27. The first important \_\_\_\_\_ was ammonium nitrate for soil fertilization through the Haber process.

- A. Compound
- B. Complexed mineral
- C. Cation
- D. Man-made inorganic compound
- E. Nature-made inorganic compounds
- F. None of the Above

28. Subdivisions of inorganic chemistry are organometallic chemistry, \_\_\_\_\_ and bioinorganic chemistry.

- A. Supramolecular coordination chemistry
- B. Classical coordination compounds
- C. Cluster chemistry
- D. Grouping compounds
- E. FUBAR chemistry
- F. None of the Above

### **Descriptive Inorganic Chemistry**

29. Descriptive inorganic chemistry focuses on the \_\_\_\_\_ based on their properties.

- A. Classification of reactivity
- B. Classification of coordination complexes
- C. Classification of compounds
- D. Classification of inorganic compound
- E. Classification of nature
- F. None of the Above

30. Partly the classification focuses on the position in the periodic table of the heaviest element in the compound, partly by grouping compounds by their?

- A. Supramolecular similarities
- B. Classical coordination compounds
- C. Inorganic compounds similarities
- D. Structural similarities
- E. Organometallic chemistry similarities
- F. None of the Above

31. An organometallic compound is characterized by its coordination chemistry, and may show interesting?

- A. Often similar reactivity
- B. Coordination complexes
- C. Classification of compounds
- D. Man-made inorganic compound
- E. Solid state properties
- F. None of the Above

**Different classifications are:**

**Coordination Compounds**

32. In \_\_\_\_\_ almost all organic and inorganic compounds can be used as ligands.

- A. Supramolecular coordination chemistry
- B. Classical coordination compounds
- C. Inorganic compounds
- D. Modern coordination compounds
- E. Organometallic chemistry
- F. None of the Above

33. "Metal" usually is a metal from the groups 3-13, as well as the trans-lanthanides and trans-actinides, all chemical compounds can be described as?

- A. Reactivity
- B. Coordination complexes
- C. Classification of compounds
- D. Man-made inorganic compound
- E. Small nuclear explosions
- F. None of the Above

34. The stereochemistry of coordination complexes can be quite rich, as hinted at by Werner's separation of two enantiomers of  $[\text{Co}((\text{OH})_2\text{Co}(\text{NH}_3)_4)_3]^{6+}$ , an early demonstration that chirality is not inherent to \_\_\_\_\_.

- A. Organic compounds
- B. Classical coordination chemistry
- C. Inorganic chemistry
- D. Bath tub chemistry
- E. Organometallic chemistry
- F. None of the Above

**Main Group Compounds**

35. \_\_\_\_\_ is from groups 1, 2 and 13-18 (excluding hydrogen) of the periodic table.

- A. Often similar flavors
- B. Coordination colors
- C. Elements
- D. Man-made inorganic compounds
- E. Minerals
- F. None of the Above

36. \_\_\_\_\_ have been known since the beginnings of chemistry, e.g., elemental sulfur and the distillable white phosphorus.

- A. Main group compounds
- B. Organometallic chemistry
- C. Organometallic compounds
- D. Metal-metal bonded dimetallic complexes
- E. Organic compounds
- F. None of the Above

37. Experiments on oxygen, by Lavoisier and Priestley not only identified an important diatomic gas, but opened the way for describing compounds and reactions according to?

- A. Transition metals
- B. Diatomic gases
- C. Stoichiometric ratios
- D. Metal carbonyls
- E. Transition metal compounds
- F. None of the Above

38. The discovery of a practical synthesis of ammonia using iron catalysts by Carl Bosch and Fritz Haber in the early 1900s deeply impacted mankind, demonstrating the significance of \_\_\_\_\_.

- A. Transition metal synthesis
- B. Organometallic chemistry synthesis
- C. Organometallic synthesis
- D. Metal-metal synthesis
- E. Inorganic chemical synthesis
- F. None of the Above

39. Many main group compounds can also be classed as “\_\_\_\_\_”, as they contain organic groups, e.g.,  $B(CH_3)_3$ .

- A. Transition metals
- B. An important diatomic gas
- C. Organometallic
- D. Metal carbonyls and even metal alkoxides
- E. Transition metal compounds
- F. None of the Above

40. \_\_\_\_\_ such as the fullerenes, buckytubes and binary carbon oxides.

- A. Transition metal compounds
- B. Organometallic chemistry
- C. Organometallic compounds
- D. Metal-metal bonded dimetallic complexes
- E. Organic compounds
- F. None of the Above

### Transition Metal Compounds

41. Compounds with a metal from group 3 or 12 are sometimes also incorporated into this group, but also often classified as \_\_\_\_\_

- A. Transition metal compounds
- B. Main group compounds
- C. Organometallic compounds
- D. Carbonyls compounds
- E. Transition metal compounds
- F. None of the Above

42. Transition metal compounds show a rich coordination chemistry, varying from tetrahedral for titanium to square planar for some nickel complexes to octahedral for \_\_\_\_\_ of cobalt.

- A. Transition metal compounds
- B. Organometallic complexes
- C. Organometallic compounds
- D. Metal-metal bonded dimetallic complexes
- E. Coordination complexes
- F. None of the Above

43. \_\_\_\_\_ can be found in biologically important compounds, such as iron in hemoglobin?

- A. Transition metals
- B. Complexes
- C. Organometallic complexes
- D. Metal complexes
- E. Transition metal compounds
- F. None of the Above

### Organometallic Compounds

44. Usually, M-C-H groups the metal (M) in these species and can either be a main group element or a?

- A. Transition metal compound
- B. Transition metal
- C. Organometallic compound
- D. Metal-metal bonded dimetallic complex
- E. Organic compound
- F. None of the Above

45. Which of the following terms is more relaxed to include also highly lipophilic complexes such as metal carbonyls and even metal alkoxides?

