

## SCIENCE 9 CHEMISTRY Practice Test

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Full Name (*print clearly*): \_\_\_\_\_

### Part A Multiple Choice

Select the best answer for each question based on the course notes.

- Matter is primarily classified into which two categories?
  - Solids and Liquids
  - Metals and Non-metals
  - Pure substances and Mixtures
  - Atoms and Molecules
- Which of the following is defined as a pure substance that cannot be separated into simpler pieces?
  - Compound
  - Mixture
  - Element
  - Solution
- What is the chemical formula given for phosphoric acid in the notes?
  - $H_2SO_4$
  - $H_3PO_4$
  - $HCl$
  - $H_3PO_3$
- A mixture that is “evenly and microscopically distributed” is called:
  - Heterogeneous
  - Homogeneous
  - Compound
  - Elemental
- Which of the following is an example of a heterogeneous mixture?
  - Salt water
  - Gold
  - Cereal
  - Phosphoric acid
- Which of the following is an example of an element?
  - Hydrogen
  - Phosphoric Acid
  - Salt Water
  - Cereal
- In a physical change, the chemical composition:
  - Alters slightly
  - Changes completely
  - Remains the same
  - Becomes unstable
- Which of the following is usually irreversible?
  - Melting ice
  - Tearing paper
  - Burning wood
  - Boiling water
- Which observation is strictly associated with a physical change?
  - Change in shape
  - Production of light
  - Production of heat
  - Color change
- Rusting iron is an example of:
  - A physical change
  - A chemical change
  - A phase change
  - A mixture separation
- Which evidence specifically indicates a chemical reaction has occurred?
  - Change in shape
  - Formation of a precipitate (solid)
  - Melting
  - Dissolving
- Which property is described as “quantitative” for solids?
  - Color
  - Brittleness
  - Density
  - Malleability
- Viscosity is a property associated with:
  - Solids
  - Liquids
  - Gases
  - All of the above

14. Which of the following is a qualitative property?
- Melting point
  - Boiling point
  - Electrical conductivity
  - Brittleness
15. When describing a smell, which word should be avoided?
- Pungent
  - Acrid
  - Smelly
  - Sweet
16. When observing a reaction, you should note the disappearance of reactants only if:
- They turn black
  - You are absolutely sure
  - Bubbles form
  - The temperature rises
17. Which of the following is listed as a quantitative property of liquids?
- Appearance
  - Refractive Index
  - Odor
  - Color
18. In the 1700s, scientists could not explain why elements:
- Had mass
  - Combined to form compounds
  - Were solid
  - Had color
19. Dalton theorized that atoms were:
- Smooth, solid spheres
  - Mostly empty space
  - Negatively charged
  - Filled with raisins
20. Which of Dalton's points was revised to explain static electricity?
- Atoms are the smallest piece
  - All atoms of an element are identical
  - Matter must contain positive/negative charges
  - Compounds are ratios
21. Who discovered the electron?
- Dalton
  - Thomson
  - Rutherford
  - Bohr
22. The mass of an electron is approximately:
- $\frac{1}{2}$  of a proton
  - $\frac{1}{100}$  of a proton
  - $\frac{1}{800}$  of a proton
  - Equal to a proton
23. Thomson's model is commonly referred to as:
- The Billiard Ball model
  - The Raisin-Bun model
  - The Planetary model
  - The Quantum model
24. In Thomson's model, the "dough" represents:
- Negative charge
  - Positive charge
  - Neutrons
  - Empty space
25. Rutherford used what kind of particles in his experiment?
- Electrons
  - Positively charged particles
  - Neutrons
  - Gamma rays
26. What material did Rutherford shoot particles at?
- Silver sheet
  - Aluminum foil
  - Gold foil
  - Copper wire
27. Rutherford concluded that the atom is:
- Solid throughout
  - Mostly empty space
  - Positively charged on the outside
  - Made of pure energy
28. According to Rutherford, the nucleus contains:
- Protons and Electrons
  - Protons and Neutrons
  - Only Neutrons
  - Only Electrons
29. What determines the size of the atom in Rutherford's model?
- The size of the nucleus
  - The number of protons
  - The orbit of the electrons
  - The mass of the neutrons
30. An emission spectrum is produced when atoms:

