

Registration form

**Metalloids 109 CEU Training Course \$100.00
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

Name _____ Signature _____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

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List hours worked on assignment must match State Requirement. _____

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

Water Treatment _____ Distribution _____ Collection _____ Laboratory _____

Wastewater Treatment _____ Other _____

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Professional Engineers; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

You can obtain a printed version from TLC for an additional \$69.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

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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In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

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Metalloids 109 Answer Key

Name _____

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| 107. A B C D E F | 126. A B C D E F | 145. A B C D E F |
| 108. A B C D E F | 127. A B C D E F | 146. A B C D E F |
| 109. A B C D E F | 128. A B C D E F | 147. A B C D E F |
| 110. A B C D E F | 129. A B C D E F | 148. A B C D E F |
| 111. A B C D E F | 130. A B C D E F | 149. A B C D E F |
| 112. A B C D E F | 131. A B C D E F | 150. A B C D E F |

**Please fax the answer key to TLC Western Campus
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If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

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Please e-mail or fax this survey along with your final exam

METALLOIDS 109 CEU TRAINING COURSE

CUSTOMER SERVICE RESPONSE CARD

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1. Please rate the difficulty of your course.
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How about the price of the course?

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Any other concerns or comments.

Metalloids 109 CEU Training Course Assignment

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit 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.

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.**

Metalloid Section

- Some water quality parameters to consider monitoring, depending on your arsenic treatment technology, include?
 - Elements
 - Near-metalloids
 - Metalloid
 - Iron, pH, manganese, alkalinity, and aluminum
 - Heavy metals
 - None of the Above
- Arsenic, boron, silicon, germanium, antimony and tellurium are commonly classified as?
 - Metalloids
 - Organic contaminants
 - Metals
 - Metals and nonmetals
 - The first indication of a problem
 - None of the Above
- One or more from among selenium, polonium or this term are sometimes added to the list. Boron is sometimes excluded from the list, by itself or together with silicon.
 - Black arsenic
 - Arsenates
 - Arsenic alloys
 - Phosphorus acid
 - Arsenide
 - None of the Above
- Which of the following terms is sometimes not regarded as a metalloid, the inclusion of antimony, polonium and astatine as metalloids has also been questioned?
 - Platinum
 - Tellurium
 - Amorphous tellurium
 - Selenium
 - Dimethyl telluride, $(\text{CH}_3)_2\text{Te}$
 - None of the Above
- Drinking water contaminants that can cause health effects after continuous long-term exposure at levels greater than the maximum contaminant level are considered which type of contaminants?
 - Elements
 - Near-metalloids
 - Chronic
 - Thermodynamically stable form
 - Incomplete
 - None of the Above

6. Some examples of chronic drinking water contaminants regulated by EPA include inorganic contaminants like arsenic, cadmium, and copper; organic contaminants such as pesticides and which missing term and radiological contaminants like radium and uranium?

- A. Metalloids
- B. Organic contaminants
- C. Industrial chemicals
- D. Metals and nonmetals
- E. Problems
- F. None of the Above

7. If your water system has installed some form of _____ treatment, it might cause the water to react differently in the distribution system.

- A. Elements
- B. Near-metalloids
- C. Metalloids
- D. Inorganic contaminant or arsenic
- E. Organic contaminants or arsenic
- F. None of the Above

8. A change in the taste, odor or appearance of the water at customers' taps may be the first indication of a?

- A. Metalloid
- B. Organic contaminant
- C. Metal
- D. Metal or nonmetal
- E. Problem
- F. None of the Above

9. A metalloid is a _____ with properties that are in-between or a mixture of those of metals and nonmetals.

- A. Element
- B. Near-metalloid
- C. Metalloid
- D. Thermodynamically stable form
- E. Chemical element
- F. None of the Above

10. Other elements less commonly recognized as metalloids include carbon, _____ selenium, polonium and astatine.

- A. Platinum
- B. Tellurium
- C. Amorphous tellurium
- D. Aluminum
- E. Dimethyl telluride, $(\text{CH}_3)_2\text{Te}$
- F. None of the Above

11. On a standard periodic table these _____ as well as the elements commonly recognized as metalloids, occur in or near a diagonal region of the p-block.