- A. Transition metals
- B. An important diatomic gas
- C. An organometallic compound
- D. Metal carbonyls and even metal alkoxides
- E. Transition metal compounds
- F. None of the Above

46. \_\_\_\_\_ employs more specialized preparative methods than was traditional in Werner-type complexes.

- A. Transition metal compounds
- B. Organometallic chemistry
- C. Organometallic compounds
- D. Metal-metal chemistry
- E. Organic chemistry
- F. None of the Above

47. Which of the following terms has the ability to manipulate complexes in solvents of low coordinating power, enabled the exploration of very weakly coordinating ligands such as hydrocarbons?

- A. Transition metals
- B. Synthetic gas methodology
- C. Synthetic methodology
- D. Synthetic carbonyl and even metal alkoxides
- E. Transition metal compounds
- F. None of the Above

### Cluster Compounds

48. Clusters can be found in all classes of \_\_\_\_\_.

- A. Transition metal compounds
- B. Organometallic chemistry
- C. Organometallic compounds
- D. Chemical compounds
- E. Organic compounds
- F. None of the Above

49. Which of the following terms includes organometallic chemistry, main group chemistry, and bioinorganic chemistry?

- A. Transition metals
- B. Inorganic systems
- C. Organometallic systems
- D. Metal carbonyls and even metal alkoxides
- E. Transition metal compounds
- F. None of the Above

50. The interface is the chemical basis of nanoscience or nanotechnology and specifically arise from the study of quantum size effects in?

- A. Transition metal compounds
- B. Organometallic chemistry
- C. Organometallic compounds
- D. Metal-metal bonded dimetallic complexes
- E. Organic compounds
- F. None of the Above

### Inorganic Chemical Introduction

#### What are Inorganic Compounds?

51. Which of the following terms in biological systems incorporates carbohydrates into the molecular structure?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

52. Organic chemists traditionally refer to any molecule containing carbon as an organic compound and by default this means that \_\_\_\_\_ deals with molecules lacking carbon.

- A. Presence of a carbon atom
- B. Atmospheric CO<sub>2</sub>
- C. Inorganic chemistry
- D. Inorganic compounds
- E. Carbon
- F. None of the Above

53. Which of the following terms has been metabolically incorporated into living tissues persist in decomposing tissues?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Organic matter
- E. Organic compounds
- F. None of the Above

54. The distinction between inorganic and organic compounds is not always clear when dealing with open and closed systems, some view the open environment (i.e., the ecosphere) as an extension of life and from this perspective may consider atmospheric CO<sub>2</sub> as \_\_\_\_\_.

- A. Presence of a carbon atom
- B. An organic compound
- C. Typical examples
- D. Inorganic compounds
- E. Carbon
- F. None of the Above

55. Which of the following terms are rather simple chemicals present in groundwater?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

56. Which of the following terms are dissolved from the rock/soil that makes up the aquifer or water-bearing rock formations below the soil surface?

- A. Presence of a carbon atom
- B. Atmospheric CO<sub>2</sub>
- C. Typical examples
- D. Inorganic compounds
- E. Minerals
- F. None of the Above

57. Which of the following terms may be introduced into groundwater by human activities?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Compounds
- F. None of the Above

58. Water purveyors need to test for 30 different \_\_\_\_\_ including all arsenic, barium, cadmium, lead, mercury, selenium, and thallium

- A. Presence of a carbon atom
- B. Atmospheric CO<sub>2</sub>
- C. Typical examples
- D. Inorganic compounds
- E. Carbon
- F. None of the Above

59. \_\_\_\_\_ these are once living, or are living and can bring life to cells.

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

60. Which of the following terms were never living, without carbon and cannot bring life to cells?

- A. Presence of a carbon atom
- B. Atmospheric CO<sub>2</sub>
- C. Typical examples
- D. Inorganic compounds
- E. Carbon
- F. None of the Above

### **SOC Section**

#### **SOC Introduction**

61. Synthetic Organic Chemicals (SOCs) are organic (carbon based) chemicals that are less volatile than?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above



62. Which of the following terms are used as pesticides, defoliants, fuel additives and as ingredients for other organic compounds?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

63. Which of the following terms are very persistent in the environment, whether in soil or water?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

64. SOCs are known carcinogens. EPA has set Maximum Contaminant Levels (MCL) for 30 \_\_\_\_\_ under the Safe Drinking Water Act.

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

65. The Safe Drinking Water Act requires that all water sources of all public water systems be periodically monitored for regulated?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

66. \_\_\_\_\_ or "blue baby syndrome" from ingestion of elevated levels of nitrate or nitrite.

- A. Methemoglobinemia
- B. Most contaminants
- C. Three contaminant groups
- D. Elevated levels of nitrate or nitrite
- E. Chemical compounds
- F. None of the Above

67. All public water systems must monitor for \_\_\_\_\_.

- A. Valuable Organic Compounds (VOCs)
- B. Synthesis Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Constant Levels (MCL)
- E. Nitrate and Nitrite
- F. None of the Above

### **Volatile Organic Compounds (VOCs)**

#### **VOCs Explained**

68. Which of the following terms are organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions?

- A. Volatile Organic Compounds (VOCs)
- B. Synthetic Organic Chemicals (SOCs)
- C. Polychlorinated Biphenyls (PCBs)
- D. Maximum Contaminant Levels (MCL)
- E. Organic compounds
- F. None of the Above

69. \_\_\_\_\_ are of VOCs.

- A. 60 organic chemicals
- B. Most scents or odors
- C. Three contaminant groups
- D. Elevated odors
- E. Chemical compounds
- F. None of the Above

70. Which of the following terms are regulated by law, especially indoors, where concentrations are the highest?

- A. Anthropogenic VOCs
- B. Aqueous solvents
- C. VOCs
- D. Benzene
- E. Methylene chloride
- F. None of the Above

### **Specific Components**

#### **Paints and Coatings**

71. Which of the following terms are required to spread a protective or decorative film. Approximately 12 billion liters of paints are produced annually?