- (a) Absorb energy  
 (b) Collide  
 (c) Split  
 (d) Form compounds
- 31.** The emission spectrum is also referred to as a:  
 (a) Color wheel  
 (b) Line spectrum  
 (c) Wave graph  
 (d) Energy chart
- 32.** Bohr theorized that electrons are restricted to:  
 (a) The nucleus  
 (b) Random clouds  
 (c) Specific orbits (shells)  
 (d) The surface of the atom
- 33.** When an electron moves to a lower shell, it:  
 (a) Gains energy  
 (b) Loses energy  
 (c) Becomes a proton  
 (d) Disappears
- 34.** The maximum number of electrons in the 2nd shell is:  
 (a) 2  
 (b) 8  
 (c) 18  
 (d) 32
- 35.** The maximum number of electrons in the 1st shell is:  
 (a) 1  
 (b) 2  
 (c) 4  
 (d) 8
- 36.** Which concept was NOT part of Dalton's original theory but was added later to explain static electricity?  
 (a) Atoms are the smallest piece  
 (b) Atoms combine in ratios  
 (c) Matter contains positive and negative charges  
 (d) All atoms of one element are identical
- 37.** Which family is mostly solid, shiny, and good conductors?  
 (a) Non-metals  
 (b) Metalloids  
 (c) Metals  
 (d) Gases
- 38.** Where are non-metals typically located on the Periodic Table?  
 (a) Left side  
 (b) Center  
 (c) Right side  
 (d) Bottom
- 39.** Metalloids are described as:  
 (a) Insulators  
 (b) Good conductors  
 (c) Semiconductors  
 (d) Superconductors
- 40.** Which group forms +1 ions?  
 (a) Alkali metals  
 (b) Alkaline earth metals  
 (c) Halogens  
 (d) Noble gases
- 41.** Alkaline earth metals form ions with a charge of:  
 (a) +1  
 (b) +2  
 (c) -1  
 (d) -2
- 42.** Which group contains elements used in fireworks and construction?  
 (a) Alkali metals  
 (b) Alkaline earth metals  
 (c) Halogens  
 (d) Noble gases
- 43.** Which element fires cannot be extinguished with standard extinguishers?  
 (a) Calcium  
 (b) Magnesium  
 (c) Barium  
 (d) Sodium
- 44.** Halogens are known to be:  
 (a) Chemically inert  
 (b) Brightly colored gases  
 (c) Shiny solids  
 (d) Semiconductors
- 45.** Noble gases have a:  
 (a) Full valence shell  
 (b) High reactivity  
 (c) +1 charge  
 (d) Metallic appearance
- 46.** Which element is mentioned as reacting violently with water and being stored in oil, similar to Alkali metals?  
 (a) Magnesium