- A. Elements
- B. Near-metalloids
- C. Metalloids
- D. Thermodynamically stable forms
- E. Heavy metals
- F. None of the Above

12. Some periodic tables include a dividing line between metals and nonmetals and it is generally the elements adjacent to this line or, less frequently, one or more of the elements adjacent to those elements, which are identified as?

- A. Metalloids
- B. Organic contaminants
- C. Metals
- D. Metals and nonmetals
- E. Heavy metals
- F. None of the Above

Near Metalloids

13. Elements such as these are occasionally called, or described as, _____, or the like. They are located near the elements commonly recognized as metalloids, and usually classified as either metals or nonmetals.

- A. Elements
- B. Near-metalloids
- C. Metalloids
- D. Thermodynamically stable forms
- E. Heavy metals
- F. None of the Above

14. Which of the following terms falls into this loose category tend to show 'odd' packing structures, marked covalent chemistry, and amphoterism?

- A. Metalloids
- B. Organic contaminants
- C. Metals
- D. Metals and nonmetals
- E. Heavy metals
- F. None of the Above

15. Nonmetals in which missing term - category include carbon, phosphorus, selenium and iodine?

- A. Metalloid
- B. Organic contaminant
- C. Metal
- D. Metal and nonmetal
- E. Near-metalloid
- F. None of the Above

16. This applies to their most thermodynamically stable forms under ambient conditions: carbon as graphite; phosphorus as black phosphorus; and _____ as grey selenium.

- A. Black arsenic
- B. Arsenates
- C. Arsenic alloys
- D. Selenium
- E. Arsenide
- F. None of the Above

17. These elements are alternatively described as being _____, showing metalloidal character, or having metalloid-like or some metalloid(al) or metallic properties.

- A. Metalloids
- B. Organic contaminants
- C. Metals
- D. Metals and nonmetals
- E. Near metalloidal
- F. None of the Above

Allotropes

18. The diamond allotrope of carbon is clearly?

- A. Metalloid
- B. Element
- C. A heavy metal
- D. Toxic metal
- E. Nonmetallic
- F. None of the Above

19. Phosphorus, selenium, tin, and - which missing term- also have allotropes that display borderline or either metallic or nonmetallic behavior.

- A. Black arsenic
- B. Arsenate
- C. Arsenic alloy
- D. Bismuth
- E. Arsenide
- F. None of the Above

Other Metalloids

20. Given there is no agreed definition of a metalloid, some other elements include hydrogen, beryllium, nitrogen, phosphorus, - which missing term-, zinc, gallium, tin, iodine, lead, bismuth and radon.

- A. Platinum
- B. Tellurium
- C. Amorphous tellurium
- D. Aluminum
- E. Sulfur
- F. None of the Above

21. Elements that are otherwise sometimes referred to as?

- A. Metalloid
- B. Elements
- C. A heavy metal
- D. Toxic metal
- E. Poor metals
- F. None of the Above

22. Which of the following terms can form alloys with, or modify the properties of, metals?
- A. Metals
 - B. Toxic metals
 - C. Metalloids
 - D. Heavy metals
 - E. Nonmetallic elements
 - F. None of the Above

Heavy Metals

23. Heavy metals include the transition metals, some metalloids, lanthanides, and actinides.
- A. True
 - B. False

24. Which of the following terms is a member of a loosely defined subset of elements that exhibit metallic properties?

- A. Metalloid
- B. Elements
- C. A heavy metal
- D. Toxic metal
- E. Aluminum
- F. None of the Above

25. Many different definitions have been proposed—some based on density, some on atomic number or atomic weight, and some on?