- A. Solvents
- B. VOC
- C. Benzene
- D. Cleaning products
- E. Carbon monoxide
- F. None of the Above

#### **Chlorofluorocarbons and Chlorocarbons**

72. Which of the following terms are banned or highly regulated, were widely used cleaning products and refrigerants?

- A. Solvents
- B. VOC
- C. Benzene
- D. Cleaning products
- E. Carbon monoxide
- F. None of the Above

#### **Benzene**

73. One VOC that is a known human carcinogen is?

- A. Solvents
- B. VOC
- C. Benzene
- D. Cleaning products
- E. Carbon
- F. None of the Above

74. Which of the following terms evaporates into the air quickly and the vapor of benzene is heavier than air allowing the compound to sink into low-lying areas?

- A. Solvents
- B. VOC
- C. Benzene
- D. Cleaning products
- E. Carbon monoxide
- F. None of the Above

75. Which of the following terms has also been known to contaminate food and water and if digested can lead to vomiting, dizziness, sleepiness, rapid heartbeat?

- A. Mother-in-law
- B. Aqueous solvents
- C. TOCs
- D. Benzene
- E. Sodium chloride
- F. None of the Above

#### **Methylene Chloride**

76. Which of the following terms is converted to carbon monoxide and in which a person will suffer the same symptoms as exposure to carbon monoxide?

- A. Solvent
- B. VOC
- C. Benzene
- D. Methylene chloride
- E. Carbon monoxide
- F. None of the Above

### Perchloroethylene

77. Perchloroethylene is a volatile organic compound that has been linked to causing cancer in animals. It is also suspected to cause many breathing related symptoms due to exposure to VOC's.

- A. True    B. False

78. To avoid exposure to perchloroethylene, be careful not to breathe if a \_\_\_\_\_ is coming from clothing when picked up from the dry cleaner.

- A. Perchloroethylene    D. Strong chemical odor  
B. Organic chemical    E. Blue liquid  
C. VOC    F. None of the Above

### MTBE

79. MTBE was used as an octane booster and?

- A. Formaldehyde    D. Oxygenated-additive  
B. FDE    E. Organic chemicals  
C. VOCs    F. None of the Above

### Formaldehyde

80. Many building materials such as paints, adhesives, wallboards, and ceiling tiles slowly emit?

- A. Perchloroethylene    D. Sounds  
B. Organic chemicals    E. Formaldehyde  
C. VOCs    F. None of the Above

### Health Risks

81. Which of the following terms are important in the creation of smog?

- A. Formaldehyde    D. Perchloroethylene  
B. MT    E. Organic chemicals  
C. VOCs    F. None of the Above

### Health effects include:

82. Which of the following terms can cause cancer in animals; some are suspected or known to cause cancer in humans?

- A. Perchloroethylene    D. Some organics  
B. Organic chemicals    E. Water  
C. VOCs    F. None of the Above

### Reducing Exposure

83. Use products with \_\_\_\_\_ in well-ventilated areas.

- A. Formaldehyde    D. Perchloroethylene  
B. MTBE    E. Organic chemicals  
C. VOCs    F. None of the Above

84. Architects and engineers implement best practices in ventilation and mechanical systems, the owner must maintain good \_\_\_\_\_ thereafter.

- A. Perchloroethylene free homes    D. Dinner parties  
B. Organic chemicals free homes    E. Relationships  
C. VOCs free clothes    F. None of the Above

### Allotropes Section

85. Allotropy or allotropism is the property of \_\_\_\_\_ to exist in two or more different forms, known as allotropes of these elements.

- A. Allotropy
- B. Allotropes
- C. Molecular formulae
- D. Some chemical elements
- E. Metalloids
- F. None of the Above

86. Which of the following terms represents different structural modifications of an element; the atoms of the element are bonded together in a different manner?

- A. Allotropy
- B. Allotropes
- C. Molecular formulae
- D. Some elements
- E. Metalloids
- F. None of the Above

87. The term allotropy is used for elements only, not for compounds. The more general term, used for any crystalline material, is \_\_\_\_\_.

- A. Allotropy
- B. Allotrope
- C. Molecular formulae
- D. Polymorphism
- E. Metalloid
- F. None of the Above

### List of Allotropes

88. Which of the following terms is capable of variable coordination number and/or oxidation states tend to exhibit greater numbers of allotropic forms?

- A. Allotropy
- B. Allotropes
- C. Molecular formulae
- D. Elements
- E. Metalloids
- F. None of the Above

89. Which of the following terms are typically more noticeable in non-metals (excluding the halogens and the noble gases) and metalloids?

- A. Allotropy
- B. Allotropes
- C. Molecular formulae
- D. Some elements
- E. Metalloids
- F. None of the Above

### Bioinorganic Compounds

90. The phosphates in DNA, and metal complexes containing ligands that range from \_\_\_\_\_, commonly peptides, to ill-defined species such as humic acid, and to water (e.g., coordinated to gadolinium complexes employed for MRI).

- A. Crystallography
- B. Biological macromolecules
- C. Inter alia
- D. Theoretical chemistry
- E. Molecular symmetry
- F. None of the Above

### Solid State Compounds

91. Which of the following terms uses techniques such as crystallography to gain an understanding of the properties that result from collective interactions between the subunits of the solid?

- A. Crystallography
- B. VSEPR theory
- C. Solid state inorganic chemistry
- D. Theoretical chemistry
- E. Molecular symmetry
- F. None of the Above

### Theoretical Inorganic Chemistry

92. Which of the following terms represents using tools and models of theoretical chemistry and computational chemistry, expands into bonding in simple and then more complex molecules?