- (b) Calcium  
(c) Barium  
(d) Beryllium
47. Atoms combine to form compounds in order to:  
(a) Increase their mass  
(b) Complete their outer shell  
(c) Become radioactive  
(d) Change their state
48. An ionic compound is formed between:  
(a) Two metals  
(b) Two non-metals  
(c) A metal and a non-metal  
(d) A gas and a liquid
49. In an ionic bond, the metal generally:  
(a) Gains electrons  
(b) Loses electrons  
(c) Shares electrons  
(d) Destroys electrons
50. What is the ion charge of Barium (*Ba*)?  
(a) +1  
(b) +2  
(c) -2  
(d) -3
51. What is the ion charge of Phosphorus (*P*)?  
(a) +3  
(b) +5  
(c) -3  
(d) -2
52. Using the criss-cross method for  $K^{1+} + O^{2-}$ , the formula is:  
(a) *KO*  
(b)  $K_2O$   
(c)  $KO_2$   
(d)  $K_2O_2$
53. The correct formula for Magnesium Bicarbonate is:  
(a)  $MgHCO_3$   
(b)  $Mg_2HCO_3$   
(c)  $Mg(HCO_3)_2$   
(d)  $Mg(HCO)_2$
54. In the name "Iron(II) chloride", the Roman numeral indicates:  
(a) There are 2 iron atoms  
(b) There are 2 chloride atoms  
(c) The ion charge of iron is +2  
(d) The ion charge of iron is -2
55. The suffix for non-metals in ionic compounds is changed to:  
(a) -ate  
(b) -ite  
(c) -ide  
(d) -ine
56. Which of the following names is capitalized INCORRECTLY?  
(a) copper(I) fluoride  
(b) Copper(I) Fluoride  
(c) iron(II) oxide  
(d) sodium chloride
57. Which is the correct IUPAC name for  $FeCl_2$ ?  
(a) Iron Chloride  
(b) Iron(II) chloride  
(c) iron(II) chloride  
(d) Iron(11) Chloride
58. An exothermic reaction:  
(a) Absorbs energy  
(b) Releases energy  
(c) Requires heat to start  
(d) Feels cold
59. An endothermic reaction:  
(a) Releases light  
(b) Explodes  
(c) Requires energy to initiate  
(d) Occurs spontaneously
60. Which is evidence of an exothermic reaction?  
(a) Temperature drop  
(b) Absorption of light  
(c) Temperature rise  
(d) Solidifying
61. In formula writing, if a subscript can be simplified (e.g.,  $Pb_2O_4$ ), you should:  
(a) Leave it as is  
(b) Simplify it ( $PbO_2$ )  
(c) Convert to decimals  
(d) Add coefficients
62. Which element is found in the "stair-step boundary"?  
(a) Aluminum (*Al*)  
(b) Silicon (*Si*)  
(c) Carbon (*C*)  
(d) Iodine (*I*)

- 63.** Magnesium burning brightly is an example of what type of reaction?
- (a) Exothermic
  - (b) Endothermic
  - (c) Physical
  - (d) Nuclear

## Part B Short Answer

Answer the following questions in clear, concise sentences or bullet points.

1. Define a **Compound** and provide the example given in the notes.
2. Explain the difference between a **heterogeneous** and a **homogeneous** mixture.
3. Using the table of changes, contrast Physical and Chemical changes in terms of **Reversibility** and **Energy Change**.
4. List three examples of **Qualitative** properties for liquids.
5. List three examples of **Quantitative** properties for liquids.
6. What are the five key revisions Dalton made to his theory to explain static electricity?
7. Summarize the five points of J.J. Thomson's atomic theory.
8. Describe Rutherford's Gold Foil experiment: What did he do, and what was the unexpected result?
9. List Rutherford's six conclusions about the atom's structure.
10. Define **Emission Spectra**.
11. Explain the four main points of Bohr's Atomic Theory.
12. Draw or describe the electron capacity for the first four shells according to Bohr.
13. Compare **Metals** and **Non-metals** in terms of: State at STP, Appearance, and Conductivity.
14. Describe the properties and uses of **Alkali Metals (Group 1)**.
15. Why are **Alkaline Earth Metals (Group 2)** like Magnesium dangerous in a fire?
16. Explain the steps of the **Criss-Cross Method** using Potassium and Oxygen as an example.
17. Write the chemical formulas for:
  - Barium Phosphide
  - Magnesium Bicarbonate
  - Iron(II) Chloride
18. Write the IUPAC names for:
  - $CuF$
  - $FeCl_2$
  - $Mg(HCO_3)_2$
19. Define **Exothermic** and **Endothermic** reactions and describe the energy movement in each.
20. List four specific pieces of evidence that indicate a chemical reaction has occurred.
21. Explain why Noble Gases (Group 18) are described as "chemically inert".
22. Why are Roman numerals used in the names of some ionic compounds? Give an example.