- A. Metals
- B. Toxic metals
- C. Metalloid
- D. Heavy metals
- E. Chemical properties or toxicity
- F. None of the Above

26. Which of the following terms has been called a "misinterpretation" in an IUPAC technical report due to the contradictory definitions and its lack of a "coherent scientific basis"?

- A. Metalloid
- B. Elements
- C. Heavy metal
- D. Toxic metal
- E. Poor metals
- F. None of the Above

27. There is an alternative term _____, for which no consensus of exact definition exists either.

- A. Metal
- B. Toxic metal
- C. Metalloid
- D. Heavy metal
- E. Poor metal
- F. None of the Above

28. Depending on context, _____ can include elements lighter than carbon and can exclude some of the heaviest metals.

- A. Metalloids
- B. Elements
- C. Heavy metal
- D. Toxic metals
- E. Poor metals
- F. None of the Above

29. Which of the following terms occur naturally in the ecosystem with large variations in concentration?

- A. Metalloids
- B. Elements
- C. Heavy metals
- D. Toxic metals
- E. Poor metals
- F. None of the Above

30. Waste-derived fuels are especially prone to contain heavy metals, so _____ are a concern in consideration of waste as fuel.

- A. Metalloid
- B. Elements
- C. Heavy metals
- D. Toxic metal
- E. Poor metals
- F. None of the Above

31. One of the largest problems associated with the persistence of _____ is the potential for bioaccumulation and biomagnification causing heavier exposure for some organisms than is present in the environment alone.

- A. Metalloid
- B. Elements
- C. Heavy metals
- D. Toxic metal
- E. Poor metals
- F. None of the Above

32. Living organisms require varying amounts of "heavy metals". Iron, cobalt, copper, _____, molybdenum, and zinc are required by humans.

- A. Platinum
- B. Tellurium
- C. Cadmium
- D. Aluminum
- E. Manganese
- F. None of the Above

33. Other heavy metals such as mercury, plutonium, and lead are _____ that have no known vital or beneficial effect on organisms, and their accumulation over time in the bodies of animals can cause serious illness.

- A. Metals
- B. Toxic metals
- C. Metalloid
- D. Heavy metals
- E. Elements lighter than carbon
- F. None of the Above

34. Certain elements that are normally toxic are, for certain organisms or under certain conditions, beneficial. Examples include vanadium, tungsten, and even?

- A. Platinum
- B. Tellurium
- C. Cadmium
- D. Aluminum
- E. Manganese
- F. None of the Above

Toxic Metals

35. Which of the following terms are metals that form poisonous soluble compounds and have no biological role?

- A. Platinum
- B. Toxic metals
- C. Metalloid
- D. Heavy metals
- E. Manganese
- F. None of the Above

36. Often heavy metals are thought as synonymous, but _____ also have toxicity, such as beryllium, and not all heavy metals are particularly toxic, and some are essential, such as iron.

- A. Lighter metals
- B. Toxic metals
- C. Metalloids
- D. Heavy metals
- E. Zincs
- F. None of the Above

37. Which of the following terms is when considered in abnormally high, toxic doses. A difference is that there is no beneficial dose for a toxic metal with no biological role.

- A. Metalloids
- B. Elements
- C. Heavy metals
- D. Toxic metals
- E. Trace elements
- F. None of the Above

38. Toxic metals sometimes imitate the action of an essential element in the body, interfering with the metabolic process to cause illness.

- A. True
- B. False

39. Which of the following terms particularly heavy metals are toxic, but some heavy metals are essential, and some, such as bismuth, have a low toxicity?

- A. Metals
- B. Toxic metals
- C. Metalloid
- D. Heavy metals
- E. Many metals
- F. None of the Above

40. Most often the definition includes at least _____, lead, mercury and the radioactive metals. Metalloids (arsenic, polonium) may be included in the definition.