- A. Crystallography
- B. VSEPR theory
- C. Bohr model of the atom
- D. Theoretical chemistry and computational chemistry
- E. Molecular symmetry
- F. None of the Above

93. Which of the following terms represents the province of inorganic chemistry?

- A. Symmetry
- B. Theoretical calculations
- C. Qualitative approaches
- D. Quantum mechanical descriptions
- E. Solid-state chemistry
- F. None of the Above

### Qualitative Theories

94. Which of the following terms powerfully predicts, or at least rationalizes, the structures of main group compounds?

- A. Crystallography theory
- B. VSEPR theory
- C. Inter alia theory
- D. Theoretical chemistry theory
- E. Molecular symmetry theory
- F. None of the Above

### Molecular Symmetry Group Theory

95. A central construct in inorganic chemistry is the theory of?

- A. Crystallography theory
- B. VSEPR theory
- C. Inter alia theory
- D. Theoretical chemistry and computational chemistry
- E. Molecular symmetry
- F. None of the Above

96. Which of the following terms represents the language to describe the shapes of molecules according to their point group symmetry?

- A. Mathematical group theory
- B. Theoretical theory
- C. Qualitative approach
- D. Evolutionary theory
- E. Solid theory
- F. None of the Above

### Synthetic Inorganic Chemistry

97. Some \_\_\_\_\_ can be obtained in pure form from nature; most are synthesized in chemical plants and in the laboratory.

- A. Maximum Contaminant Level (MCL)
- B. Species
- C. Organisms
- D. (MCLG)
- E. Inorganic species
- F. None of the Above

98. \_\_\_\_\_ are prepared using methods of organic synthesis.

- A. Soluble inorganic compounds
- B. Methemoglobinemia
- C. Products and reactants
- D. Carcinogens
- E. Chemicals
- F. None of the Above

99. \_\_\_\_\_ are manipulated in "vacuum manifolds" consisting of glass piping interconnected through valves?

- A. Maximum corrections
- B. Chain of custody procedures
- C. Volatile compounds and gases
- D. Maximum odors
- E. Inorganic species
- F. None of the Above

### Regulated Chemical Contaminants

100. EPA established Maximum Contaminant Levels (MCL), \_\_\_\_\_, monitoring requirements and best available technologies for removal for 65 chemical contaminants over a five-year period as EPA gathered and analyzed occurrence and health effects data.

- A. Minimum Contaminant Level (MCL)
- B. Chain of custody procedures
- C. ACLs
- D. Maximum Contaminant Level Goals (MCLG)
- E. Inorganic species
- F. None of the Above

101. This series of rules are known as the Chemical Phase Rules and they define regulations for three contaminant groups: \_\_\_\_\_, Synthetic Organic Chemicals (SOC), and Volatile Organic Chemicals (VOC).

- A. Inorganic Chemicals (IOC)
- B. IOUs and UFOs
- C. Products and reactants
- D. Carcinogens
- E. Chemical Phase Rules
- F. None of the Above

102. Which of the following terms or "blue baby syndrome" from ingestion of elevated levels of nitrate or nitrite? (QA/QC question)

- A. Aldicarb, aldicarb sulfone, and aldicarb sulfoxide
- B. Methemoglobinemia
- C. Products and reactants
- D. Carcinogens
- E. SMURF chemicals
- F. None of the Above

### Definitions

103. Action level - the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

- A. True
- B. False

104. Non-Detects (ND) - laboratory analysis indicates that the constituent is present.

- A. True
- B. False

105. Parts per million (ppm) or Milligrams per liter (mg/L) - ten parts per million corresponds to one minute in two years or a single penny in \$100,000.

- A. True
- B. False

106. Parts per billion (ppb) or Micrograms per liter (ug/L) - one part per billion corresponds to one minute in 2,000 years, or a single penny in \$10,000,000.

- A. True
- B. False

107. Maximum Contaminant Level - the "Maximum Allowed" (MCL) is the lowest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

- A. True
- B. False

108. Maximum Contaminant Level Goal - the "Goal" (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

- A. True
- B. False

### Chain of Custody Procedures

109. \_\_\_\_\_ are used to maintain and document sample possession from the time the sample is collected until it is introduced as evidence.

- A. Samples
- B. Seal
- C. Evidence tape
- D. Chain of custody procedures
- E. Chain of custody record
- F. None of the Above

110. \_\_\_\_\_ of a sample, have it in view, or have physically secured it to prevent tampering then it is defined as being in "custody."

- A. Physical possession
- B. A taste
- C. Evidence tape
- D. Physical evidence
- E. Chain of custody record
- F. None of the Above

### Chemical Monitoring

111. Phase II and V contaminants consists of Inorganic Chemicals (IOC), Volatile Organic Chemicals (VOC) and Synthetic Organic Chemicals (SOC) and the rule applies to all?

- A. Contamination
- B. Mix surface and ground water
- C. Gross alpha activity
- D. Promulgated by the U.S. EPA in 1992
- E. A one-time inorganic chemical analysis
- F. None of the Above

### Inorganic Chemical Monitoring

112. All systems must monitor for inorganics. Please refer to the \_\_\_\_\_ provided by your state health or drinking water sections for assistance in determining individual requirements.

- A. Drinking water treatment process
- B. Manual
- C. List
- D. EPA book
- E. EPA rule
- F. None of the Above

113. A one-time inorganic chemical analysis is to be collected at \_\_\_\_\_ to the distribution system representative of each source after any application of treatment.

- A. Contamination sources
- B. Areas of surface and ground water
- C. Signs of gross alpha activity
- D. Entry points (POE)
- E. Water main breaks
- F. None of the Above

### Nitrates

114. Nitrate is regarded as an " \_\_\_\_\_ " because it can quickly cause illness.

- A. Drinking water treatment health risk
- B. Optimal health risk
- C. A surface water system health risk
- D. Chronic health risk
- E. Acute health risk
- F. None of the Above

115. \_\_\_\_\_ may go to yearly testing if community and nontransient noncommunity water must do quarterly monitoring whenever they exceed 5 mg/l in a test.

