Registration form

Chemical Contaminants 201 CEU Training Course $200.00
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

Address: ______________________________________________________________

City________________________ State ____________ Zip ________________

Email________________________ Fax (___) ____________________________

Phone:
Home (___) ____________________ Work (___) __________________________

Operator ID # ___________________________ Exp. Date ________________

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

Wastewater Collection____ Wastewater Treatment____ Distribution ____

Water Treatment _____ Other __________________________

Technical Learning College PO Box 3060, Chino Valley, AZ 86323
(928) 468-0665 Fax (928) 272-0747 Back-up Fax (928) 468-0675
Toll Free (866) 557-1746 info@tlch2o.com

If you’ve paid on the Internet, please write your Customer #__________

Please invoice me, My PO #_____________________________________________
DISCLAIMER NOTICE
I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I also understand that this type of study program deals with dangerous conditions and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material. I will call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded.

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 of the course manual from TLC for an additional $79.95 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.

Grading Information
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.

States and many employers require the final exam to be proctored.

Do not solely depend on TLC’s Approval list for it may be outdated.

All downloads are electronically tracked and monitored for security purposes.

We will stop mailing the certificate of completion so we need your e-mail address. We will e-mail the certificate to you, if no e-mail address; we will mail it to you.
Chemical Contaminants 201 Answer Key

Name___________________________

Phone# ___________________________

You are solely responsible in ensuring 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?

Method of Course acceptance confirmation. Please fill this section

Website ___ Telephone Call___ Email____ Spoke to__________________________

Do not solely depend on TLC’s Approval list for it may be outdated.

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
2. A B C D E F
3. A B C D E F
4. A B C D E F
5. A B C D E F
6. A B C D E F
7. A B C D E F
8. A B C D E F
9. A B C D E F
10. A B C D E F
11. A B C D E F
12. A B C D E F
13. A B C D E F
14. A B C D E F
15. A B C D E F
16. A B C D E F
17. A B C D E F
18. A B C D E F
19. A B C D E F
20. A B C D E F
21. A B C D E F
22. A B C D E F
23. A B C D E F
24. A B C D E F
25. A B C D E F
26. A B C D E F
27. A B C D E F
28. A B C D E F
29. A B C D E F
30. A B C D E F
31. A B C D E F
32. A B C D E F
33. A B C D E F
34. A B C D E F
35. A B C D E F
36. A B C D E F
37. A B C D E F
38. A B C D E F
39. A B C D E F
40. A B C D E F
41. A B C D E F
42. A B C D E F
236. A B C D E F  268. A B C D E F  300. A B C D E F
237. A B C D E F  269. A B C D E F  301. A B C D E F
244. A B C D E F  276. A B C D E F  308. A B C D E F
246. A B C D E F  278. A B C D E F  310. A B C D E F
261. A B C D E F  293. A B C D E F  325. A B C D E F
263. A B C D E F  295. A B C D E F  327. A B C D E F

Chemical Contaminants Ass 8/1/2018  TLC (928) 468-0665
333. A B C D E F 357. A B C D E F 381. A B C D E F
344. A B C D E F 368. A B C D E F 392. A B C D E F
349. A B C D E F 373. A B C D E F 397. A B C D E F
351. A B C D E F 375. A B C D E F 399. A B C D E F
352. A B C D E F 376. A B C D E F 400. A B C D E F
353. A B C D E F 377. A B C D E F
354. A B C D E F 378. A B C D E F

Please fax the answer key to TLC
(928) 272-0747

Rush Grading Service
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. Thank you…
CUSTOMER SERVICE RESPONSE CARD

NAME: __________________________

E-MAIL _________________________________ PHONE _____________________

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.
   Very Similar   0  1  2  3  4  5     Very Different

4. How did you hear about this Course? _______________________________

5. What would you do to improve the Course?

________________________________________________________________

How about the price of the course?
Poor_____ Fair ____ Average ____ Good____ Great____

How was your customer service?
Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.

________________________________________________________________
Chemical Contaminants 201 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.

Inorganic Chemical Introduction
1. Which of the following terms in biological systems incorporates carbohydrates into the molecular structure?
   A. Volatile Organic Compounds (VOCs)          D. Maximum Contaminant Levels (MCL)
   B. Synthetic Organic Chemicals (SOCs)         E. Organic compounds
   C. Polychlorinated Biphenyls (PCBs)           F. None of the Above

2. Which of the following terms - are rather simple chemicals present in ground water?
   A. Volatile Organic Compounds (VOCs)          D. Maximum Contaminant Levels (MCL)
   B. Synthetic Organic Chemicals (SOCs)         E. Organic compounds
   C. Polychlorinated Biphenyls (PCBs)           F. None of the Above

3. 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                  D. Inorganic compounds
   B. Atmospheric CO2                             E. Minerals
   C. Typical examples                            F. None of the Above

4. 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                  D. Inorganic compounds
   B. Atmospheric CO2                             E. Carbon
   C. Inorganic chemistry                        F. None of the Above

5. Which of the following terms have been metabolically incorporated into living tissues persist in decomposing tissues?
   A. Volatile Organic Compounds (VOCs)          D. Organic matter
   B. Synthetic Organic Chemicals (SOCs)         E. Organic compounds
   C. Polychlorinated Biphenyls (PCBs)           F. None of the Above
6. 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\textsubscript{2} as?

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

7. Which of the following terms may be introduced into ground water 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

8. 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\textsubscript{2}  
C. Typical examples  
D. Inorganic compounds  
E. Carbon  
F. None of the Above

9. Which of the following terms 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

10. 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\textsubscript{2}  
C. Typical examples  
D. Inorganic compounds  
E. Carbon  
F. None of the Above

**SOC Section -SOC Introduction**

11. EPA has set Maximum Contaminant Levels 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

12. 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

13. 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
14. Which of the following terms or "blue baby syndrome" from ingestion of elevated levels of nitrate or nitrite?
   A. Methemoglobinemia  D. Elevated levels of nitrate or nitrite
   B. Most contaminants  E. Chemical compounds
   C. Three contaminant groups  F. None of the Above

15. All public water systems must monitor for?
   A. Valuable Organic Compounds (VOCs)  D. Maximum Constant Levels (MCL)
   B. Synthesis Organic Chemicals (SOCs)  E. Nitrate and Nitrite
   C. Polychlorinated Biphenyls (PCBs)  F. None of the Above

Volatile Organic Compounds (VOCs)

16. Which of the following terms are organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions?
   A. Volatile Organic Compounds (VOCs)  D. Maximum Contaminant Levels (MCL)
   B. Synthetic Organic Chemicals (SOCs)  E. Organic compounds
   C. Polychlorinated Biphenyls (PCBs)  F. None of the Above

17. Which of the following terms - _______ are of VOCs?.
   A. 3 organic chemicals  D. Elevated odors
   B. Most scents or odors  E. Substances
   C. Five contaminant groups  F. None of the Above

18. Which of the following terms are regulated by law, especially indoors, where concentrations are the highest.
   A. Anthropogenic VOCs  D. Benzene
   B. Aqueous solvents  E. Methylene chloride
   C. VOCs  F. None of the Above

Specific Components - Paints and Coatings

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

Chlorofluorocarbons and Chlorocarbons

20. Which of the following terms - which are banned or highly regulated, were widely used cleaning products and refrigerants?
   A. Solvents  D. Cleaning products
   B. VOC  E. Carbon monoxide
   C. Benzene  F. None of the Above

Benzene

21. One VOC that is a known human carcinogen?
   A. Solvents  D. Cleaning products
   B. VOC  E. Carbon
   C. Benzene  F. None of the Above
22. 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  D. Cleaning products
B. VOC  E. Carbon monoxide
C. Benzene  F. None of the Above

23. 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  D. Benzene
B. Aqueous solvents  E. Sodium chloride
C. TOCs  F. None of the Above

Methylene Chloride
24. 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  D. Methylene chloride
B. VOC  E. Carbon monoxide
C. Benzene  F. None of the Above

Perchloroethylene
25. 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

26. To avoid exposure to perchloroethylene, if a ________________ is coming from clothing when picked up from the dry cleaner.
A. Perchloroethylene  D. Strong chemical odor
B. Organic chemical  E. Furry creature
C. VOC  F. None of the Above

MTBE
27. 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
28. 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
29. 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:
30. 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
31. Use products with __________ in well-ventilated areas.
A. Formaldehyde  D. Perchloroethylene
B. MTBE  E. Organic chemicals
C. VOCs  F. None of the Above

32. 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

33. Allotropy or allotropism is the property of ____________ to exist in two or more different forms, known as allotropes of these elements.
A. Allotropy  D. Some chemical elements
B. Allotropes  E. Metalloids
C. Molecular formulae  F. None of the Above

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

35. The term allotropy is used for elements only, not for compounds. The more general term, used for any crystalline material, is?
A. Allotropy  D. Polymorphism
B. Allotrope  E. Metalloid
C. Molecular formulae  F. None of the Above

List of Allotropes
36. Which of the following terms are typically more noticeable in non-metals (excluding the halogens and the noble gases) and metalloids?
A. Allotropy  D. Some elements
B. Allotropes  E. Metalloids
C. Molecular formulae  F. None of the Above

37. Which of the following terms are capable of variable coordination number and/or oxidation states tend to exhibit greater numbers of allotropic forms?
A. Allotropy  D. Elements
B. Allotropes  E. Metalloids
C. Molecular formulae  F. None of the Above
Bioinorganic Compounds
38. The phosphates in DNA, and also 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
39. 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 and computational chemistry E. Molecular symmetry F. None of the Above

Theoretical Inorganic Chemistry
40. ________________ 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

41. Which of the following terms is 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
42. Which of the following terms 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
43. 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

44. Which of the following terms provides 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

45. Which of the following terms can be obtained in pure form from nature, most are synthesized in chemical plants and in the laboratory?
A. Maximum Contaminant Level (MCL)  D. (MCLG)
B. Species  E. Inorganic species
C. Organisms  F. None of the Above

46. Which of the following terms are prepared using methods of organic synthesis?
A. Soluble inorganic compounds  D. Carcinogens
B. Methemoglobinemia  E. Chemicals
C. Products and reactants  F. None of the Above

47. Which of the following terms are manipulated in “vacuum manifolds” consisting of glass piping interconnected through valves?
A. Maximum corrections  D. Maximum odors
B. Chain of custody procedures  E. Inorganic species
C. Volatile compounds and gases  F. None of the Above