- A. Platinum
- B. Tellurium
- C. Cadmium
- D. Aluminum
- E. Manganese
- F. None of the Above

Heavy Metals in Water

41. Which of the following terms can be naturally occurring?

- A. Light metals
- B. Harmful health effects
- C. Concentrations
- D. High heavy metals concentrations
- E. Heavy metal water contamination
- F. None of the Above

42. Water in these areas may have _____ due to the combination of naturally occurring deposits and mine waste.

- A. Large volumes of water
- B. The metallic elements
- C. Human life-biological anomalies
- D. High heavy metals concentrations
- E. Heavy metal contamination
- F. None of the Above

43. Water samples are usually taken randomly within a contaminated area and offsite to identify the source of contamination and the pathway it travels, into the drinkable groundwater system or away from?

- A. Light metals
- B. Harmful health effects
- C. Soluble compounds
- D. High heavy metals concentrations
- E. Heavy metal water contamination
- F. None of the Above

44. Accurate determination of _____ is important to identify cumulative risks to people drinking water derived from these areas.

- A. Large volumes of water
- B. The metallic elements
- C. Human life-biological anomalies
- D. High heavy metals concentrations
- E. Heavy metal contamination
- F. None of the Above

Treating Heavy Metal Contamination in Water

45. Which of the following terms is a difficult expensive problem to address?

- A. Light metals
- B. Harmful health effect
- C. Water samples
- D. High heavy metals concentrations
- E. Heavy metal water contamination
- F. None of the Above

46. There are some new technologies being developed that actually treat the _____ which operate more efficiently and quickly, decreasing costs.

- A. Large volumes of water
- B. The metallic elements
- C. Human life-biological anomalies
- D. High heavy metals concentrations
- E. Heavy metal contamination
- F. None of the Above

47. If groundwater is contaminated with _____, an alternative source of drinking water must be used to prevent harmful health effects, until the water is treated to meet standards protective of human health and the environment

- A. Metals
- B. Toxic metals
- C. Metalloids
- D. Heavy metals
- E. Many metals
- F. None of the Above

Health Significance of Metals in the Environment

48. The heavy metals are those having densities five times greater than water, and the _____, those having lesser densities.

- A. Metals
- B. Toxic metals
- C. Metalloids
- D. Heavy metals
- E. Light metals
- F. None of the Above

49. Which of the following terms are sodium, magnesium, and potassium?

- A. Metals
- B. Toxic metals
- C. Metalloids
- D. Heavy metals
- E. Light metals
- F. None of the Above

50. Some metals such as sodium, potassium, _____, calcium, and iron are found in living tissue and are essential to human life-biological anomalies arise when they are depleted or removed.

- A. Platinum
- B. Tellurium
- C. Cadmium
- D. Magnesium
- E. Manganese
- F. None of the Above

Arsenic Introduction

Metalloid

51. Arsenic is this missing term with symbol As and the atomic number is 33.

- A. A metalloid
- B. The trioxide
- C. A chemical element
- D. An inorganic
- E. Mixed with hydrogen
- F. None of the Above

52. Arsenic occurs in many minerals, usually in conjunction with _____, and also as a pure elemental crystal. It was first documented by Albertus Magnus in 1250.

- A. Alloys of copper
- B. Naturally occurring elements
- C. Inorganics
- D. Pure elemental crystals
- E. Sulfur and metals
- F. None of the Above

53. Arsenic is a metalloid. It can exist in _____, although only the gray form has important use in industry.

- A. Various allotropes
- B. The trioxide
- C. Contamination
- D. Inorganic forms
- E. Aluminum arsenide
- F. None of the Above

54. In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine the level of this missing term in drinking water at which no adverse health effects are likely to occur.

- A. Zero
- B. MCLs
- C. MCLG
- D. Safe Drinking Water Act
- E. Contaminants
- F. None of the Above

55. Which of the following terms is based solely on possible health risks and exposure over a lifetime with an adequate margin of safety, are called maximum contaminant level goals?