## Answer Key

### Part A Multiple Choice

1. (c) Pure substances and Mixtures 23. (b) Raisin-Bun 24. (b) Positive gases 45. (a) Full valence shell 46.  
2. (c) Element 3. (b)  $H_3PO_4$  4. (b) charge 25. (b) Positively charged 26. (c) Barium 47. (b) Complete outer  
Homogeneous 5. (c) Cereal 6. (a) (c) Gold foil 27. (b) Mostly empty shell 48. (c) Metal and non-metal  
Hydrogen 7. (c) Remains the same space 28. (b) Protons and Neutrons 49. (b) Loses electrons 50. (b) +2  
8. (c) Burning wood 9. (a) Change in 29. (c) Orbit of electrons 30. (a) 51. (c) -3 52. (b)  $K_2O$  53. (c)  
shape 10. (b) Chemical change 11. Absorb energy 31. (b) Line spec-  $Mg(HCO_3)_2$  54. (c) Ion charge is  
(b) Formation of a precipitate 12. (c) trum 32. (c) Specific orbits 33. (b) +2 55. (c) -ide 56. (b) Copper(I)  
Density 13. (b) Liquids 14. (d) Brit- Loses energy 34. (b) 8 35. (b) 2 Fluoride 57. (c) iron(II) chloride 58.  
tleness 15. (c) Smelly 16. (b) You 36. (c) Matter contains positive and (b) Releases energy 59. (c) Requires  
are absolutely sure 17. (b) Refrac- negative charges 37. (c) Metals 38. energy 60. (c) Temperature rise 61.  
tive Index 18. (b) Combined to form (c) Right side 39. (c) Semiconduc- (b) Simplify it 62. (b) Silicon 63. (a)  
compounds 19. (a) Smooth, solid tors 40. (a) Alkali metals 41. (b) +2 Exothermic  
spheres 20. (c) Matter must contain 42. (b) Alkaline earth metals 43. (b)  
charges 21. (b) Thomson 22. (c)  $\frac{1}{800}$  Magnesium 44. (b) Brightly colored

### Part B Short Answer

- Pure substance with 2+ elements chemically bonded ( $H_3PO_4$ ).
- Hetero: not uniform (cereal). Homo: evenly distributed (salt water).
- Physical: Reversible, small energy. Chemical: Irreversible, large energy.
- Color, appearance (clear/cloudy), viscosity.
- Concentration, conductivity, density, boiling/melting point, refractive index.
- (1) Matter has +/- charges, (2) Opposites attract/likes repel, (3) Atoms combine via attraction, (4-5) Standard atomic definitions retained.
- (1) Contain electrons, (2) e- are negative & tiny mass, (3) Rest is positive, (4) e- scattered randomly, (5) e- can be removed/added.
- Shot positive particles at gold foil. Unexpectedly, some bounced back.
- (1) Nucleus is positive, (2) Contains protons/neutrons, (3) Neutrons similar mass to protons, (4) Nucleus is small, (5) Electrons orbit, (6) Empty space.
- Pattern of light emitted when atoms absorb energy.
- (1) Restricted to orbits, (2) Cannot occupy space between, (3) Excited e- moves up/falls back releasing energy, (4) Stable when close to nucleus.
- 1: 2e, 2: 8e, 3: 8e, 4: remaining.
- Metals: Solid, Shiny, Good conductors. Non-metals: Solid/Liq/Gas, Dull, Poor conductors.
- Extremely high reactivity, soft, low density, form +1 ions. Uses: Batteries, fertilizers.
- Mg burns brightly, reacts with  $CO_2$ , cannot use standard extinguishers.
- Write symbols/charges ( $K^{1+}O^{2-}$ ), Criss-cross numbers ( $K_2O_1$ ), Simplify ( $K_2O$ ).
- $Ba_3P_2$ ,  $Mg(HCO_3)_2$ ,  $FeCl_2$ .
- copper(I) fluoride, iron(II) chloride, magnesium bicarbonate.
- Exothermic: Releases energy (heat/light). Endothermic: Requires energy to initiate.

- 20.** Color change, formation of gas/solid/liquid, temperature change, disappearance of reactants, sound/light, smell.
- 21.** They have a full valence shell (stable), so they do not easily gain or lose electrons.
- 22.** To indicate the specific ion charge of a multivalent metal (e.g., Iron can be +2 or +3). Example: iron(II) chloride.