Small Water Filters

48. Water filters are used for "_________________________" drinking water, that is, to filter out harmful or unwanted particles before the water is used for human consumption.
A. A carbon filter  D. Man-made filter
B. Backwash carbon  E. Point of use
C. Activated carbon  F. None of the Above

49. Reverse osmosis works by forcing the water through a _____________that stops certain particles from passing through.
A. Semi-permeable membrane  D. Recommend treatment
B. Activated carbon  E. Carbon filter or system
C. Process  F. None of the Above

50. Portable water filters work using a cartridge containing activated carbon and?
A. A carbon filter  D. Ion exchange resin
B. Backwash carbon  E. Organic matter
C. Activated carbon  F. None of the Above

Activated Carbon Filtration

51. According to the text, which of the following terms has been used for many years to solve water problems?
A. Osmosis  D. Money
B. Activated carbon  E. Government
C. The adsorption process  F. None of the Above

52. According to the text, which of the following terms quickly and effectively removes chlorine from water?
A. A carbon filter  D. Man-made organics
B. Robots  E. Organic matter
C. Activated carbon  F. None of the Above
53. According to the text, ____________________ takes time, so service rates should be limited to 5 gpm/ft (12m/hr) or less for these applications?
A. Reverse Osmosis  D. Sand filter
B. Activated carbon  E. A carbon filter or system
C. The adsorption process  F. None of the Above

**Synthetic Organic Chemicals**

54. Synthetic organic chemicals (SOC) include all?
A. Carbon based units  D. Man-made organics
B. Carbon atoms  E. Organic matter
C. Re-activated carbon  F. None of the Above

55. According to the text, which of the following terms can substantially reduce many VOCs such as benzene, trichlorethane and carbon tetrachloride?
A. Reverse Osmosis  D. Fire
B. Activated carbon  E. A carbon filter or system
C. The adsorption process  F. None of the Above

56. According to the text, which of the following terms also removes SOCs such as Alachlor, EDB and toluene?
A. A carbon filter  D. Man-made machines
B. Backwash carbon  E. Organic filters
C. Activated carbon  F. None of the Above

57. Before recommending_______________, water suspected of containing any of these and other substances must be analyzed to determine their concentrations and whether they exceed the EPA standards.
A. Reverse Osmosis  D. Treatment
B. Activated carbon  E. A carbon filter or system
C. The adsorption process  F. None of the Above

58. When operating ______________________ on turbid water supplies, remove suspended particles with a depth filter before treating it with activated carbon.
A. Reverse Osmosis process  D. A boat
B. Activated carbon filters  E. A carbon filter or system
C. The adsorption process  F. None of the Above

59. According to the text, which of the following terms typically backwashes at 10 gpm/ft (25 m/hr) for about 10 minutes, followed by a 5 minute downflow rinse?
A. A carbon filter  D. Man
B. Backwash carbon filter  E. Organic matter filtering
C. Activated carbon process  F. None of the Above

60. Over a period of several months to two years, the carbon's adsorption capacity diminishes. The exhausted __________________________should be replaced with fresh carbon. The old carbon should be hauled to an approved disposal facility.
A. Reverse Osmosis  D. Carbon bed
B. Activated carbon  E. A carbon filter or system
C. Adsorption process  F. None of the Above
Membrane Filtration Processes

61. According to the text, which of the following terms - a process in which water from a dilute solution will naturally pass through a porous membrane into a concentrate solution?
   A. Reverse osmosis      D. RO membranes
   B. A porous membrane    E. Osmosis
   C. Potable water        F. None of the Above

62. It wasn’t until the late 1950s that membranes were produced that could be used for what is known as?
   A. Direct filtration process   D. Membrane filtration processes
   B. MF                         E. Reverse osmosis
   C. Desalinization             F. None of the Above

63. _____________ water is forced to move through a membrane from a concentrate solution to a dilute solution.
   A. Reverse osmosis  D. RO membranes
   B. A porous membrane E. Rapid sand filters
   C. Potable water    F. None of the Above

64. According to the text, which of the following terms are membranes have been used for desalinization, removal of dissolved inorganic and organic chemicals, water softening, and removal of the fine solids?
   A. Direct filtration process   D. Membrane filtration processes
   B. Potable water treatment    E. Reverse osmosis
   C. Desalinization             F. None of the Above

65. According to the text, which of the following terms enables some water systems having contaminated water sources to meet new, more stringent regulations?
   A. Reverse osmosis  D. RO membranes
   B. A porous membrane E. Rapid sand filters
   C. Potable water    F. None of the Above

66. There is great potential for the continuing wide use of this method in potable water treatment, especially as technology improves and costs are reduced.
   A. Direct filtration process   D. Membrane filtration processes
   B. MF                         E. Reverse osmosis
   C. Desalinization             F. None of the Above

Microfiltration

67. Microfiltration (MF) is a process in which water is forced under pressure through?
   A. Reverse osmosis  D. RO membranes
   B. A porous membrane E. Rapid sand filters
   C. Potable water    F. None of the Above

68. Membranes with a pore size of 0.45µ m are normally used; this size is relatively large compared with the other?
   A. Direct filtration process   D. Membrane filtration processes
   B. MF                         E. Reverse osmosis
   C. Desalinization             F. None of the Above
69. This process has not been generally applicable to drinking water treatment because it either does not remove substances or the problem substances can be removed more economically using?
A. Reverse osmosis   D. RO membranes
B. A porous membrane E. Rapid sand filters
C. Other processes    F. None of the Above

70. According to the text, which of the following terms is by industries to remove very fine particles from process water?
A. Direct filtration process D. Membrane filtration processes
B. MF E. Reverse osmosis
C. Desalinization F. None of the Above

71. According to the text, which of the following terms are susceptible to clogging or filter binding unless the water being processed is already quite clean?
A. Reverse osmosis filters D. RO membranes
B. Porous membranes E. Rapid sand filters
C. Probable water filters F. None of the Above

72. Microfiltration has been proposed as a filtering method for particles resulting from the?
A. Direct filtration process D. Membrane filtration processes
B. MF E. Reverse osmosis
C. Desalinization F. None of the Above

73. According to the text, _______________ has used the injection of coagulants such as alum or polymers into the raw water stream to remove turbidity such as clay or silts?
A. Direct filtration process D. Membrane filtration processes
B. MF E. Reverse osmosis
C. Desalinization F. None of the Above

74. The formed particles were then removed by?
A. Reverse osmosis D. RO membranes
B. A porous membrane E. Rapid sand filters
C. Portable water filter F. None of the Above

Ultrafiltration
75. According to the text, which of the following terms is a process that uses a membrane with a pore size generally below 0.1 µm.
A. EDR D. NF
B. RO E. XF
C. ED F. None of the Above

76. According to the text, _______________ can be designed to pass material that weigh less than or equal to a certain molecular weight?
A. Demineralizing compartments D. Direct electric current applied to the solution
B. UF E. Membrane process
C. Processes for this service F. None of the Above
77. According to the text, which of the following terms does not generally work well for removal of salt or dissolved solids, it can be used effectively for removal or most organic chemicals?
A. Electrodialysis Reversal (EDR)  D. NF
B. An important RO process  E. UF
C. These RO membranes  F. None of the Above

**Nanofiltration**
78. Nanofiltration (NF) is a process using membranes that will reject even smaller molecules than?
A. DO  D. ET
B. UF  E. Membrane process
C. UFO  F. None of the Above

79. NF’s capability will undoubtedly increase the use of ______________ for potable water treatment.
A. EDR  D. NF
B. RO process  E. UF
C. These RO membranes  F. None of the Above

**Reverse Osmosis**
80. RO is a membrane process that has the highest rejection capability of all the?
A. Demineralizing compartments  D. Machines
B. UF  E. Membrane processes
C. Processes for this service  F. None of the Above

81. Which of the following terms have very low MWC pore size that can reject ions at very high rates, including chloride and sodium?
A. Electrodialysis Reversal (EDR) membranes  D. NF
B. RO process  E. UF
C. These RO membranes  F. None of the Above

82. Water from this __________________ is very pure due to the high reject rates. A. Demineralizing process  D. Device
B. UF  E. System
C. Service  F. None of the Above

83. Industrial water uses such as semiconductor manufacturing is also an important ______________.
A. Purpose  D. Function
B. RO process  E. UF
C. RO membranes  F. None of the Above

**Electrodialysis**
84. Electrodialysis (ED) is a process in which ions are transferred through __________ as a result of direct electric current applied to the solution.
A. Demineralizing compartments  D. The solution
B. A membrane  E. Membrane process
C. Processes for this service  F. None of the Above
Electrodialysis Reversal

85. Electrodialysis Reversal (EDR) is a process similar to ______________, except that the polarity of the direct current is periodically reversed.
A. ED  D. NF
B. An important RO process  E. UF
C. RO membranes  F. None of the Above

86. The reversal in polarity reverses the flow of ions ______________ compartments, which provides automatic flushing of scale-forming materials from the membrane surface.
A. Between demineralizing  D. Direct electric current applied to the solution
B. In the UF  E. Breakdown
C. In the processing  F. None of the Above

87. Which of the following terms and EDR have been used at only a few locations for drinking water treatment.
A. ED  D. NF
B. An important RO process  E. UF
C. These RO membranes  F. None of the Above

Inorganic Chemistry

88. 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. Some metals  F. None of the Above

89. The distinction between the two disciplines is far from absolute, and there is much overlap, most importantly in the sub-discipline of?
A. Crystallization  D. Organometallic chemistry
B. Inorganic salts  E. Lead, mercury, and arsenic
C. Electrically neutral  F. None of the Above

Key Concepts

90. Many inorganic compounds are ionic compounds, consisting of ______________ joined by ionic bonding.
A. Myriad organic compounds  D. Cations and anions
B. Inorganic compounds  E. Electron affinity (anions)
C. Some metals  F. None of the Above

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

92. The ions are described by their oxidation state and their ease of formation can be inferred from the ionization potential or from the electron affinity.
A. True  B. False
93. Important classes of inorganic salts are the_____________, the sulfates and the halides.
   A. Crystals   D. Sub-discipline of organometallic chemistry like
   B. Oxides, the carbonates   E. Sulfites
   C. Electrically neutral cations   F. None of the Above