- A. Zero
- B. MCLs
- C. MCLG
- D. These non-enforceable health goals
- E. 0.010 mg/L or 10 ppb
- F. None of the Above

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

- A. Contaminants
- B. MCLs
- C. MCLG
- D. Safe Drinking Water Act
- E. 0.010 mg/L or 10 ppb
- F. None of the Above

57. Which of the following terms for arsenic is zero?

- A. Standard
- B. MCLs
- C. MCLG
- D. Safe Drinking Water Act limit
- E. 0.010 mg/L or 10 ppb
- F. None of the Above

58. Based on the MCLG, EPA has set an enforceable regulation for arsenic, called a maximum contaminant level, at?

- A. Zero
- B. MCLs
- C. 0.050 mg/L or 1.0 ppb
- D. 0.010 mg/L or 1 ppb
- E. 0.010 mg/L or 10 ppb
- F. None of the Above

59. Which of the following terms are set as close to the health goals as possible, considering cost, benefits and the ability of public water systems to detect and remove contaminants?

- A. Action levels
- B. MCLs
- C. MCLG
- D. Safe Drinking Water Act limits
- E. ppb
- F. None of the Above

60. The main uses of this missing term is for strengthening alloys of copper and especially lead.

- A. Alloys of copper
- B. A naturally occurring element
- C. Inorganic arsenic
- D. A pure elemental crystal
- E. Metallic arsenic
- F. None of the Above

61. Arsenic is a common n-type dopant in semiconductor electronic devices, and the optoelectronic compound of which missing term is the most common semiconductor in use after doped silicon?

- A. Gallium arsenide
- B. Arsenates
- C. Arsenic alloys
- D. Phosphorus acid
- E. Aluminum arsenide
- F. None of the Above

62. Arsenic and its compounds, especially of _____ are used in the production of pesticides, herbicides, and insecticides. These applications are declining, however.

- A. Alloys of copper
- B. Naturally occurring element
- C. Inorganic arsenic
- D. Pure elemental crystal
- E. Trioxide
- F. None of the Above

63. Which of the following terms of groundwater is a problem that affects millions of people across the world?

- A. Metalloid contamination
- B. The trioxide contamination
- C. Arsenic contamination
- D. Inorganic arsenic contamination
- E. Hydrogen contamination
- F. None of the Above

64. Arsenic, a naturally occurring element, is found throughout the environment; for most people, food is?

- A. Alloys of copper
- B. A naturally occurring element
- C. Inorganic arsenic
- D. A pure elemental crystal
- E. The major source of exposure
- F. None of the Above

65. Acute high-level inhalation exposure to arsenic dust or fumes has resulted in gastrointestinal effects; central and peripheral nervous system disorders have occurred in workers acutely exposed to?

- A. The Metalloid
- B. The trioxide
- C. The Arsenic contamination
- D. Inorganic arsenic
- E. Arsenic and hydrogen
- F. None of the Above

66. Chronic inhalation exposure to which missing term in humans is associated with irritation of the skin and mucous membranes?

- A. Alloys of copper
- B. A naturally occurring element
- C. Inorganic arsenic
- D. The trioxide
- E. Herbicides, and insecticides
- F. None of the Above

67. Chronic oral exposure has resulted in this missing term, anemia, peripheral neuropathy, skin lesions, hyperpigmentation, and liver or kidney damage in humans.

- A. Body weight basis
- B. Risk factor for type 2 diabetes
- C. Prevalence of type 2 diabetes
- D. Exposures and risks for the fetus
- E. Cancer risk is long-term exposure
- F. None of the Above

68. EPA has classified inorganic arsenic as a?

- A. Group A, human carcinogen
- B. Risk factor for type 2 diabetes
- C. Prevalence of type 2 diabetes
- D. Exposures and risks for the fetus
- E. Cancer risk is long-term exposure
- F. None of the Above

Arsine

69. EPA has not classified arsine for?

- A. Body weight basis
- B. Risk factor for type 2 diabetes
- C. Prevalence of type 2 diabetes
- D. Exposures and risks for the fetus
- E. Cancer risk is long-term exposure
- F. None of the Above

70. Which of the following terms require public water systems to monitor for arsenic at the entry point to the distribution system?