- A. Drinking water treatment process
- B. Mix surface and ground water
- C. A surface water system
- D. Some groundwater
- E. All systems
- F. None of the Above

### Radiological Contaminants

116. Depending on your state rules, compliance may be based on the annual composite of 4 consecutive quarters or?

- A. Sample instructions
- B. Established action levels
- C. Triggers
- D. Laboratory performance requirements
- E. Average annual concentration
- F. None of the Above

### Total Trihalomethanes (TTHM)

117. The MCL is 0.1 mg/l and consists of a calculation of \_\_\_\_\_ of the concentrations of bromodichloromethane, di-bromochloromethane, bromoform and chloroform.

- A. Water treatment process
- B. Optimal corrosion control
- C. Surface water system
- D. Some groundwater
- E. The running average of quarterly analyses of the sum
- F. None of the Above

### Lead and Copper Rule

118. The Lead and Copper Rule applies to all community and nontransient, noncommunity water systems and \_\_\_\_\_ for these two contaminants at the consumer's tap.

- A. Sample instructions
- B. Establishes action levels
- C. Establishes MCL levels
- D. Laboratory performance requirements
- E. Average annual concentration
- F. None of the Above

119. Lead and Copper Rule establishes maximum contaminant level goals (MCLGs) for lead and copper, treatment technique requirements for optimal corrosion control, \_\_\_\_\_, public education and lead service line replacement.

- A. Drinking water treatment process
- B. Source water treatment
- C. A surface water system
- D. Some groundwater
- E. All systems
- F. None of the Above

120. The Lead and Copper Rule also includes the best available technology (**BAT**) for complying with the treatment technique requirements, mandatory health effects language for public notification of violations and analytical methods and?

- A. Sample instructions
- B. Establishes action levels
- C. An action level is exceeded
- D. Laboratory performance requirements
- E. The action level for the system
- F. None of the Above

### IOC Sample Collection – Things to Remember

121. If the laboratory fails to include sample instructions, contact the laboratory and?

- A. Collect samples
- B. Run
- C. Request sample instructions
- D. Do not change the flow
- E. Maintain chemical analysis reports
- F. None of the Above

### Some general practices to remember:

122. Samples should be collected at \_\_\_\_\_ after all treatment (finished water).

- A. Homes
- B. SNAFU
- C. Sample locations
- D. The entry point to the distribution system
- E. At water storage tanks
- F. None of the Above



123. Select a sampling faucet that does NOT have an aerator (sampling must be done with?)

- A. Sample instructions
- B. Proper action levels
- C. Minimum aeration
- D. Laboratory performance requirements
- E. Average flow
- F. None of the Above

### Antimony - Inorganic Contaminant 0.006 mg/L MCL

#### Metalloid

124. Antimony is a toxic chemical element with symbol **Sb** and atomic number 51. A lustrous gray metalloid, it is found in nature mainly as the \_\_\_\_\_

- A. Contaminant
- B. Analytical element
- C. Sulfide mineral stibnite ( $Sb_2S_3$ )
- D. Subsequent element
- E. Stibnite with iron
- F. None of the Above

#### What are EPA's drinking water regulations for antimony?

125. \_\_\_\_\_ is based solely on possible health risks and exposure over a lifetime with an adequate margin of safety, are called maximum contaminant level goals (MCLG).

- A. Grey areas are
- B. Enforceable health goals
- C. Nitrogen group contaminants
- D. Non-enforceable health goals
- E. Maximum contaminant levels (MCLs)
- F. None of the Above

126. Contaminants are \_\_\_\_\_ or matter in water.

- A. Contaminants
- B. Analytical problems
- C. Commonly found
- D. Organic and inorganic
- E. Prominent additives
- F. None of the Above

#### Applications

127. \_\_\_\_\_ with antimony improves the properties of the alloys that are used in solders, bullets and plain bearings.

- A. Gray allotrope of arsenic
- B. Four allotropes
- C. Nitrogen group (group 15)
- D. Metallic antimony
- E. Alloying lead and tin
- F. None of the Above

128. Which of the following terms are prominent additives for chlorine- and bromine-containing fire retardants found in many commercial and domestic products?

- A. Contaminants
- B. Gray allotrope of arsenic
- C. Antimony compounds
- D. Metallic antimony
- E. Prominent additives
- F. None of the Above

129. Antimony is in the nitrogen group (group 15) and has an electronegativity of 2.05. As expected by periodic trends, it is \_\_\_\_\_.

- A. A gray allotrope of arsenic
- B. Has four allotropes
- C. In the Nitrogen group
- D. A metallic antimony
- E. More electronegative than tin or bismuth
- F. None of the Above

#### Asbestos

130. The MCLG for asbestos?

- A. 00.7 MCLG
- B. 0.7 MCLs
- C. 7 MFL
- D. Zero
- E. 10
- F. None of the Above

131. \_\_\_\_\_ because analytical methods or treatment technology do not pose any limitation.

- A. MCLG
- B. MCL equals the MCLG
- C. MFL
- D. EPCRA
- E. EPA
- F. None of the Above

132. EPA reviewed asbestos as part of the Six Year Review and determined that the 7 MFL MCLG and \_\_\_\_\_ for asbestos are still protective of human health.

- A. MCLG
- B. MCL equals the MCLG
- C. MFL
- D. EPCRA
- E. 7 MFL MCL
- F. None of the Above

### Barium

133. In 1974, Congress passed the \_\_\_\_\_

- A. CWA
- B. Phase IIB Rule
- C. Safe Drinking Water Act
- D. EPCRA
- E. EPA
- F. None of the Above

134. The EPA has set an enforceable regulation for barium, called a maximum contaminant level (MCL), at \_\_\_\_\_

- A. MCLG
- B. MCL
- C. MFL
- D. Trigger
- E. 2 mg/L or 2 ppm
- F. None of the Above

135. MCLs are set as close to the health goals as possible, the \_\_\_\_\_, because analytical methods or treatment technology do not pose any limitation.