94. Inorganic salts typically are poor conductors in the?
   A. Myriad   D. Ionic compound
   B. Inorganic compound mixture   E. Solid state
   C. Customer’s coffee   F. None of the Above

95. Another important feature is their solubility in water, e.g?
   A. And ease of crystallization   D. Sub-discipline of organometallic chemistry
   B. Inorganic salts   E. Ionic compound
   C. Electrically neutral   F. None of the Above

96. In redox reactions one reactant, the oxidant, lowers its __________________ and
the reductant, has its oxidation state increased.
   A. pH   D. Ionic count
   B. Redox state   E. Electron affinity (anions)
   C. Oxidation state   F. None of the Above

97. Which of the following terms can occur indirectly as well, e.g., in batteries, a key concept in electrochemistry?
   A. Crystallization   D. Electron exchange
   B. Inorganic salts   E. Regeneration
   C. Electrically neutral charges   F. None of the Above

98. When one reactant contains hydrogen atoms, a reaction can take place by exchanging protons in acid-base chemistry. In a more general definition, an acid can be any chemical species capable of binding to electron pairs is called a Lewis acid; conversely any molecule that tends to donate an electron pair is referred to as a Lewis base.
   A. True   B. False

99. Soil may contain iron sulfide as pyrite or ________________ .
   A. Often similar reactivity   D. Man-made inorganic compounds
   B. Coordination complexes   E. Nature-made inorganic compounds
   C. Classification of compounds   F. None of the Above

100. Inorganic compounds are also found multitasking as biomolecules: as electrolytes, in energy storage (ATP) or in construction.
   A. True   B. False

101. ________________ was ammonium nitrate for soil fertilization through the Haber process.
   A. Compound   D. Man-made inorganic compound
   B. Complexed mineral   E. Nature-made inorganic compounds
   C. Cation   F. None of the Above
102. Subdivisions of inorganic chemistry are active areas of research in inorganic chemistry, aimed toward new catalysts, superconductors, and therapies.
A. True   B. False

**Descriptive Inorganic Chemistry**

103. Descriptive inorganic chemistry focuses on the ___________ based on their properties.
A. Classification of reactivity  D. Classification of inorganic compound
B. Classification of coordination complexes  E. Classification of nature
C. Classification of compounds  F. None of the Above

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

105. When studying inorganic compounds, one often encounters parts of the different classes of inorganic chemistry; an organometallic compound is characterized by its coordination chemistry, and may show interesting?
A. Often similar reactivity  D. Man-made inorganic compound
B. Coordination complexes  E. Solid state properties
C. Classification of compounds  F. None of the Above

**Different classifications are:**

**Coordination Compounds**

106. _______________ almost all organic and inorganic compounds can be used as ligands.
A. Supramolecular coordination chemistry  D. Modern coordination compounds
B. Classical coordination compounds  E. Organometallic chemistry
C. Inorganic compounds  F. None of the Above

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

108. The stereochemistry of coordination complexes can be a topical theme within this specialization is?
A. Supramolecular coordination chemistry  D. Bath tub chemistry
B. Classical coordination chemistry  E. Organometallic chemistry
C. Inorganic chemistry  F. None of the Above
Main Group Compounds

109. 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

110. 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

111. 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

112. 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

113. According to the text, main group compounds are SiO₂, SnCl₄, and N₂O. 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

114. 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

115. 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
116. Transition metal compounds show a rich coordination chemistry, varying from tetrahedral for titanium (e.g., TiCl$_4$) to square planar for some nickel complexes to octahedral for ______________ of cobalt.
A. Transition metal compounds  D. Metal-metal bonded dimetallic complexes
B. Organometallic complexes  E. Coordination complexes
C. Organometallic compounds  F. None of the Above

117. Which of the following terms can be found in biologically important compounds, such as iron in hemoglobin?
A. Transition metals  D. Metal complexes
B. Complexes  E. Transition metal compounds
C. Organometallic complexes  F. None of the Above

Organometallic Compounds
118. Usually, M-C-H group the metal (M) in these species can either be a main group element or a?
A. Transition metal compound  D. Metal-metal bonded dimetallic complex
B. Transition metal  E. Organic compound
C. Organometallic compound  F. None of the Above

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

120. Which of the following terms employs more specialized preparative methods than was traditional in Werner-type complexes?
A. Transition metal compounds  D. Metal-metal chemistry
B. Organometallic chemistry  E. Organic chemistry
C. Organometallic compounds  F. None of the Above

121. _________________________, especially 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  D. Synthetic carbonyl and even metal alkoxides
B. Synthetic gas methodology  E. Transition metal compounds
C. Synthetic methodology  F. None of the Above

Cluster Compounds
122. Clusters can be found in all classes of?
A. Transition metal compounds  D. Chemical compounds
B. Organometallic chemistry  E. Organic compounds
C. Organometallic compounds  F. None of the Above
123. _________________organometallic chemistry, main group chemistry, and bioinorganic chemistry.
A. Transition metals  D. Metal carbyonyls and even metal alkoxides
B. Inorganic systems  E. Transition metal compounds
C. Organometallic systems  F. None of the Above

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

Bioinorganic Compounds
125. By definition, these compounds occur in nature, but the subfield includes anthropogenic species, such as pollutants (e.g., methylmercury) and drugs (e.g., Cisplatin). The field, which incorporates many aspects of biochemistry, includes many kinds of compounds, e.g., the phosphates in DNA, and metal complexes containing ligands that range from biological macromolecules, commonly peptides, to ill-defined species such as humic acid, and to water (e.g., coordinated to gadolinium complexes employed for MRI).
A. True  B. False

126. Which of the following terms includes the study of both non-essential and essential elements with applications to diagnosis and therapies?
A. Symmetry to spectroscopy  D. Medicinal inorganic chemistry
B. Theoretical calculations  E. Solid state chemistry
C. Qualitative approach  F. None of the Above

Solid State Compounds
127. 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  D. Computational chemistry
B. VSEPR theory  E. Molecular symmetry
C. Solid state inorganic chemistry  F. None of the Above

128. Which of the following terms are metals and their alloys or intermetallic derivatives?
A. Symmetry to spectroscopy  D. Precise quantum mechanical descriptions
B. Theoretical calculations  E. Solid state chemistry
C. Qualitative approach  F. None of the Above

Theoretical Inorganic Chemistry
129. 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  D. Theoretical chemistry and computational chemistry
B. VSEPR theory  E. Molecular symmetry
C. Bohr model of the atom  F. None of the Above
130. The province of inorganic chemistry has spawned many semi-quantitative or semi-empirical approaches including molecular orbital theory.
A. Symmetry B. Theoretical calculations C. Qualitative approaches D. Quantum mechanical descriptions E. Solid state chemistry F. None of the Above

**Qualitative Theories**

131. 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

132. For the transition metals, crystal field theory allows one to understand the magnetism of many simple complexes, such as why $[\text{Fe}^{III}(\text{CN})_6]^{3-}$ has only one unpaired electron, whereas $[\text{Fe}^{III}(\text{H}_2\text{O})_6]^{3+}$ has five. A particularly powerful qualitative approach to assessing the structure and reactivity begins with classifying molecules according to electron counting, focusing on the numbers of valence electrons, usually at the central atom in a molecule.
A. True B. False

**Molecular Symmetry Group Theory**

133. 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

134. Which of the following terms provides 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

135. Knowledge of the crystallography properties of the ground and excited states allows one to predict the numbers and intensities of absorptions in vibrational and electronic spectra.
A. True B. False

136. The most common applications of precise quantum mechanical description to spectroscopy involve vibrational and electronic spectra.
A. True B. False

137. Which of the following terms highlights commonalities and differences in the bonding of otherwise disparate species, such as WF₆ and Mo(CO)₆ or CO₂ and NO₂?
A. Group theory B. Theoretical calculation C. Qualitative approach D. Precise quantum mechanical description E. Solid state chemistry F. None of the Above
Synthetic Inorganic Chemistry

138. Which of the following terms can be obtained in pure form from nature, most are synthesized in chemical plants and in the laboratory?
A. Maximum Contaminant Level (MCL)  D. Maximum Contaminant Level Goals (MCLG)
B. Species  E. Inorganic species
C. Organisms  F. None of the Above

139. Which of the following terms are prepared using methods of organic synthesis. For metal-containing compounds that are reactive toward air?
A. Soluble inorganic compounds  D. Carcinogens
B. Methemoglobinemia  E. Chemicals
C. Products and reactants  F. None of the Above

140. Which of the following terms are manipulated in “vacuum manifolds” consisting of glass piping interconnected through valves?
A. Corrections  D. Maximum odors
B. Gas and Chains  E. Inorganic species
C. Volatile compounds and gases  F. None of the Above

141. Which of the following terms are condensed using liquid nitrogen or other cryogens?
A. Compounds  D. Carcinogens
B. Methemoglobinemia  E. Chemicals
C. Products and reactants  F. None of the Above

142. Solids are typically prepared using tube furnaces, the reactants and products being sealed in containers, often made of fused silica (amorphous SiO₂) but sometimes more specialized materials such as welded Ta tubes or Pt “boats”. Products and reactants are transported between temperature zones to drive reactions.
A. True  B. False

Regulated Chemical Contaminants

143. This series of rules are known as the Chemical Phase Rules define regulations for three contaminant groups:___________, Synthetic Organic Chemicals (SOC), and Volatile Organic Chemicals (VOC).
A. Inorganic Chemicals (IOC)  D. Carcinogens
B. IOUs and UFOs  E. Chemical Phase Rules
C. Products and reactants  F. None of the Above

144. Non-Detects (ND) - laboratory analysis indicates that the constituent is not present.
A. True  B. False

145. Parts per million (ppm) or Milligrams per liter (mg/L) - one part per million corresponds to ten minutes in one year or a single penny in $1,000.
A. True  B. False

146. The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow is called the “Action level”.
A. True  B. False
147. Maximum Contaminant Level - the “Maximum Allowed” (MCL) is the lowest level of a contaminant that is allowed in drinking water.
A. True   B. False

148. 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

149. Parts per billion (ppb) or Micrograms per liter (ug/L) - one part per billion corresponds to one minute in 10,000 years, or a single penny in $10,000.
A. True   B. False