- A. Drinking water regulations
- B. MCLs
- C. MCLG
- D. Safe Drinking Water Act
- E. 0.010 mg/L or 10 ppb
- F. None of the Above

71. You may, however, want to test your distribution system water for arsenic to be sure that the water being delivered has arsenic levels below the?

- A. Drinking water regulations
- B. MCL
- C. MCLG
- D. Safe Drinking Water Act
- E. Local limits
- F. None of the Above

72. If your water system has installed some form of arsenic treatment, keep in mind that the treatment you installed may change the _____ in other ways.

- A. Problem
- B. Water quality
- C. Distribution system
- D. Arsenic treatment technology
- E. Arsenic and hydrogen
- F. None of the Above

73. A change in the taste, odor or appearance of the water at _____ may be the first indication of a problem.

- A. The problem
- B. Pipe scales
- C. The distribution system
- D. Arsenic treatment technology
- E. Customers' taps
- F. None of the Above

74. _____ to consider when monitoring, depending on your arsenic treatment technology, include iron, pH, manganese, alkalinity, and aluminum.

- A. Synthetic arsenates
- B. Arsenic acid in water is something
- C. Readily soluble in water is something
- D. Alloy-like intermetallic compounds
- E. Some water quality parameters
- F. None of the Above

75. The current drinking water standard or Maximum Contaminant Level set by the U.S. Environmental Protection Agency is 0.010 mg/L or parts per million, this is equivalent to?

- A. 50 ppb to 10 ppb
- B. MCLs
- C. MCLG
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 0.010 mg/L or 100 ppb
- F. None of the Above

76. In 2001, the U.S. Environmental Protection Agency (EPA) reduced the regulatory MCL from this term on the basis on bladder and lung cancer risks.

- A. 50 ppb to 10 ppb
- B. MCLs
- C. MCLG
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 0.010 mg/L or 100 ppb
- F. None of the Above

77. Long term exposure to drinking water containing arsenic at levels higher than this term increases the chances of getting cancer, while for lower arsenic water levels the chances are less.

- A. 50 ppb to 10 ppb
- B. 10 ppb
- C. MCLG
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 00.10 mg/L or 100 ppb
- F. None of the Above

78. If your water has arsenic levels above this term, you should obtain drinking water from another source or install a home treatment device.

- A. 50 ppb to 10 ppb
- B. 10 ppb
- C. MCLG
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 00.10 mg/L or 100 ppb
- F. None of the Above

79. Concentrations above this term will increase the risk of long-term or chronic health problems, the higher the level and length of exposure.

- A. 50 ppb to 10 ppb
- B. 10 ppb
- C. MCLG
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 00.10 mg/L or 100 ppb
- F. None of the Above

80. Children are at greater risk (to any agent in water) because of their greater water consumption on a per unit?

- A. Body weight basis
- B. Risk factor for type 2 diabetes
- C. Prevalence of type 2 diabetes
- D. Exposures and risks for the fetus
- E. Cancer risk is long-term exposure
- F. None of the Above

81. Pregnant women may wish to reduce this term because arsenic has been found at low levels in mother's milk and will cross the placenta, increasing exposures and risks for the fetus.

- A. Arsenic exposures
- B. Risk factor
- C. Prevalence
- D. Exposures and risks for the fetus
- E. Long-term exposure
- F. None of the Above

82. If your water has arsenic levels above _____, you should immediately stop drinking the water until you can either obtain water from another source or install and maintain treatment.