- A. MCLG
- B. MCL equals the MCLG
- C. EPA
- D. SDWA
- E. 2 mg/L or 2 ppm
- F. None of the Above

136. Which of the following terms was identified as a new element in 1774, but not reduced to a metal until 1808?

- A. Beryllium
- B. Barium
- C. Barium carbonate, BaCO<sub>3</sub>
- D. Soluble barium compound
- E. Sodium
- F. None of the Above

137. Which of the following terms is added to steel and cast iron to reduce the size of carbon grains within the microstructure of the metal?

- A. Beryllium
- B. Barium
- C. Barium carbonate, BaCO<sub>3</sub>
- D. Soluble barium compound
- E. Its high chemical reactivity
- F. None of the Above

138. \_\_\_\_\_ are added to fireworks to impart a green color?

- A. Beryllium
- B. Barium
- C. Barium carbonate, BaCO<sub>3</sub>
- D. Soluble barium compound
- E. Barium compounds
- F. None of the Above

139. \_\_\_\_\_ are poisonous due to release of the soluble barium ion, and therefore have been used as rodenticides.

- A. Beryllium
- B. Barium
- C. Barium carbonate, BaCO<sub>3</sub>
- D. Soluble barium compounds
- E. Its high chemical reactivity
- F. None of the Above

#### **Beryllium - Inorganic Contaminant 0.004 mg/L MCL**

140. The non-enforceable health goals, based solely on possible health risks and exposure over a lifetime with an adequate margin of safety are called?

- A. MCLG
- B. MCL equals the MCLG
- C. EPA
- D. SDWA
- E. Maximum contaminant level goals (MCLG)
- F. None of the Above

141. Which of the following terms represents the regulation for beryllium, became effective in 1994?

- A. Phase V Rule
- B. MCL
- C. Group 2
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. EPA
- F. None of the Above

#### **How does Beryllium get into my Drinking Water?**

142. Beryllium naturally enters surface water and ground water and is a major source of environmental releases from \_\_\_\_ are coal and fuel oil combustion.

- A. Divalent elements
- B. Brittle alkaline earth metal
- C. Industrial waste disposal practices
- D. Hardness and resistance to corrosion
- E. Waste batteries and paints
- F. None of the Above

143. \_\_\_\_\_ requires facilities in certain industries, which manufacture, process, or use significant amounts of toxic chemicals, to report annually on their releases of these chemicals.

- A. Phase V Rule
- B. MCL
- C. OSHA
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. EPA
- F. None of the Above

144. When routine monitoring indicates that beryllium levels are above the \_\_\_\_\_, your water supplier must take steps to reduce the amount of beryllium so that it is below that level.

- A. MCLG
- B. MCL equals the MCLG
- C. EPA
- D. SDWA
- E. 2 mg/L or 2 ppm
- F. None of the Above

#### **Cadmium**

145. \_\_\_\_\_ law requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur.

- A. MCLG
- B. CWA
- C. Safe Drinking Water Act
- D. CWA
- E. OSHA
- F. None of the Above

146. The MCLG for cadmium is?

- A. 4.0
- B. .002
- C. 1.3
- D. .015
- E. 0.005 mg/L or 5 ppb
- F. None of the Above

147. Cadmium has a \_\_\_\_\_ MCLG and 0.005 mg/L or 5 ppb MCL for cadmium are still protective of human health.

- A. 4.0      D. .015
- B. .002     E. 0.005 mg/L or 5 ppb
- C. 1.3      F. None of the Above

#### How does cadmium get into my drinking water?

148. The major sources of cadmium in drinking water are corrosion of galvanized pipes; erosion of natural deposits; \_\_\_\_\_; runoff from waste batteries and paints.

- A. It is a divalent element      D. It may burn and release toxic fumes
- B. Brittle alkaline earth metal    E. Discharge from metal refineries
- C. Coal and fuel oil combustion   F. None of the Above

149. \_\_\_\_\_ requires facilities in certain industries, which manufacture, process, or use significant amounts of toxic chemicals, to report annually on their releases of these chemicals? QA/QC question

- A. MCLG                      D. Emergency Planning and Community Right to Know Act
- B. CWA                        E. OSHA
- C. SDWA                      F. None of the Above

#### How will I know if cadmium is in my drinking water?

150. Routine monitoring indicates that cadmium levels are above the \_\_\_\_\_, your water supplier must take steps to reduce the amount of cadmium so that it is below that level.

- A. MCLG                      D. SDWA limit
- B. MCL                        E. 2 mg/L or 2 ppm
- C. EPA standard          F. None of the Above

#### How will cadmium be removed from my drinking water?

151. Treatment method(s) have proven to be effective for removing cadmium to below \_\_\_\_\_ include: coagulation/filtration, ion exchange, lime softening, and reverse osmosis.

- A. 4.0      D. .015
- B. .002     E. 0.005 mg/L or 5 ppb
- C. 1.3      F. None of the Above

#### Characteristics

##### Physical Properties

152. As a bulk metal, cadmium is \_\_\_\_\_, in its powdered form, it may burn and release toxic fumes.

- A. Insoluble in water and is not flammable      D. It may burn and release toxic fumes
- B. Is in making steel and other alloys            E. Reduces the amount of cadmium sulfate
- C. Normal industrial waste disposal practices   F. None of the Above

#### Chromium- Inorganic Contaminant 0.1 mg/L MCL

153. \_\_\_\_\_ is to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur.

- A. FAA                        D. Emergency Planning and Community Right to Know Act (EPCRA)
- B. FFA                        E. EPA
- C. OSHA                      F. None of the Above

154. Which of the following terms are set as close to the health goals as possible after considering costs, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies?

- A. MCLG
- B. MCLs
- C. Set points
- D. WHO
- E. Triggers
- F. None of the Above

155. Chromium is?

- A. An odorless and tasteless metallic element
- B. Used for making steel and other alloys
- C. Normally found in industrial waste disposal
- D. Flammable
- E. Fun to play with
- F. None of the Above

156. Chromium-3 is an essential human dietary element and?

- A. An odorless and tasteless metallic element
- B. Used for making steel and other alloys
- C. Normally found in industrial waste disposal
- D. Flammable
- E. Fun to play with
- F. None of the Above

157. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits but it can also be produced by?

