



National Championship Science Chemistry Exam

Name _____

School _____

Grade _____

Email address _____

Instructions – Circle the correct answer or leave it blank. Correct answers are worth 2 points. Incorrect answers are worth –1 point. Questions left blank are worth 0 points.

- Molecules can be described as?
 - mixtures of two or more pure substances.
 - mixtures of two or more elements that have a specific ratio between components.
 - two or more atoms chemically joined together.
 - homogeneous mixtures.
- In the periodic table, what is a period?
 - A horizontal row
 - A vertical line
 - The left hand side
 - The middle block
- Which of the following is the symbol for copper?
 - C
 - Ca
 - Co
 - Cu
- Which of the following is the name for group 7 in the periodic table?
 - Alkali metals
 - Alkaline earth metals
 - Halogens
 - Noble gasses
- Which of the following is the name for group 2 in the periodic table?
 - Alkali metals
 - Alkaline earth metals
 - Halogens
 - Noble gasses
- Which of the following elements is metal?
 - Magnesium
 - Nitrogen
 - Helium
 - Phosphorus
- Predict the charge that an aluminum ion would have.
 - 1+
 - 1–
 - 2+
 - 3+
- What is listed in the Periodic Table?
 - Compounds
 - Elements
 - Gasses
 - Metals
- How many atoms are there in KMnO_4 ?
 - three
 - five
 - six
 - four
- What is the correct formula for H-H?
 - 2H
 - H_1H_1
 - H_2
 - H_{22}
- Which elements are in CoCO_3 ?
 - Cobalt, carbon, and oxygen
 - Cobalt and copper
 - Copper, carbon, and oxygen
 - Copper, chlorine, and oxygen
- Which of the following contains BOTH ionic and covalent bonds?
 - BaF_2
 - Cl_2
 - MgSO_4
 - SF_6
- Which of the following is the correct chemical formula for a molecule of chlorine?
 - Cl
 - Cl^-

- C. Cl^+
D. Cl_2
14. Write the name for $\text{Mg}_3(\text{PO}_4)_2$.
A. magnesium(III) phosphite
B. magnesium(II) phosphite
C. magnesium phosphate
D. trimagnesium phosphorustetraoxide
15. Which elements are liquids at room temperature?
A. Calcium and rubidium
B. Mercury and bromine
C. Mercury and radon
D. Nitrogen and bromine
16. Which of the following elements are magnetic?
A. Cobalt, iron, copper
B. Zinc, neodymium, and nickel
C. Iron, nickel, and cobalt
D. Platinum, titanium, and iron
17. The smallest part of an element that retains the identity (and the chemical properties) of that element is?
A. A molecule
B. An atom
C. A chemical
D. An electron
18. Which of the following is NOT a helpful chemical?
A. Sodium chloride
B. Mercury
C. Penicillin
D. Vinegar
19. Which element gives pepto bismol its pink color?
A. Potassium
B. Barium
C. Selenium
D. Bismuth
20. For a scientific theory to be valid, it must allow you to?
A. Perform experiments
B. Obtain new results each time
C. Find a new, more complex explanation
D. Make predictions
21. What element is used to galvanize steel?
A. Nickel
B. Magnesium
C. Zinc
D. Cobalt
22. What chemical gets into drinking water through pipes?
A. Arsenic
B. Chlorine
C. Flourine
D. Lead
23. Which of the following solutions will have the highest concentration of fluoride ions?
A. 0.10 M KF
B. 0.10 M SrF_2
C. 0.10 M AlF_3
D. 0.05 M CaF_2
24. Which of the following explains the difference between speed and velocity?
A. Velocity has motion, and speed does not
B. Velocity has direction, and speed does not
C. Velocity involves time, and speed does not
D. Velocity involves acceleration, and speed does not
25. What are the main branches of natural science?
A. Physics and chemistry
B. Biology, zoology, & ecology
C. Medicine & agriculture
D. Life, physical, & earth science
26. Pure science is best defined as the?
A. Continuing search for new knowledge
B. Use of science to solve human problems
C. Study of the makeup of living things
D. Application of scientific knowledge
27. What do scientists who do pure science do?
A. They look for ways to use scientific knowledge to solve problems
B. They develop new uses for scientific knowledge
C. They do experiments to find out about the world
D. They build faster and more powerful computers
28. What is a scientific law?
A. It is the same as a hypothesis
B. It is a description of a natural event
C. It is an explanation of scientific observation
D. It is the conclusion of a scientific experiment

29. A scientific model is a?
- Representation of a real event or object
 - Small building used to conduct experiments
 - Mathematical statement of a theory
 - New theory that takes the place of an incorrect one
30. A series of logical steps that is followed in order to solve a problem is called the?
- Experimental process
 - Scientific theory
 - Scientific method
 - Model method
31. Which question cannot be answered by an experiment?
- Does penicillin kill Salmonella bacteria?
 - Is rabies caused by a virus?
 - Did a comet impact kill the dinosaurs?
 - Can radiation cause cancer?
32. What is the SI unit for measuring temperature?
- Degree
 - Kelvin
 - Mole
 - Ampere
33. Which SI prefix means one million??
- Kilo-
 - Mega-
 - Giga-
 - Milli-
34. Maria is 123 centimeters tall. Her height in meters is?
- 0123 m
 - 0.123 m
 - 1.23 m
 - 12.3 m
35. The force with which gravity pulls on a quantity of matter is referred to as?
- Mass
 - Length
 - Volume
 - Weight
36. Which of the following processes is exothermic?
- a candle flame
 - melting of ice
 - the chemical reaction in a "cold pack" often used to treat injuries
 - the vaporization of water
37. A precise measurement is one that
- Contains the correct number of significant figures
 - Contains at least three significant figures
 - Is close to the true value
 - Is as exact as possible
38. Identify the ion that is responsible for the red color of rubies. What is 78,900,000,000 expressed in scientific notation?
- 789×109
 - 7.89×10^{10}
 - 7.89×10^9
 - 7.89×10^{11}
39. A measurement that is accurate is one that
- Is as exact as possible
 - Is close to the true value
 - Contains at least four significant figures
 - Contains five decimal places
40. A substance that cannot be broken down into simpler substances is?
- a compound
 - an element
 - a mixture
 - an atom
41. Identify the substances which contain a high concentration of a specific mineral.
- slag
 - minerals
 - ores
 - gangue
42. Matter is defined as anything that
- can be seen and touched
 - can be weighed
 - has mass and takes up space
 - contains kinetic or potential energy
43. You put 1 gram of salt into 1 liter of water and stir. The resulting liquid is an example of?
- A pure substance
 - A heterogeneous mixture
 - A homogeneous mixture
 - An immiscible mixture
44. Galvanizing is when an object is dipped into a molten bath of
- magnesium.
 - lithium.
 - zinc.
 - sodium.