- A. 50 ppb to 10 ppb
- B. 10 ppb
- C. 200 ppb
- D. 10 ug/L (micrograms per liter) or 10 ppb
- E. 00.10 mg/L or 100 ppb
- F. None of the Above

Physical Characteristics

83. The three most common arsenic allotropes are metallic gray, yellow and _____, with gray being the most common.

- A. Black arsenic
- B. Arsenates
- C. Arsenic alloys
- D. Phosphorus acid
- E. Aluminum arsenide
- F. None of the Above

84. Which of the following terms is brittle and has a relatively low Mohs hardness of 3.5?

- A. Arsenic
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

85. Nearest and next-nearest neighbors form this term, with the three atoms in the same double-layer being slightly closer than the three atoms in the next.

- A. Synthetic arsenates
- B. Arsenic acid
- C. Readily soluble in water
- D. Alloy-like intermetallic compounds
- E. A distorted octahedral complex
- F. None of the Above

86. Solid yellow arsenic is produced by rapid cooling of arsenic vapor, As_4 . It is rapidly transformed into which term by light?

- A. Arsenic
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

87. Which of the following terms is similar in structure to red phosphorus?

- A. Synthetic arsenates
- B. Arsenic acid
- C. Black arsenic
- D. Alloy-like intermetallic compounds
- E. Arsenic oxidizes to arsenic trioxide
- F. None of the Above

Isotopes

88. Naturally occurring _____ is composed of one stable isotope.

- A. Arsenic
- B. Arsenate
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

Chemistry

89. When heated in air, arsenic oxidizes to arsenic trioxide; the fumes from this reaction have an odor resembling garlic odor and can be detected on striking arsenide minerals such as with this term with a hammer.

- A. Synthetic arsenates
- B. Arsenic acid
- C. Arsenopyrite
- D. Alloy-like intermetallic compounds
- E. Arsenic oxidizes to arsenic trioxide
- F. None of the Above

90. Arsenic along with some arsenic compounds sublimes upon heating at atmospheric pressure, converting directly to a gaseous form without an intervening liquid state at 614 °C.

- A. True
- B. False

91. Arsenic makes arsenic acid with concentrated nitric acid, arsenious acid with dilute nitric acid, and this missing term with concentrated sulfuric acid.

- A. Synthetic arsenates
- B. Arsenic acid
- C. Arsenic trioxide
- D. Alloy-like intermetallic compounds
- E. Arsenic oxidizes to arsenic trioxide
- F. None of the Above

Compounds

92. Arsenic compounds resemble in some respects those of which missing term, which occupies the same group of the periodic table?

- A. Phosphorus
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

93. The most common oxidation states for arsenic are: -3 in the arsenides, such as alloy-like intermetallic compounds; and +3 in the arsenites, arsenates (III), and?

- A. Synthetic arsenates
- B. Arsenic acid
- C. Readily soluble in water
- D. Alloy-like intermetallic compounds
- E. Most organoarsenic compounds
- F. None of the Above

94. Which of the following terms also bonds readily to itself as seen in the square As_3-4 ions in the mineral skutterudite?

- A. Arsenic
- B. Arsenate
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

Inorganic

95. Arsenic forms colorless, odorless, crystalline oxides As_2O_3 ("_____") and As_2O_5 , which are hygroscopic and readily soluble in water to form acidic solutions.

- A. Synthetic arsenates
- B. Arsenic acid
- C. White arsenic
- D. Alloy-like intermetallic compounds
- E. Arsenic oxidizes to arsenic trioxide
- F. None of the Above

96. Arsenic (V) acid is a weak acid, its salts are called?

- A. White arsenic
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

97. Synthetic arsenates include _____, calcium arsenate, and lead hydrogen arsenate.

- A. Paris Green
- B. Arsenic acid
- C. Phosphorus acid
- D. Alloy-like intermetallic compounds
- E. Arsenic oxidizes to arsenic trioxide
- F. None of the Above

98. The protonation steps between the arsenate and arsenic acid are similar to those between?

- A. Phosphate and phosphoric acid
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

99. Unlike phosphorus acid, this term is genuinely tribasic, with the formula $\text{As}(\text{OH})_3$.

- A. Arsenous acid
- B. Arsenates
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. Gray arsenic
- F. None of the Above

100. A broad variety of this term of arsenic are known.

- A. Synthetic arsenates
- B. Arsenic acid
- C. Readily soluble in water
- D. Alloy-like intermetallic compounds
- E. Sulfur compounds
- F. None of the Above

101. In which of the following terms, arsenic has a formal oxidation state of +2 in As_4S_4 , which features As-As bonds so that the total covalency of As is still three?