- A. Reverse osmosis
- B. Making steel and other alloys
- C. Industrial processes
- D. Burning and releasing toxic fumes
- E. Chemistry
- F. None of the Above

#### **What are Chromium's Health Effects?**

158. People who use water containing total chromium in excess of the \_\_\_\_\_ over many years could experience allergic dermatitis.

- A. MCLG
- B. MCL
- C. Limit
- D. Rule
- E. Standard
- F. None of the Above

159. Which of the following terms will determine whether the drinking water standard for total chromium needs to be revised?

- A. MCLG
- B. OSHA
- C. CWA
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. EPA
- F. None of the Above

#### **What are EPA's drinking water regulations for Chromium?**

160. The Safe Drinking Water Act requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These non-enforceable health goals, based on possible health risks from exposure over a lifetime are called maximum contaminant level goals (MCLG).

- A. True
- B. False

161. \_\_\_\_\_ for total chromium 0.1 mg/L or 100 parts per billion?

- A. MCLG
- B. MCL
- C. Limit
- D. Rule
- E. Standard
- F. None of the Above

162. Sometimes, the \_\_\_\_\_ because analytical methods or treatment technology do not pose any limitation.

- A. MCLG
- B. MCL
- C. Limit
- D. MCL equals the MCLG
- E. Standard
- F. None of the Above

### Chromium Explained

163. Chromium is the first element in \_\_\_\_\_.

- A. Group 6
- B. Trivalent chromium (Cr(III)) ion
- C. Toxic chromium classification
- D. The roasting and leaching processes
- E. Forming stainless steel
- F. None of the Above

164. Chromium metal and ferrochromium alloy are commercially produced from chromite by silicothermic or aluminothermic reactions, or by?

- A. Adding copper
- B. Adding trivalent chromium
- C. Adding Aluminum
- D. Roasting and leaching processes
- E. Adding metallic chromium to form stainless steel
- F. None of the Above

### Copper

#### What are Copper's Health Effects?

165. Some people who drink water containing copper in excess of the \_\_\_\_\_ may, with short-term exposure, experience gastrointestinal distress.

- A. MCLG
- B. MCL
- C. Limit
- D. Standard
- E. Action level
- F. None of the Above

#### What are EPA's Drinking Water Regulations for Copper?

166. In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These non-enforceable health goals, based solely on possible health risks and exposure over a lifetime with an adequate margin of safety, are called MCLG.

- A. True
- B. False

167. \_\_\_\_\_ for copper is 1.3 mg/L or 1.3 ppm?

- A. MCLG
- B. MCL
- C. Limit
- D. Standard
- E. Action level
- F. None of the Above

### Copper Explained

168. Pure copper is a liquid metal much like Mercury.

- A. True
- B. False

169. Which of the following terms often imparts blue or green colors to minerals such as turquoise and have been widely used historically as pigments?

- A. Copper (II) salts
- B. Element
- C. Carbon-nitrogen chemical
- D. A mixture of gold and copper
- E. Salts
- F. None of the Above

### Cyanide - Inorganic Contaminant 0.2 mg/L MCL

170. Cyanide is a carbon-nitrogen chemical unit that combines with many?

- A. Copper (II) salts
- B. Organic and inorganic compounds
- C. Carbon-nitrogen chemicals
- D. Nitrogen atoms
- E. Salts
- F. None of the Above

### Uses for Cyanide.

171. Which of the following terms is mainly used to make compounds and other synthetic fibers and resins?

- A. Copper (II) salts
- B. Cyanide (II)
- C. Carbon-nitrogen chemical
- D. The nitrogen atom
- E. Salts of the anion  $\text{CN}^-$
- F. None of the Above

### Cyanide Explained

172. Which of the following terms consists of a carbon atom triple-bonded to a nitrogen atom?

- A. Naked contaminants
- B. Halides
- C. Contaminants
- D. Solutions of inorganic contaminants
- E. Cyanides
- F. None of the Above

173. Most cyanides are highly toxic \_\_\_\_\_.

- A. Cyanide salts
- B. Salts of the anion  $\text{CN}^-$ ,
- C. Carbon-nitrogen chemical
- D. Solutions of salts of the anion  $\text{CN}^-$ ,
- E. Cyanides solutions
- F. None of the Above

### Fluoride

174. Which of the following terms are any physical, chemical, biological or radiological substances or matter in water?

- A. MCLG
- B. MCL
- C. Limit
- D. Standard
- E. MCLs are set as close to the health goals as possible
- F. None of the Above

175. \_\_\_\_\_ for fluoride is 4.0 mg/L or 4.0 ppm?

- A. MCLG
- B. MCL
- C. Limit
- D. Standard
- E. MCLs are set as close to the health goals as possible
- F. None of the Above

176. MCLs are set as close to the health goals as possible, in this case, the \_\_\_\_\_, because analytical methods or treatment technology do not pose any limitation.

- A. MCLG
- B. MCL
- C. Limit
- D. Standard
- E. MCL equals the MCLG
- F. None of the Above

177. Which of the following terms is voluntarily added to some drinking water systems as a public health measure for reducing the incidence of cavities among the treated population?

- A. Naked fluoride
- B. Halides
- C. Fluoride
- D. Solutions of inorganic fluorides
- E. Fluorite and fluorapatite
- F. None of the Above

178. Structurally and chemically, the \_\_\_\_\_ resembles the hydroxide ion.

- A. Naked fluoride
- B. Halides
- C. Fluoride
- D. Solutions of inorganic fluorides
- E. Fluoride ion
- F. None of the Above

### Occurrence

179. Solutions of inorganic fluorides in water contain  $F^-$  and bifluoride  $HF_2^-$ . Few inorganic fluorides are soluble in water without undergoing significant hydrolysis. In terms of its reactivity, fluoride differs significantly from chloride and other halides, and is more strongly solvated due to its smaller radius/charge ratio.