150. Picocuries per liter (pCi/L) - picocuries per liter is a measure of the radioactivity in water.
A. True   B. False

Chain of Custody Procedures
151. Which of the following terms are used to maintain and document sample possession from the time the sample is collected until it is introduced as evidence?
A. Samples  D. Chain of custody procedures
B. Seal  E. Chain of custody record
C. Evidence tape   F. None of the Above

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

Wastewater Priory Pollutants Section
Wastewater/Pretreatment Sampling General Information
153. In accordance with the Clean Water Act and_____________ , the POTW conducts a variety of sampling activities which must be closely coordinated.
A. General Pretreatment Program Regulations D. Priority Pollutants within
B. Each site user and    E. Characteristics of the wastes
C. All industrial users and   F. None of the Above

Permit Application Policy Example
154. All industrial users that require a permit must be sampled to determine the characteristics of the _____________ to be discharged into the POTW’s sewer system.
A. SROG  D. Priority Pollutants
B. Local limits  E. Wastes
C. Outer limits  F. None of the Above
155. Prior to the issuance of a permit for existing industrial users, the POTW samples the user's effluent, and performs the analyses required by the applicable discharge standards (i.e., Categorical standards or?
A. Taste test D. Priority Pollutants
B. Local limits E. Characteristics of the wastes
C. SDWA F. None of the Above

156. For new industrial users, estimates of the ____________ to be discharged into the POTW’s sewer system must be submitted along with the permit application.
A. Wastes D. Priority Pollutants
B. CWA E. Characteristics of the wastes
C. Odor F. None of the Above

157. No sampling would be performed at these new facilities, since they do not presently discharge wastes into the?
A. POTWs D. Priority system
B. Sewer system E. Interceptor
C. CMOM F. None of the Above

158. A four-day sampling program is usually conducted at ____________ to collect both composite and grab (for pollutants not amenable to composite sampling) samples as needed.
A. POTWs D. The interceptor
B. Each site E. The manhole
C. All industrial users F. None of the Above

Wastewater Priority Pollutants
159. The concentrations of various substances in ____________in dissolved, colloidal or suspended form are typically low but vary considerably.
A. POTWs D. Priority Pollutants
B. These 126 pollutants E. Water
C. New industrial users F. None of the Above

160. Priority Pollutants refer to a list of 126 specific pollutants that includes heavy metals and specific organic chemicals. The priority pollutants are a subset of "______________ " as defined in the Clean Water Act (USA).
A. POTWs D. Priority Pollutants
B. Toxic pollutants E. Safe contaminants
C. Friendly pollutants F. None of the Above

161. Which of the following terms were assigned a high priority for development of water quality criteria and effluent limitation guidelines because they are frequently found in wastewater?
A. POTW managers D. Priority Pollutants
B. These 126 pollutants E. The concentrations of various substances
C. Safe contaminants F. None of the Above
162. ______________________ with an approved pretreatment program must develop local limits for arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, silver and zinc.  
A. Each POTW  D. Priority pollutant producers  
B. Each city  E. Home owners  
C. All industrial users  F. None of the Above

163. The POTW must also identify all ______________ and evaluate the need for limits for these pollutants.  
A. Other pollutants of concern  D. Priority Pollutants  
B. 126 pollutants  E. Concentrations of various substances  
C. New industrial users  F. None of the Above

164. Concentrations of various substances is defined as any pollutant limited in the POTW's NPDES permit or found in the collection system in sufficient quantity to have a reasonable potential to cause pass through or interference at the treatment plant, pose a threat to worker health and safety, or to cause other problems within the collection system or at the treatment plant, such as explosions or obstruction of wastewater flow.  
A. True  B. False

165. The priority pollutant scans performed periodically by POTWs with approved pretreatment programs are useful in identifying?  
A. Pollutants of concern  D. Priority Pollutants  
B. These 126 pollutants  E. The concentrations of various substances  
C. New industrial users  F. None of the Above

166. POTWs with multiple plants may wish to develop __________ for each plant or after calculating the limits for each plant choose the most stringent as uniform local limits across all plants.  
A. Local limits  D. Priority Pollutants  
B. Headworks  E. Characteristics of the wastes  
C. Industrial users  F. None of the Above

167. Local limits are most often associated with the control of toxic pollutants. However, if a POTW has experienced violations of their?  
A. POTWs  D. NPDES permit effluent limits for conventional pollutants  
B. Surcharge programs  E. Local limits  
C. Industrial users  F. None of the Above

168. Many POTWs have surcharge programs for?  
A. POTWs  D. Priority Pollutants  
B. Conventional pollutants  E. Local limits  
C. All industrial users  F. None of the Above

169. A POTW should set absolute upper limits for ______________ in its sewer use ordinance (SUO) or industrial user (IU) permits, based on total plant capacity.  
A. Conventional pollutants  D. Priority Pollutants  
B. Surcharge programs  E. Local limits  
C. All industrial users  F. None of the Above
170. Which of the following terms can stimulate the growth of algae and other aquatic plants?
A. Excess nutrients  D. Carbon, nitrogen and phosphorus
B. Industrial discharges  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

171. When these plants die and decompose, they may reduce the amount of __________ in the water.
A. Nutrients  D. Carbon, nitrogen and phosphorus
B. Oxygen  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

172. Which of the following terms can also get into wastewater from industrial discharges, common household detergents and cleaners, runoff from streets and lawns and air pollutants that fall to the ground?
A. Nutrients  D. Carbon, nitrogen and phosphorus
B. Industrial discharges  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

173. Treatment plants cannot remove all _____________ from the wastewater.
A. Nutrients  D. Carbon, nitrogen and phosphorus
B. Industrial discharges  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

174. "Heavy Metal" in the water treatment field refers to heavy, dense, __________ that occur only at trace levels in water, but are very toxic and tend to accumulate.
A. Nutrients  D. Metallic elements
B. Industrial discharges  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

175. Which of the following terms include DDT, Aldrin, Chlordane, Endosulfan, Endrin, Heptachlor, and Diazinon. Surprisingly, concentrations of pesticides in urban runoff may be equal or greater than the pesticides in agricultural runoff?
A. Nutrients  D. Typical pesticides and herbicides
B. Industrial discharges  E. Agricultural runoff
C. Heavy Metal  F. None of the Above

176. Which of the following terms spilled or released petroleum products and combustion products that are found in urban runoff?
A. PAHs  D. Open-ended groups of pollutants
B. Priority Pollutants  E. Inorganics
C. Chemical standards  F. None of the Above

177. Polychlorinated biphenyls are organic chemicals that formerly had widespread use in electrical transformers and hydraulic equipment. This class of chemicals is extremely persistent in the environment and has been proven to bioconcentrate in the food chain, thereby leading to environmental and human health concerns in areas such as the Great Lakes.
A. True  B. False
178. The Priority Pollutants are a set of _______________EPA regulates, and for which EPA has published analytical test methods.
A. Combustion products  D. Open-ended groups of pollutants
B. Chemical pollutants  E. Sampling requirements for inorganics
C. Chemical standards  F. None of the Above

179. _________________ list is more practical for testing and for regulation in that chemicals are described by their individual chemical names.
A. Organics  D. List of toxic pollutants more usable
B. Preservatives  E. Environmental and human health concerns
C. Priority Pollutant  F. None of the Above

180. Which of the following terms contains hundreds of compounds; there is no test for the group as a whole, nor is it practical to regulate or test for all of these compounds.
A. Combustion products  D. Open-ended groups of pollutants
B. Priority Pollutants  E. The list of toxic pollutants
C. Chemical standard  F. None of the Above

Proper Sample Handling
181. The proper handling of _________________ also includes wearing gloves.
A. Containers and preservatives  D. Pre-preserved bottles
B. Water quality samples  E. Samples in the shade
C. The most common preservatives  F. None of the Above

182. Gloves not only protect field personnel, but also prevent potential contamination to the water sample. Always wear powderless, disposable gloves.
A. True  B. False

183. When sampling for organics, wear latex gloves.
A. True  B. False

184. Nitrile gloves are not appropriate for organics.
A. True  B. False

185. Use chain-of-custody procedures when coolers and containers are prepared, sealed and shipped. They will remain sealed until used in the field.
A. True  B. False

186. When making arrangements with the laboratory, make sure you request enough containers, including those for blank and duplicate samples. Order extra sample bottles to allow for breakage or contamination in the field.
A. True  B. False

187. Some samples require _________________ and/or preservation with chemicals to maintain their integrity during shipment and before analysis in the laboratory.
A. Containers and preservatives  D. Pre-preserved bottles
B. Low-temperature storage  E. Samples in the shade
C. The most common preservatives  F. None of the Above
188. Which of the following terms are hydrochloric, nitric, sulfuric and ascorbic acids, sodium hydroxide, sodium thiosulfate, and biocides?
A. Containers and preservatives  D. Pre-preserved bottles
B. Low-temperature storage  E. Samples
C. Preservatives  F. None of the Above

189. Some federal and state agencies allow the use of ______________, some may require either cool temperatures or added preservatives in the field.
A. Appropriate for organics  D. List of toxic pollutants more usable
B. Preservatives  E. Environmental and human health concerns
C. Pre-preserved sample containers  F. None of the Above

190. Which of the following terms are received from the laboratory, check to see that none have leaked?
A. Containers and preservatives  D. Pre-preserved bottles
B. Paperwork  E. Donuts
C. Most common preservatives  F. None of the Above

191. Make sure you can tell which containers are a one-time inorganic chemical analysis because extra care must be taken not to overfill them when collecting samples in the field.
A. True  B. False

192. Check with the laboratory about field parameters procedures when using pre-preserved bottles.
A. True  B. False

Field Parameters
193. Measure and record the ______________of temperature, electrical conductivity, pH and dissolved oxygen in an undisturbed section of streamflow.
A. Process  D. Grab samples
B. Optimal effects  E. Field parameters
C. Current  F. None of the Above

Chemical Monitoring
194. The final federal rules regarding Phase II and V contaminants were promulgated by the U.S. EPA in 1992 and initial monitoring began in January 1993. This group of contaminants consists of Inorganic Chemicals (IOC), Volatile Organic Chemicals (VOC) and Synthetic Organic Chemicals (SOC) and the rule applies to all?
A. Contamination  D. Promulgated by the U.S. EPA in 1992
B. Mix surface and ground water  E. A one-time inorganic chemical analysis
C. Gross alpha activity  F. None of the Above