- A. As_4S_{10}
- B. Arsenate
- C. Solid yellow arsenic
- D. Phosphorus acid
- E. As_2S_{12}
- F. None of the Above

Alloys

102. Arsenic is used as the group 5 element in the III-V semiconductors _____, indium arsenide, and aluminum arsenide.

- A. Arsenic
- B. Arsenates
- C. Arsenic alloys
- D. Gallium arsenide
- E. Aluminum arsenide
- F. None of the Above

103. Other arsenic alloys include the II-IV semiconductor?

- A. Arsenic
- B. Arsenates
- C. Arsenic alloys
- D. Cadmium arsenide
- E. Aluminum arsenide
- F. None of the Above

SOC Section - SOC Introduction

104. Which of the following terms 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

105. All public water systems must monitor for?

- A. Valuable Organic Compounds (VOCs)
- B. Synthetic 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

106. 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

107. Which of the following terms - _____ are of VOCs?

- A. 3 organic chemicals
- B. Most scents or odors
- C. Five contaminant groups
- D. Elevated odors
- E. Substances
- F. None of the Above

108. 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

109. 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

110. 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

111. One VOC that is a known human carcinogen?

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

112. 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

113. 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

114. Which of the following terms is converted to carbon monoxide and 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

115. Perchloroethylene is a Volatile organic compound that has been linked to causing cancer in animals. It is also suspected to cause many of the breathing related symptoms of exposure to VOC's.

- A. True
- B. False

116. To avoid exposure to perchloroethylene, if a _____ is coming from clothing when picked up from the dry cleaner.

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

MTBE

117. MTBE was used as an octane booster and?

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

Formaldehyde

118. Many building materials such as paints, adhesives, wall boards, and ceiling tiles slowly emit?

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

Health Risks

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

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

Health effects include:

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

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

Reducing Exposure

121. Use products with _____ in well ventilated areas.

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

122. Architects and engineers implement best practices in ventilation and mechanical systems, the owner must maintain good _____ thereafter.

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

123. 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

124. Which of the following terms are 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

125. 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

What are Inorganic Compounds?**Inorganic Chemical Introduction**

126. 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

127. Which of the following terms are rather simple chemicals present in ground 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

128. Which of the following terms are dissolved from the rock/soil which make up the aquifer or water-bearing rock formations below the soil surface?

- A. Presence of a carbon atom
- B. Atmospheric CO₂
- C. Typical examples
- D. Inorganic compounds
- E. Minerals
- F. None of the Above

129. Which of the following terms were 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

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

- A. Presence of a carbon atom
- B. Atmospheric CO₂
- C. Typical examples
- D. Inorganic compounds
- E. Carbon
- F. None of the Above

Bioinorganic Compounds

131. The phosphates in DNA, and o metal complexes containing ligands that range from _____, commonly peptides, to ill-defined species such as humic acid, and to water.

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

Solid State Compounds

132. 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

133. Which of the following terms using the 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

134. 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

135. 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

136. 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

Coordination Compounds

137. The "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

138. The stereochemistry of coordination complexes can be a topical theme within this specialization is?

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

Main Group Compounds

139. Which of the following terms 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

140. Which of the following terms 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

141. 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

142. 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

143. According to the text, main group compounds are SiO_2 , SnCl_4 , and N_2O . Many main group compounds can also be classed as?

- 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

144. Which of the following terms 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

145. 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

146. 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

147. Which of the following terms 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

148. Which of the following terms 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

Cluster Compounds

149. 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

150. 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. Computational chemistry
- E. Molecular symmetry
- F. None of the Above