45. Identify a nonmetal.
- P
 - Ca
 - Pd
 - Ni
46. The science of what matter is made of and how it changes is called?
- Chemistry
 - Physics
 - Kinetics
 - Engineering
47. The chemical element that is most abundant in the human body is?
- Nitrogen
 - Iron
 - Carbon
 - Oxygen
48. Identify baking powder.
- lithium bicarbonate
 - sodium bicarbonate and an acid
 - magnesium carbonate and a base
 - magnesium oxide
49. The chemical symbol for sulfuric acid is H_2SO_4 . How many atoms are contained in each molecule of sulfuric acid?
- 3
 - 5
 - 6
 - 7
50. The element that is most abundant on Earth is?
- Iron
 - Oxygen
 - Silicon
 - Magnesium
51. Which of the following is an example of a gas-liquid mixture?
- the air we breathe
 - a carbonated drink
 - soapsuds
 - ice cubes
52. Which state of matter will hold its shape without a container?
- Gas
 - Liquid
 - Solid
 - Plasma
53. The change of a substance from a solid directly to a gas is called?
- condensation
 - melting
 - evaporation
 - sublimation
54. The law of conservation of mass states that mass cannot be?
- burned
 - changed in form
 - created or destroyed
 - heated or cooled
55. During a chemical or physical change, energy may be?
- created
 - destroyed
 - greatly increased in strength
 - converted into another form
56. Identify the scientist(s) that were awarded the Nobel Prize in physics for the discovery of radioactivity in 1903.
- Johannes Geiger, Marie Curie
 - Albert Einstein
 - Antoine-Henri Becquerel, Marie Curie, Pierre Curie
 - Ernest Rutherford, Johannes Geiger
57. Identify the elements discovered by Marie Curie.
- polonium and radium
 - radium and cesium
 - argon and xenon
 - radon and xenon
58. Knowing the chemical properties of a substance will tell you how the substance?
- looks
 - smells
 - can be broken down into atoms
 - reacts with other substances
59. Identify the instrument(s) used to detect radiation.
- film-badge dosimeter
 - Geiger-Muller counter
 - scintillation counter
 - all of the above
60. Which of the following is not an example of a physical property?
- freezing point
 - boiling point
 - reactivity
 - density

- C. 0
D. +1
61. Which of the following is an example of a chemical change?
A. ice melting
B. paint fading
C. pounding gold into a coin
D. a puddle of water evaporating
62. Give the conditions for nuclear fusion.
A. catalyst
B. low temperature
C. low pressure
D. high temperature
63. Which of the following is an example of a physical change?
A. dissolving salt in water
B. burning wood into charcoal
C. cooking an egg
D. rusting of iron
64. Ice floats in water because it is?
A. more dense than water
B. less dense than water
C. colder than water
D. warmer than water
65. When water is broken down, what happens to the oxygen and hydrogen atoms it is made of?
A. They combine with oxygen in air to produce new substances
B. They are rearranged to form hydrogen and oxygen gas
C. They are destroyed
D. They increase in size until they form a solid
66. The tendency of a less dense substance to float in a more dense liquid is called?
A. viscosity
B. density
C. sublimation
D. buoyancy
67. Dalton's atomic theory stated that every element was made of atoms that could not be subdivided, atoms of the same element are alike, and?
A. atoms are made of protons, neutrons, and electrons
B. the nucleus in center of the atom
C. atoms can join to form molecules
D. atoms are constantly in motion
68. The charge of an electron is?
A. -2
B. -1
69. Atoms have no electric charge because they?
A. have an equal number of charged and uncharged particles.
B. have neutrons in their nuclei
C. have an equal number of electrons and protons
D. have an equal number of neutrons and protons
70. Ionization refers to the process of?
A. changing from one period to another
B. losing or gaining protons
C. turning lithium into fluorine
D. losing or gaining electrons
71. Which of the following choices best represents force?
A. a push or a pull always causing motion
B. a push or a pull always causing acceleration
C. a push or a pull acting without an object
D. a push or a pull acting on an object
72. Identify the thinnest known material.
A. buckyball
B. diamond
C. graphene
D. fullerene
73. What is a force that opposes motion between two surfaces that are in contact?
A. friction
B. motion
C. velocity
D. acceleration
74. When two waves interact with the crests of one aligning with the troughs of the other is called
A. complimentary interference.
B. destructive interference.
C. opposing interference.
D. constructive interference.
75. Dividing the total distance traveled by the total time is how to calculate?
A. average speed
B. average velocity
C. average acceleration
D. average motion

Tie Breaker Question: List as many of the 19 branches of physical science as possible.