Inorganic Chemical Monitoring
195. The one-time inorganic chemical analysis sample is to be collected at__________ to the distribution system representative of each source after any application of treatment.
A. Contamination sources  D. Entry points (POE)
B. Areas of surface and ground water  E. Water main breaks
C. Signs of gross alpha activity  F. None of the Above
**Nitrates**

196. Nitrate is an organic chemical that occurs unnaturally in some groundwater but most often is introduced into ground and surface waters by man.
   A. True   B. False

197. At high levels (over 100 mg/l) it can cause the “blue baby” syndrome in young infants, which can lead to serious illness and even death. It is regarded as an “Chronic health risk” because it can quickly cause illness.
   A. True   B. False

198. Every water system must test for Nitrate at least yearly, systems that use _______ must test yearly.
   A. Contamination   D. Water
   B. Mix surface and ground water   E. A one-time inorganic chemical analysis
   C. Ground water only   F. None of the Above

199. A surface water system 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. True   B. False

200. After 4 quarters of testing and the results show that the nitrate level is not going up, they may go back to yearly testing.
   A. True   B. False

**Radiological Contaminants**

201. Some of the community water systems may monitor for gross beta activity every four years for each source.
   A. True   B. False

202. Depending on your state rules, compliance will be based on the annual composite of 4 consecutive quarters or ________________.
   A. Sample instructions   D. Laboratory performance requirements
   B. Established action levels   E. Average annual concentration
   C. Minimum aeration   F. None of the Above

203. If the average annual concentration is less than one tenth the MCL, an analysis of a single sample may be substituted for the quarterly sampling procedure.
   A. True   B. False

**Total Trihalomethanes (TTHM)**

204. All community water systems serving a population of 10,000 or more and which add a disinfectant in any part of the drinking water treatment process shall monitor for total trihalomethanes (TTHM).
   A. True   B. False
205. 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  D. Some groundwater
B. Optimal corrosion control  E. The running average of quarterly analyses of the sum
C. Surface water system  F. None of the Above

Lead and Copper Rule
206. 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  D. Laboratory performance requirements
B. Establishes action levels  E. Average annual concentration
C. Establishes MCL levels  F. None of the Above

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

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

IOC Sample Collection – Things to Remember
209. If the laboratory fails to include sample instructions, contact the laboratory and?
A. Collect samples  D. Do not change the flow
B. Run  E. Maintain chemical analysis reports
C. Request sample instructions  F. None of the Above

Some general practices to remember:
210. Samples should be collected at _______________ after all treatment (finished water).
A. Homes  D. The entry point to the distribution system
B. SNAFU  E. At water storage tanks
C. Sample locations  F. None of the Above

211. Select a sampling faucet that does not have an aerator (sampling must be done with?
A. Sample instructions  D. Laboratory performance requirements
B. Proper action levels  E. Average flow
C. Minimum aeration  F. None of the Above
Some general practices to remember:
212. Samples should be collected at _______________ after all treatment.
A. Homes   D. The entry point to the distribution system
B. SNAFU    E. At water storage tanks
C. Sample locations  F. None of the Above

Antimony
213. Antimony is a toxic chemical element with symbol \textbf{Sb} and atomic number 51.
A. True   B. False

214. Antimony is a lustrous gray metalloid; it is found in nature mainly as the?
A. Contaminant     D. Subsequent element
B. Analytical element   E. Stibnite with iron
C. Sulfide mineral stibnite (Sb$_2$S$_3$)     F. None of the Above

215. Which of the following terms have been known since ancient times and were used for cosmetics?
A. Gray allotrope of arsenic     D. Metallic antimony
B. Four allotropes   E. Antimony compounds
C. Nitrogen group (group 15)   F. None of the Above

216. The industrial methods to produce antimony are roasting and subsequent carbothermal reduction or direct reduction of?
A. Sulfide mineral stibnite (Sb$_2$S$_3$)  D. Heat
B. Copper   E. Lead
C. Stibnite with iron  F. None of the Above

What are EPA's drinking water regulations for antimony?
217. Contaminants are _______________ or matter in water.
A. Contaminants   D. Organic and inorganic
B. Analytical problems   E. Prominent additives
C. Commonly found   F. None of the Above

218. The Phase VI Rule, the regulation for antimony, became effective in 2001.
A. True   B. False

219. The Safe Drinking Water Act requires _______________ to periodically review the national primary drinking water regulation for each contaminant and revise the regulation, if appropriate.
A. OSHA    D. Emergency Planning and Community Right to Know Act (EPCRA)
B. MCLs   E. EPA
C. States   F. None of the Above

220. Which of the following terms - reviewed antimony as part of the Six Year Review and determined that the 0.006 mg/L or 6 ppb MCLG and 0.006 mg/L or 6 ppb MCL for antimony?
A. OSHA    D. Emergency Planning and Community Right to Know Act (EPCRA)
B. MCLs   E. EPA
C. States   F. None of the Above
221. EPA has set an enforceable regulation for antimony, called a ________________, at 0.006 mg/L or 6 ppb.
A. MCLG       D. Emergency Planning and Community Right to Know Act (EPCRA)
B. MCL        E. EPA
C. CWA       F. None of the Above

Applications

222. ________________ with antimony improves the properties of the alloys which are used in solders, bullets and plain bearings.
A. Gray allotrope of arsenic       D. Metallic antimony
B. Four allotropes                 E. Alloying lead and tin
C. Nitrogen group (group 15)      F. None of the Above

223. Which of the following terms are prominent additives for chlorine- and bromine-containing fire retardants found in many commercial and domestic products?
A. Contaminants       D. Metallic antimony
B. Gray allotrope of arsenic   E. Prominent additives
C. Antimony compounds    F. None of the Above

224. Antimony is in the nitrogen group (group 15) and it is______________, and less electronegative than tellurium or arsenic.
A. A gray allotrope of arsenic   D. A metallic antimony
B. Has four allotropes           E. More electronegative than tin or bismuth
C. In the Nitrogen group        F. None of the Above

225. Antimony is stable in air at room temperature, but reacts with oxygen if heated to form antimony trioxide, Sb₂O₃.
A. True       B. False

226. Antimony is a silvery, lustrous gray metal that has a Mohs scale hardness of 7.
A. True       B. False

227. Black antimony is formed upon rapid cooling of vapor derived from metallic antimony. It has the same crystal structure as red phosphorus and black arsenic; it oxidizes in air and may ignite spontaneously.
A. True       B. False

228. At 70 °C, antimony gradually transforms into the stable form.
A. True       B. False

229. The yellow allotrope of antimony is the most unstable. It has only been generated by oxidation of stibine (SbH₃) at ~90 °C.
A. True       B. False

230. Pure antimony is?
A. High chemical reactivity       D. A metallic antimony
B. Analytical methods             E. Not used to make hard objects
C. High chemical reactivity       F. None of the Above
231. Four allotropes of antimony are known, a stable metallic form and_______, explosive, black and yellow.
A. Gray  D. Liquid
B. Three metastable forms  E. Its high chemical reactivity
C. In the Nitrogen group  F. None of the Above

232. Metallic antimony is a brittle, silver-white shiny metal. When molten antimony is slowly cooled, metallic antimony crystallizes?
A. In a trigonal cell  D. Metallic
B. Four allotropes  E. Its high chemical reactivity
C. Nitrogen group (group 15)  F. None of the Above

233. A rare explosive form of antimony can be formed from the electrolysis of antimony (III) trichloride.
A. True  B. False

**Asbestos**

234. EPA has set an enforceable regulation for asbestos, called a maximum contaminant level (MCL), at .07 MFL.
A. True  B. False

235. EPA reviewed asbestos as part of the Six Year Review and determined that the .07 MFL MCLG.
A. True  B. False

**Barium**

236. The MCLG for barium is 20 mg/L or 20 ppm
A. True  B. False

237. When routine monitoring indicates that barium levels are above the MCL; your water supplier must take steps to reduce the amount of barium so that it is below that level.
A. True  B. False

238. ______________________ such as providing alternative drinking water supplies, may be required to prevent serious risks to public health.
A. MCLG  D. Additional actions
B. MCL equals the MCLG  E. 2 mg/L or 2 ppm
C. MFL  F. None of the Above

239. ______________________ the regulation for barium, became effective in 1993.
A. MCLG  D. EPCRA
B. Phase IIB Rule  E. EPA
C. Safe Drinking Water Act  F. None of the Above

240. Major sources of barium in drinking water are discharge of drilling wastes; _________; and erosion of natural deposits.
A. Discharge from metal refineries  D. Soluble barium compounds
B. Barium  E. Its high chemical reactivity
C. Barium carbonate, BaCO₃  F. None of the Above
241. Which of the following terms requires facilities in certain industries, which manufacture, process, or use significant amounts of toxic chemicals?
A. MCLG Rule   D. Emergency Planning and Community Right to Know Act (EPCRA)
B. Phase II Rule  E. EPA
C. SDWA   F. None of the Above

Barium Explained
242. The most common naturally occurring minerals of barium are barite and witherite (______________), both being insoluble in water.
A. A natural deposit   D. A soluble compound
B. Baryta  E. Highly reactive chemical
C. Barium carbonate, BaCO₃   F. None of the Above

243. Which of the following terms was identified as a new element in 1774, but not reduced to a metal until 1808?
A. Beryllium   D. Soluble barium compound
B. Barium  E. Its high chemical reactivity
C. Barium carbonate, BaCO₃  F. None of the Above

244. Which of the following terms has only a few industrial applications. The metal has been historically used to scavenge air in vacuum tubes?
A. Beryllium   D. Soluble barium compound
B. Barium  E. Its high chemical reactivity
C. Barium carbonate, BaCO₃  F. None of the Above

245. Barium is a ___________________________ with symbol Ba and atomic number 56.
A. Erosion of natural deposits   D. Soluble compounds
B. Chemical element  E. Highly reactive chemical
C. Carbonate, BaCO₃  F. None of the Above

246. Barium is the fifth element in Group 3, a hard silvery metallic alkaline earth metal.
A. True  B. False

247. Because of its high chemical reactivity barium is easily found in nature as a free element.
A. True  B. False

248. Barium’s hydroxide was known in pre-modern history as?
A. A natural deposit   D. A soluble compound
B. Baryta  E. Highly reactive chemical
C. Barium carbonate, BaCO₃  F. None of the Above

249. Which of the following terms are added to fireworks to impart a green color?
A. Beryllium   D. Soluble barium compound
B. Barium  E. Barium compounds
C. Barium carbonate, BaCO₃  F. None of the Above
250. Which of the following terms are poisonous due to release of the soluble barium ion, and therefore have been used as rodenticides?
A. Beryllium  
B. Barium  
C. Barium carbonate, BaCO₃  
D. Soluble barium compounds  
E. Its high chemical reactivity  
F. None of the Above

Beryllium

251. Which of the following terms - for beryllium is 0.004 mg/L or 4 ppb.
A. MCLG  
B. MCL  
C. EPA  
D. SDWA  
E. 2 mg/L or 2 ppm  
F. None of the Above

How does Beryllium get into my Drinking Water?