- A. True
- B. False

180. Which of the following terms is a very strong Lewis base?

- A. Naked fluoride
- B. Halides
- C. Fluoride
- D. Solutions of inorganic fluorides
- E. Fluorite and fluorapatite
- F. None of the Above

### Natural Occurrence

181. \_\_\_\_\_ are known, but of paramount commercial importance are fluorite and fluorapatite.

- A. Naked fluoride
- B. Halides
- C. Many fluoride minerals
- D. Solutions of inorganic fluorides
- E. Fluorite and fluorapatite
- F. None of the Above

### Mercury

182. Which of the following terms regulates mercury in drinking water to protect public health?

- A. MCLG
- B. MCLs
- C. SDWA
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. EPA
- F. None of the Above

### What is Mercury?

183. Mercury is a liquid metal found in natural deposits such as ores containing?

- A. Aluminum
- B. Ultraviolet light
- C. Cinnabar (mercuric sulfide)
- D. Mercury-aluminum amalgam
- E. Copper
- F. None of the Above

### Uses for Mercury.

184. Electrical products such as dry-cell batteries, fluorescent light bulbs, switches, and other control equipment account for 50 percent of \_\_\_\_\_.

- A. Aluminum
- B. Mercury
- C. Cinnabar (mercuric sulfide)
- D. Mercury-aluminum amalgams
- E. Lead
- F. None of the Above

185. Health effects language is not intended to catalog all possible \_\_\_\_\_ for mercury.

- A. MCLG
- B. MCLs
- C. Health effects
- D. Standards
- E. EPA
- F. None of the Above



### What are EPA's Drinking Water Regulations for Mercury?

186. Which of the following terms represents the law that requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur?

- A. MCLG
- B. MCL
- C. Limit
- D. Secondary standard (SMCL)
- E. Safe Drinking Water Act
- F. None of the Above

### What is Nitrate?

187. Nitrates and nitrites are \_\_\_\_\_ which combine with various organic and inorganic compounds.

- A. Nitrogen-oxygen chemical units
- B. Nitrate ion
- C. Nitrate
- D. Nitrates are converted to nitrites
- E. Various organic and inorganic compounds
- F. None of the Above

### Uses for Nitrate.

188. Once in the body, nitrates are converted to?

- A. Nitrates and nitrites
- B. Nitrate ion
- C. Nitrate
- D. Nitrites
- E. Various organic and inorganic compounds
- F. None of the Above

### What are EPA's Drinking Water Regulations for Nitrate?

189. Contaminants are any \_\_\_\_\_.

- A. MCLG
- B. MCL
- C. Limit
- D. Secondary standard (SMCL)
- E. An enforceable regulation for nitrate
- F. None of the Above

190. The MCLG for nitrate is 10 mg/L or 10 ppm. EPA has set this level of protection based on the best available science to prevent potential health problems. EPA has set an enforceable regulation for nitrate, called a maximum contaminant level (MCL), at 10 mg/L or 10 ppm?

- A. MCLG
- B. MCLs
- C. Limits
- D. MCLGs are set as close to the health goals as possible
- E. MCLs are set as close to the health goals as possible
- F. None of the Above

191. Which of the following terms is for nitrate, became effective in 1992?

- A. MCLG
- B. MCLs
- C. Grouping
- D. Regulation
- E. Standard
- F. None of the Above

192. For more information on the uses and releases of chemicals in your state, contact the?

- A. MCLG
- B. Water supplier
- C. OSHA
- D. Emergency Planning and Community Right to Know Act (EPCRA)
- E. EPA
- F. None of the Above

### Nitrate Explained

193. The nitrate ion is a polyatomic ion with the \_\_\_\_\_ and a molecular mass of 62.0049 g/mol.

- A. Nitrates and nitrites
- B. Nitrate ion
- C. Nitrate
- D. Molecular formula  $\text{NO}_3^-$
- E. Various organic and inorganic compounds
- F. None of the Above

### Structure

194. The nitrate ion carries a combination formal charge in which each of the three oxygens carries a  $-\frac{2}{3}$  charge, whereas the nitrogen carries a +1 charge, all these adding up to formal charge of the?

- A. Nitrates and nitrites
- B. Nitrate ion
- C. Nitrate
- D. Polyatomic nitrate ion
- E. Various organic and inorganic compounds
- F. None of the Above

### Nitrite (Measured as Nitrogen)

195. Nitrite may cause health problems if present in public or private water supplies in amounts greater than the drinking water standard set by?

- A. MCLG
- B. Water supplier
- C. Cops
- D. Emergency Planning and Community Right to Know Act
- E. EPA
- F. None of the Above

### Selenium

196. Selenium (Se) is an essential element for?

- A. Vitamins
- B. Drinking water
- C. Minerals
- D. Selenide or selenate compounds
- E. Human nutrition
- F. None of the Above

### Thallium- Inorganic Contaminant 0.002 mg/L MCL

197. Thallium is a metal found in natural deposits such as ores containing?

- A. Metal sulfide ores
- B. Natural deposits
- C. Selenium
- D. Silicon
- E. Other elements
- F. None of the Above

### What are Thallium's Health Effects?

198. People who drink water containing thallium well in \_\_\_\_\_ for many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver problems.

- A. MCLG
- B. MCLs
- C. The Phase II Rule
- D. MCLGs are set as close to the health goals as possible
- E. Excess of the maximum contaminant level (MCL)
- F. None of the Above

### Thallium Explained

199. When isolated, Thallium resembles tin, but discolors when exposed to?

- A. Hydrogen
- B. Water
- C. Air
- D. Potassium
- E. Acid
- F. None of the Above

200. Thallium its popularity as a murder weapon, thallium has gained notoriety as "the poisoner's poison" and "\_\_\_\_\_?"

- A. Inheritance powder
- B. Pharmaceutical powder
- C. Saltpeter powder
- D. Soluble sleeping powder
- E. Sleeping powder
- F. None of the Above