252. Beryllium naturally enters surface water and ground water through the weathering of rocks and soils or from industrial wastewater discharges.
A. True  
B. False

How will I know if Beryllium is in my Drinking Water?

253. 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

254. Water suppliers must notify their customers as soon as practical, but no later than 90 days after the system learns of the violation. Additional actions, such as providing alternative drinking water supplies, may be required to prevent serious risks to public health.
A. True  
B. False

Beryllium Explained

255. Beryllium is the chemical element with the symbol Be and atomic number 4. Because any beryllium synthesized in stars is short-lived, ______________ in both the universe and in the crust of the Earth.
A. It is a divalent element  
B. Brittle alkaline earth metal  
C. Is a relatively abundant element  
D. Hard and resistant to corrosion  
E. It is a relatively rare element  
F. None of the Above

256. As a free element, Beryllium is______________, lightweight and brittle alkaline earth metal.
A. A divalent element  
B. A steel-gray, strong  
C. Coal based  
D. Hard and resistant to corrosion  
E. Shiny  
F. None of the Above

257. Beryllium increases ____________ when alloyed to aluminum, cobalt, copper (notably beryllium copper), iron and nickel.
A. A divalent element  
B. A steel-gray, strong  
C. Coal based  
D. Hard and resistance to corrosion  
E. Shiny  
F. None of the Above
258. Beryllium is a quality aerospace material for high-speed aircraft, missiles, space vehicles and communication satellites.
A. True   B. False

Cadmium
259. The MCLG for cadmium is?
A. 4.0 D. .015
B. .002 E. 0.005 mg/L or 5 ppb
C. 1.3 F. None of the Above

260. EPA has set an enforceable regulation for cadmium, called a maximum contaminant level (MCL), at?
A. 4.0 D. .015
B. .002 E. 0.005 mg/L or 5 ppb
C. 1.3 F. None of the Above

261. EPA reviewed cadmium as part of the Six Year Review and determined that the __________ 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?
262. 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

How will I know if cadmium is in my drinking water?
263. When 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?
264. The following treatment method(s) have proven to be effective for removing cadmium to below _______________: 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
265. Cadmium is a soft, malleable, ductile, bluish-white divalent metal. It is similar in many respects to zinc but forms complex compounds.
A. True   B. False

266. Like other metals, cadmium is subject to corrosion.
A. True   B. False

267. As a bulk metal, cadmium is?
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
268. Chromium is?
A. An odorless and tasteless metallic element    D. Flammable
B. Used for making steel and other alloys       E. Fun to play with
C. Normally found in industrial waste disposal F. None of the Above

269. Chromium is found naturally in rocks, plants, soil and volcanic dust, humans and animals. The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-3), and hexavalent chromium (chromium-6).
A. True   B. False

270. Chromium-5 is an essential human dietary element.
A. True   B. False

271. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits but it can also be produced by?
A. Reverse osmosis    D. Burning and releasing toxic fumes
B. Making steel and other alloys         E. Chemistry
C. Industrial processes                 F. None of the Above

272. There are demonstrated instances of chromium being released to the environment by leakage, poor storage, or inadequate industrial waste disposal practices.
A. True   B. False

What are Chromium’s Health Effects?
273. Chromium has relatively high toxicity and would be a concern in drinking water only at very high levels of contamination.
A. True   B. False

274. Chromium-6 is less toxic and poses potential health risks.
A. True   B. False
275. People who use water containing total chromium in excess of the ____________over many years could experience allergic dermatitis.
A. MCLG  D. Rule
B. MCL  E. Standard
C. Limit  F. None of the Above

What are EPA's drinking water regulations for Chromium?
276. Which of the following terms requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur?
A. Safe Drinking Water Act  D. EPCRA
B. OSHA  E. EPA
C. CWA  F. None of the Above

277. Which of the following terms for total chromium is 0.1 mg/L or 100 parts per billion?
A. MCLG  D. Rule
B. MCL  E. Standard
C. Limit  F. None of the Above

278. EPA has set an enforceable regulation for total chromium, called a maximum contaminant level (MCL), at 10 mg/L or 1000 ppb.
A. True  B. False

Chromium Description
279. Chromium is a chemical element that has the symbol Cr and atomic number 24.
A. True  B. False

280. Chromium is the first element in?
A. Group 6  D. The roasting and leaching processes
B. Trivalent chromium (Cr(III)) ion  E. Forming stainless steel
C. Toxic chromium classification  F. None of the Above

281. Chromium metal and ferrochromium alloy are commercially produced from chromite by silicothermic or aluminothermic reactions, or by?
A. Adding copper  D. Roasting and leaching processes
B. Adding trivalent chromium  E. Adding metallic chromium to form stainless steel
C. Adding Aluminum  F. None of the Above

282. Chromium metal has proven of high value due to?
A. Group 6 treatments  D. Roasting and leaching processes
B. Adding trivalent chromium  E. Its high corrosion resistance and hardness
C. Adding Aluminum  F. None of the Above

283. Which of the following terms along with chrome plating currently comprise 85% of the commercial use for the element?
A. Group 6 treatments  D. Roasting and leaching processes
B. Adding trivalent chromium  E. Its high corrosion resistance and hardness
C. Adding Aluminum  F. None of the Above
284. Trivalent chromium (Cr(III)) ion is possibly required in trace amounts for sugar and lipid metabolism, although the issue remains in debate. In larger amounts and in different forms, chromium can be_________________________.
A. Toxic and carcinogenic  
B. Trivalent chromium (Cr(III)) ion  
C. Toxic chromium  
D. Part of the leaching processes  
E. Metallic chromium  
F. None of the Above

285. The most prominent example of toxic chromium is______________. Abandoned chromium production sites often require environmental cleanup.
A. Stainless steel  
B. Trivalent chromium (Cr(III)) ion  
C. Toxic chromium  
D. Hexavalent chromium (Cr(VI))  
E. Metallic chromium  
F. None of the Above

Copper
What are Copper’s Health Effects?
286. Some people who drink water containing copper in excess of the___________ may, with short term exposure, experience gastrointestinal distress, and with long-term exposure may experience liver or kidney damage.
A. MCLG  
B. MCL  
C. Limit  
D. Standard  
E. Action level  
F. None of the Above

287. People with Zackery’s Disease should consult their personal doctor if the amount of copper in their water exceeds the action level.
A. True  
B. False

What are EPA’s Drinking Water Regulations for Copper?
288. Which of the following terms - 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

289. Which of the following terms - as feasible, considering cost, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies?
A. MCLG  
B. MCL  
C. Limit  
D. Standard  
E. MCLs are set as close to the MCLGs  
F. None of the Above

290. An action technique is a guideline procedure or level of technological performance which water systems must follow to ensure control of a contaminant.
A. True  
B. False

291. The treatment technique regulation for copper (referred to as the Lead and Copper rule) requires water systems to control the corrosivity of the water.
A. True  
B. False
292. The regulation also requires systems to collect piping samples from sites served by the system that are more likely to have plumbing materials containing plastic.

A. True   B. False

293. If more than 10 percent of tap water samples exceed the copper action level of 1.3__________, water systems must take additional steps to reduce corrosiveness.

A. MCLG   D. Milligrams per Liter (mg/L)
B. MCL     E. Action level
C. Limit   F. None of the Above


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

Copper Explained
295. Pure copper is?

A. Known also as Lead   D. Related to turquoise
B. Soft and malleable   E. A liquid like Mercury
C. A carbon-nitrogen chemical   F. None of the Above

296. Its compounds are commonly encountered as ____________, which often impart blue or green colors to minerals such as turquoise and have been widely used historically as pigments.

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

Cyanide - Inorganic Contaminant 0.2 mg/L MCL
297. Cyanide is a carbon-nitrogen chemical unit which combines with many?

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

Uses for Cyanide.
298. The most commonly used form, ________________, is mainly used to make compounds and other synthetic fibers and resins.

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

What are EPA's Drinking Water Regulations for Cyanide?
299. Which of the following terms - for cyanide is 0.2 mg/L or 200 ppb?

A. MCLG   D. Standard
B. MCL     E. MCLs are set as close to the MCLGs
C. Limit   F. None of the Above
300. 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 cyanide, called a maximum contaminant level (MCL), at 0.2 mg/L or 200 ppb.
A. True   B. False

301. Which of the following terms are any physical, chemical, biological or radiological substances or matter in water?
A. Naked contaminants   D. Solutions of inorganic contaminants
B. Halides   E. Cyanides
C. Contaminants   F. None of the Above

**Cyanide Explained**
302. A cyanide is a chemical compound that contains the ____________, which consists of a carbon atom triple-bonded to a nitrogen atom.
A. Naked contaminants   D. Solutions of inorganic contaminants
B. Halides   E. Cyanides
C. Contaminants   F. None of the Above

303. Cyanides most commonly refer to ____________, which is isoelectronic with carbon monoxide and with molecular nitrogen.
A. Cyanide salts   D. Solutions of salts of the anion CN⁻,
B. Salts of the anion CN⁻,   E. Cyanides solutions
C. Carbon-nitrogen chemical   F. None of the Above

304. Most cyanides are not toxic.
A. True   B. False

**Fluoride**
305. The ____________ for fluoride is 4.0 mg/L or 4.0 ppm.
A. MCLG   D. Standard
B. MCL   E. MCLs are set as close to the health goals as possible
C. Limit   F. None of the Above

306. EPA has set an enforceable regulation for fluoride, called a maximum contaminant level (MCL), at 4.0 mg/L or 4.0 ppm.
A. True   B. False

307. The secondary standard of 4.0 mg/L is intended as a guideline for an upper bound level in areas which have high levels of naturally occurring fluoride.
A. True   B. False

308. The level of the ____________ was set based upon a balancing of the beneficial effects of protection from tooth decay and the undesirable effects of excessive exposures leading to discoloration.
A. MCLG   D. Secondary standard (SMCL)
B. MCL   E. MCL equals the MCLG
C. Limit   F. None of the Above
309. 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  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Fluoride  F. None of the Above

310. In the case for Fluoride the__________, because analytical methods or treatment technology do not pose any limitation.
A. MCLG  D. Standard
B. MCL  E. MCL equals the MCLG
C. Limit  F. None of the Above

311. EPA has also set a ____________ for fluoride at 2.0 mg/L or 2.0 ppm.
A. MCLG  D. Secondary standard (SMCL)
B. MCL  E. MCL equals the MCLG
C. Limit  F. None of the Above

312. Tooth strengthening is caused by excess fluoride exposures during the formative period prior to eruption of the teeth in children.
A. True  B. False

Fluoride Explained
313. Structurally Fluoride and to some extent chemically, the _______resembles the hydroxide ion.
A. Naked fluoride  D. Solutions of inorganic fluorides
B. Halides  E. Fluoride ion
C. Fluoride  F. None of the Above

314. Fluoride is the cation F+, the reduced form of fluorine when as an ion and when bonded to another element. Inorganic fluorine containing compounds are called fluorides.
A. True  B. False

315. Fluoride, like other halides, is a monovalent ion (~1 charge). Its compounds often have properties that are distinct relative to other halides.
A. True  B. False

316. The presence of fluoride and its compounds can be detected by F NMR spectroscopy.
A. True  B. False

Occurrence
317. According to the text, solutions of inorganic fluorides in water contain F− and bifluoride HF−2.
A. True  B. False

318. 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. Its closest chemical relative is hydroxide.
A. True  B. False
319. When relatively unsolvated, fluoride anions are called?
A. Naked  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Fluoride  F. None of the Above

320. Which of the following terms is a very strong lewis base?
A. Naked fluoride  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Fluoride  F. None of the Above

**Natural Occurrence**
321. Which of the following terms are known, but of paramount commercial importance are fluorite and fluorapatite?
A. Naked fluoride  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Many fluoride minerals  F. None of the Above

322. Which of the following terms is usually found naturally in low concentration in drinking water and foods?
A. Naked fluoride  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Fluoride  F. None of the Above

323. Fresh water may contain dangerously high levels of ______________, leading to serious health problems.
A. Naked fluoride  D. Solutions of inorganic fluorides
B. Halides  E. Fluorite and fluorapatite
C. Fluoride  F. None of the Above

**Mercury - Inorganic Contaminant**
324. Mercury is a liquid metal found in natural deposits such as ores containing?
A. Aluminum  D. Mercury-aluminum amalgam
B. Ultraviolet light  E. Other elements
C. Cinnabar (mercuric sulfide)  F. None of the Above

**Uses for Mercury**
325. According to the text, electrical products such as dry-cell batteries, fluorescent light bulbs, switches, and other control equipment account for 50 percent of?
A. Aluminum  D. Mercury-aluminum amalgams
B. Mercury  E. Lead
C. Cinnabar (mercuric sulfide)  F. None of the Above

**What are Mercury's Health Effects?**
326. Some people who drink water containing mercury well in excess of the maximum contaminant level (MCL) for many years could experience liver damage.
A. True  B. False
What are EPA's Drinking Water Regulations for Mercury?
327. The MCLG for mercury is 0.002 mg/L or 2 ppb. EPA has set this level of protection based on the best available science to prevent potential health problems.
A. True   B. False

328. EPA reviewed mercury as part of the Six Year Review and determined that the 0.002 mg/L or 2 ppb MCLG and 0.002 mg/L or 2 ppb MCL for mercury are still protective of human health.
A. True   B. False

How will Mercury be removed from my Drinking Water?
329. The following treatment method(s) have proven to be effective for removing mercury to below 0.002 mg/L or 2 ppb: coagulation/filtration, granular activated carbon, __________, and reverse osmosis.
A. A carbon filter  D. Lime softening
B. Backwash carbon  E. Point of use
C. Activated carbon  F. None of the Above

Mercury Explained
330. Mercury occurs in deposits throughout the world mostly as cinnamon.
A. True   B. False

331. The red pigment vermilion is mostly obtained by?
A. Aluminum   D. Mercury-aluminum amalgam
B. Water-soluble forms  E. Reduction from cinnabar
C. Cinnabar (mercuric sulfide)  F. None of the Above

332. Mercury poisoning can also result from exposure to ___________ of mercury (such as mercuric chloride or methylmercury), inhalation of mercury vapor, or eating seafood contaminated with mercury.
A. Aluminum   D. Mercury-aluminum amalgam
B. Water-soluble forms  E. Reduction from cinnabar
C. Cinnabar (mercuric sulfide)  F. None of the Above

333. Mercury is used in thermometers, barometers, manometers, sphygmomanometers, though concerns about the element's toxicity have led to mercury thermometers and sphygmomanometers being largely phased out in clinical environments in favor of alcohol-filled,__________.
A. Bottles   D. Galinstan-filled, digital, or thermistor-based instruments
B. Ultraviolet light   E. Sphygmomanometers
C. Machinery   F. None of the Above

334. Mercury is used in lighting: electricity passed through mercury vapor in a phosphor tube produces short-wave ultraviolet light which then causes the _________ to fluoresce, making visible light.
A. Aluminum   D. Mercury-aluminum
B. Ultraviolet light   E. Phosphor
C. Cinnabar (mercuric sulfide)  F. None of the Above
Amalgams
335. Mercury dissolves to form amalgams with gold, zinc and many other metals.
A. True   B. False

336. Copper is an exception; copper flasks have been traditionally used to trade mercury.
A. True   B. False

337. Other metals that do not form amalgams with mercury include tantalum, tungsten and platinum. ________ is a common reducing agent in organic synthesis, and is also used in high-pressure sodium lamps.
A. Aluminum amalgam  D. Mercury-aluminum amalgam
B. Ultraviolet amalgam  E. Sodium amalgam
C. Cinnabar (mercuric sulfide)  F. None of the Above

338. Mercury readily combines with aluminum to form a ______________ when the two pure metals come into contact.
A. Aluminum amalgam  D. Mercury-aluminum amalgam
B. Ultraviolet amalgam  E. Sodium amalgam
C. Cinnabar (mercuric sulfide)  F. None of the Above

339. Amalgam destroys the ______________ which protects metallic aluminum from oxidizing in-depth.
A. Aluminum amalgam  D. Mercury-aluminum amalgam
B. Aluminum oxide layer  E. Sodium amalgam
C. Cinnabar (mercuric sulfide)  F. None of the Above

340. Mercury is not allowed aboard an aircraft under most circumstances because of the risk of it forming an amalgam with exposed aluminum parts in the aircraft unless it is in a copper pot.
A. True   B. False

Nitrate (Measured as Nitrogen)
341. EPA regulates ______________in drinking water to protect public health.
A. Nitrates and nitrites  D. Nitrates are converted to nitrites
B. Nitrate ion  E. Various organic and inorganic compounds
C. Nitrate  F. None of the Above

342. Nitrate may cause health problems if present in public or private water supplies in amounts greater than the drinking water standard set by EPA.
A. True   B. False

What is Nitrate?
343. Nitrates and nitrites are ______________ which combine with various organic and inorganic compounds.
A. Nitrogen-oxygen chemical units  D. Nitrates are converted to nitrites
B. Nitrate ion  E. Various organic and inorganic compounds
C. Nitrate  F. None of the Above
Uses for Nitrate.
344. According the text, once taken into the body, nitrates are converted to?
A. Nitrates and nitrites   D. Nitrites
B. Nitrate ion   E. Various organic and inorganic compounds
C. Nitrate   F. None of the Above

What are EPA's Drinking Water Regulations for Nitrate?
345. The MCLG for nitrate is 50 mg/L or 50 ppm. EPA has set this level of protection based on the best available science to prevent potential health problems.
A. True   B. False

346. EPA has set an enforceable regulation for nitrate, called a maximum contaminant level (MCL), at 50 mg/L or 50 ppm.
A. True   B. False

How will I know if Nitrate is in my Drinking Water?
347. Water suppliers must notify their customers as soon as practical, but no later than 24 hours after the system learns of the violation.
A. True   B. False

348. Additional actions, such as providing alternative drinking water supplies, may be required to prevent serious risks to public health.
A. True   B. False

Nitrate Explained
349. The nitrate ion is a polyatomic ion with the ____________ and a molecular mass of 62.0049 g/mol.
A. Nitrates and nitrites   D. Molecular formula NO₃⁻
B. Nitrate ion   E. Various organic and inorganic compounds
C. Nitrate   F. None of the Above

Structure
350. It is the conjugate base of nitric acid, consisting of one central nitrogen atom surrounded by three identically bonded oxygen atoms in a trigonal planar arrangement. The nitrate ion carries a formal charge of -1.
A. True   B. False

351. This results from a combination formal charge in which each of the three oxygens carries a −\(\frac{1}{3}\) charge, whereas the nitrogen carries a +1 charge, all these adding up to formal charge of the_____________________.
A. Nitrates and nitrites   D. Polyatomic nitrate ion
B. Nitrate ion   E. Various organic and inorganic compounds
C. Nitrate   F. None of the Above
Nitrite (Measured as Nitrogen) - Inorganic Contaminant 1 mg/L MCL

352. EPA regulates nitrite in drinking water to protect public health. 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  D. Emergency Planning and Community Right to Know Act (EPCRA)
B. Water supplier  E. EPA
C. Cops  F. None of the Above

What is Nitrite?
353. Nitrates and nitrites are ____________ which combine with various organic and inorganic compounds.
A. Nitrogen-oxygen chemical units  D. Nitrates are converted to nitrites
B. Nitrate ion  E. Various organic and inorganic compounds
C. Nitrate  F. None of the Above

Uses for Nitrite.
354. Once taken into the body, __________ are converted to nitrites.
A. Nitrites  D. Nitrogen ions
B. Nitrate ions  E. Various organic and inorganic compounds
C. Nitrates  F. None of the Above

What are EPA’s Drinking Water Regulations for Nitrite?
355. The MCLG for nitrite is 1 mg/L or 1 ppm. EPA has set this level of protection based on the best available science to prevent potential health problems.
A. True  B. False

356. ______________ the regulation for nitrite, became effective in 1992.
A. MCLG  D. EPCRA
B. MCLs  E. CWA
C. The Phase II Rule  F. None of the Above

How does Nitrite get into my Drinking Water?
357. The major sources of __________ in drinking water are runoff from fertilizer use; leaching from septic tanks, sewage; and erosion of natural deposits.
A. Nitrites  D. Nitrogen ions
B. Nitrate ion  E. Various organic and inorganic compounds
C. Nitrate  F. None of the Above

Selenium- Inorganic Contaminant 0.05 mg/L MCL
358. Selenium (Se) is an essential element for ____________, with the majority of our intake coming from foods such as nuts, cereals, meat, fish, and eggs.
A. Vitamins  D. Selenide or selenate compounds
B. Drinking water  E. Human nutrition
C. Minerals  F. None of the Above

359. The concentration of Selenium in drinking water is usually high, and comes from natural minerals.
A. True  B. False
360. In soils, selenium often occurs in soluble forms such as selenate, which are leached into rivers very easily by runoff increasing the amount of?
A. Selenium  D. Selenide or selenate compounds
B. Selenium in drinking water  E. An essential element
C. Minerals  F. None of the Above

361. Which of the following terms is also a by-product of copper mining / smelting?
A. Selenium  D. Selenide or selenate compounds
B. Selenium in water  E. An essential element for human nutrition
C. Minerals  F. None of the Above

362. Acute toxicity caused by ____________or other sources of intake has been observed in laboratory animals and in animals grazing in areas where high selenium levels exist in the soil. The US EPA has established the MCL for selenium in water at 0.05 mg/l.
A. Selenium  D. Selenide or selenate compounds
B. Selenium in drinking water  E. High levels of selenium in water
C. Minerals  F. None of the Above

363. Selenium is also used in photoelectric devises because its electrical conductivity varies with light.
A. True  B. False

Selenium Explained
364. Selenium is found impurely in metal sulfide ores, where it partially replaces the oxygen.
A. True  B. False

365. Commercially, selenium is produced as ____________in the refining of these ores, most often during copper production.
A. Metal sulfide ores  D. Silicon
B. Natural deposits  E. Glutathione peroxidase
C. Antioxidant enzymes  F. None of the Above

366. Minerals that are pure selenide or selenate compounds are known, but are?
A. Selenium based  D. Compounds
B. Found in drinking water  E. An essential element for human nutrition
C. Minerals  F. None of the Above

367. Selenium continues to be used in a few types of DC power surge protectors and one type of?
A. Metal sulfide ores  D. Silicon semiconductor devices
B. Natural deposits  E. Fluorescent quantum dot
C. Selenium  F. None of the Above

368. Selenium salts are toxic in________________, but trace amounts are necessary for cellular function in many organisms, including all animals.
A. The poisoner's poison  D. Large amounts
B. Pharmaceutical industry  E. A heavy layer of oxide
C. Selenium salts  F. None of the Above
Thallium- Inorganic Contaminant 0.002 mg/L MCL

369. Thallium is a metal found in natural deposits such as ores containing___________.
A. Metal sulfide ores  D. Silicon
B. Natural deposits  E. Other elements
C. Selenium  F. None of the Above

Uses for Thallium.
370. The greatest use of ____________is in specialized electronic research equipment.
A. Nonselective toxicity  D. Potassium ores
B. Thallium  E. This soft gray poor metal
C. Selenium  F. None of the Above

What are Thallium's Health Effects?
371. Some 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  D. MCLGs are set as close to the health goals as possible
B. MCLs  E. Excess of the maximum contaminant level (MCL)
C. The Phase II Rule  F. None of the Above

Thallium Explained
372. Thallium is a chemical element with symbol Tl and atomic number 81.
A. True  B. False

373. Thallium is soft gray poor metal is not found free in nature.______________, it resembles tin, but discolors when exposed to air.
A. Nonselective toxicity  D. Like Potassium ores
B. When observed  E. This soft gray poor metal
C. When isolated  F. None of the Above

374. Thallium tends to oxidize to the +3 and +1 oxidation states as ionic salts. The +3 state resembles that of the other elements in thallium's group.
A. True  B. False

375. The +1 state, which is far more prominent in thallium than the elements above it, recalls the chemistry of alkali metals, and thallium(I) ions are found geologically mostly in potassium-based ores, and (when ingested) are handled in many ways like ____________by ion pumps in living cells.
A. Metal sulfide ores  D. Potassium ions (K+)
B. Natural deposits  E. Antioxidant enzymes
C. Selenium  F. None of the Above

376. Which of the following is used in small, nontoxic amounts as an agent in a nuclear medicine scan, during one type of nuclear cardiac stress test?
A. Nonselective ion  D. Potassium ore
B. Thallium 111  E. Soluble chloride TlCl
C. Thallium 3  F. None of the Above
377. Soluble thallium salts are highly toxic in quantity, and were historically used in?
A. Nonselective ion  D. Rat poisons and insecticides
B. Thallium 111  E. Soluble chloride TlCl
C. Thallium 3  F. None of the Above

378. Thallium poisoning notably results in tooth loss.
A. True   B. False

379. Thallium has gained notoriety as "the poisoner's poison" and "_______________" (alongside arsenic).
A. Inheritance powder   D. Soluble sleeping powder
B. Pharmaceutical powder  E. Sleeping powder
C. Salt peter powder  F. None of the Above

**pH Section**

380. What is the theory that states than an acid is a substance that produces Hydronium ions when it is dissolved in water, and a base is one that produces hydroxide ions when dissolved in water?
A. Newton’s  D. Amadeus
B. Alkalinity  E. Arrhenius
C. Lord Calvin’s  F. None of the Above

381. What is the term associated with a charged species, an atom or a molecule, that has lost or gained one or more electrons?
A. A proton  D. An electron
B. Ion  E. A cation
C. Anti-matter  F. None of the Above

382. What is a substance that has the ability to reduce other substances and is said to be reductive in nature?
A. Protons  D. Electrons
B. An electron donor  E. Cations
C. Anti-matter  F. None of the Above

383. Pure water has a pH very close to _________________.
A. 5  D. 7.7
B. 6  E. 7.5
C. 7  F. None of the Above

384. According to the text, which of the following parameter/methods/measurements determine a parameter using a concentration cell with transference by measuring the potential difference.
A. Primary pH standard values  D. pH measurement(s)
B. Alkalinity  E. Measurement of pH
C. pH  F. None of the Above
385. Mathematically speaking, pH is the negative logarithm of the activity of the (solvated) hydronium ion, often expressed as the measurement of _______________________.
A. Electrons    D. Cation measurement(s)
B. Alkalinity    E. Ions
C. Hydronium ion concentration  F. None of the Above

386. When measuring alkalinity in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater, this measurement can be one of the best measures of the sensitivity of the stream to acid inputs.
A. True   B. False

387. One definition of pH is that it is defined as the decimal logarithm of the reciprocal of the _________________, aH+, in a solution.
A. Hydrogen ion activity    D. Brønsted–Lowry acid–base theory
B. Ion-selective electrode(s) E. Acid-base behavior
C. (Solvated) hydronium ion  F. None of the Above

388. Commercial standard buffer solutions usually comes with information about value and a correction factor to be applied for what temperatures?
A. 4 °C    D. 10 °C
B. 25 °C    E. 70 °F
C. 39 °F    F. None of the Above

389. Because the pH scale is logarithmic, therefore pH is? ________________.
A. Universal indicator    D. Excess of Ion concentrations
B. A dimensionless quantity E. A set of non-linear equations
C. A Spectrophotometer  F. None of the Above

390. What is the new pH scale is referred to as?
A. Total scale   D. Ph₃
B. POH  E. POE
C. P3H    F. None of the Above

391. Alkalinity is able to neutralize _________________ and is measured in a quantitative capacity in an aqueous solution.
A. Acid    D. pH measurement(s)
B. Base    E. Bond formation
C. pH    F. None of the Above

392. When using a visual comparison of the test solution with a standard color chart, measuring pH values should be done to the?
A. Universal indicator    D. Spectrophotometer Example
B. Colorwheel measurement E. Lab test
C. Nearest whole number  F. None of the Above
393. According to the manual, this device/method/calculation consists of a mixture of indicators that shows a continuous color change from pH 2 to pH 10.

A. Universal indicator  D. Excess of alkaline earth metal concentrations
B. Colorimeter of spectrophotometer  E. A set of non-linear simultaneous equations
C. Spectrophotometer  F. None of the Above

394. A(n) _____________is an example of a mathematical procedure for calculating the concentrations of all chemical species that are present in the solution.

A. Universal indicator  D. A chemical speciation calculation
B. pH log  E. A set of non-linear simultaneous equations
C. A set of linear equations  F. None of the Above

395. According to the manual, under normal circumstances, strong acids and bases are compounds that, for practical purposes, are completely dissociated in water; this means that the concentration of hydrogen ions in acidic solution can be taken to be equal to the concentration of the acid. The pH is then equal to minus the logarithm of__________.

A. The concentration value  D. End-point pH
B. The pH  E. A set of non-linear simultaneous equations
C. The Spectrophotometer  F. None of the Above

396. The sum of all the titratable bases is the Alkalinity of water and its acid-neutralizing capacity. What would cause the measured value to vary significantly?

A. Acid  D. pH measurement(s)
B. Alkalinity  E. End-point pH
C. pH  F. None of the Above

397. For strong acids and bases no calculations are necessary except in extreme situations. The pH of a solution containing a weak acid requires the solution of a quadratic equation.

A. True  B. False

398. While the general case requires the pH solution of?

A. The solution of a cubic equation  D. A set of linear simultaneous equations
B. The solution of a linear equation  E. A set of non-linear simultaneous equations
C. The solution of a squared equation  F. None of the Above

399. Because alkalinity is significant in many uses and treatments of natural waters and wastewaters. The measured values also may include contributions from _____________or other bases if these are present.

A. Acids  D. Borates, phosphates, silicates
B. Light metals  E. Caustics
C. Rare earths  F. None of the Above

400. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to a _____________difference in hydrogen ion concentration

A. 1  D. 10
B. 2  E. 100
C. 5  F. None of the Above