**Science 10**

**Energy and Matter in Chemical Change**

**Key Concepts and Learning Goals**

**Focusing Questions:**

How has knowledge of the structure of matter led to other scientific advancements?

How do elements combine?

Can these combinations be classified and the products be predicted and quantified?

Why do scientists classify chemical change, follow guidelines for nomenclature and represent chemical change with equations?

**Key Concepts:**  The following concepts are developed in this unit

• how chemical substances meet human needs

• Workplace Hazardous Materials Information System (WHMIS) and safe practices

• International Union of Pure and Applied Chemistry (IUPAC) nomenclature, ionic and molecular compounds, acids and bases

• evidence of chemical change

• role and need for classification of chemical change

• writing and balancing equations

• law of conservation of mass and the mole concept

**Learning Goal: You willdetermine and interpret energy changes in chemical reactions.**

|  |  |
| --- | --- |
| **You Will:** | **Explanation/Definition:** (What is the concept?) |
| 1.Describe the basic particles that make up the underlying structure of matter |
| -identify historical examples of how humans worked with chemical substances - identify examples of chemistry-based careers |  |
| -outline the role of evidence in the development of the atomic model consisting of protons and neutrons (nucleons) and electrons; i.e., Dalton, Thomson, Rutherford, Bohr |  |
| 2. Explain, using the periodic table, how elements combine to form compounds, and follow IUPAC guidelines for naming ionic compounds and simple molecular compounds  |
| - illustrate an awareness of WHMIS guidelines, and demonstrate safe practices in the handling, storage and disposal of chemicals in the laboratory and at home  |  |
| -explain the importance of and need for the IUPAC system of naming compounds |  |
| - explain, using the periodic table, how and why elements combine to form compounds in specific ratios  |  |
| - predict formulas and write names for ionic and molecular compounds and common acids |  |
| - classify ionic and molecular compounds, acids and bases on the basis of their properties; i.e., conductivity, pH, solubility, state  |  |
| • predict whether an ionic compound is relatively soluble in water, using a solubility chart  |  |
| • relate the molecular structure of simple substances to their properties (e.g., describe how the properties of water are due to the polar nature of water molecules, and relate this property to the transfer of energy in physical and living systems)  |  |
| • outline the issues related to personal and societal use of potentially toxic or hazardous compounds |  |
| 3. Identify and classify chemical changes, and write word and balanced chemical equations for significant chemical reactions, as applications of Lavoisier’s law of conservation of mass |
| -provide examples of household, commercial and industrial processes that use chemical reactions to produce useful substances and energy (e.g., baking powder in baking, combustion of fuels |  |
| -identify chemical reactions that are significant in societies (e.g., reactions that maintain living systems, such as photosynthesis and respiration; reactions that have an impact on the environment, such as combustion reactions and decomposition of waste materials) |  |
| -describe the evidence for chemical changes; i.e., energy change, formation of a gas or precipitate, colour or odour change, change in temperature |  |
| • differentiate between endothermic and exothermic chemical reactions (e.g., combustion of gasoline and other natural and synthetic fuels, photosynthesis)  |  |
| -classify and identify categories of chemical reactions; i.e., formation (synthesis), decomposition, hydrocarbon combustion, single replacement, double replacement |  |
| • translate word equations to balanced chemical equations and vice versa for chemical reactions that occur in living and nonliving systems |  |
| -predict the products of formation (synthesis) and decomposition, single and double replacement, and hydrocarbon combustion chemical reactions, when given the reactant |  |
| - define the mole as the amount of an element containing 6.02 × 1023 atoms |  |
| -interpret balanced chemical equations in terms of moles of chemical species, and relate the mole concept to the law of conservation of mass |  |

**Chapter 1: Summary**

**Chapter 1: Review**

1. Which process below has only been used in North America since the development of modern industrial chemistry?
2. Dying fabric C. Making leather
3. Producing medicines to treat insect bites D. Refining and processing crude oil
4. Which human need below was met by Aboriginal people using chemical processes?
5. Materials for clothing C. Fertilizers for crops
6. Purifying drinking water D. Controlling insect pests



1. A chemical packages contains this WHMIS symbol. Which action below should you be careful to avoid when handling this chemical?
2. Heating, because the material is flammable
3. Opening the container, because the material may cause other substances to start burning
4. Touching, tasting, or inhaling the material, because it has immediate toxic effects
5. Using the material in any way, because it contains dangerous living organisms.
6. A chemical used in an industrial process is explosive. Which WHMIS symbol would appear on the label?
7. B. C. D.

   

1. The MSDS for a chemical contains the following information:

Hazards Identification: dust if irritating if inhaled.....

 Which common procedure below should definitely be avoided with this chemical?

1. Stirring to dissolve C. Identify by smell
2. Examining crystals under a microscope D. Combining with an acidic liquid
3. A chemical bottle carries this WHMIS symbol. What would you expect to happen if you opened the container?
4. Escape of the compressed gas
5. A burse of flames
6. A very bad odour from the escaping chemical fumes
7. A sudden rise in temperature as the chemical vaporizes.
8. What is the key identifying characteristic of a mechanical mixture (for example, sand)?
9. It has a definite, fixed composition.
10. Different components are visible
11. There is a constant composition throughout any sample
12. The substance cannot be broken down or separated into components
13. The diagram shows the two basic classifications of matter. What label could replace the box?
14. Element
15. Compound
16. Mixtures
17. Solutions
18. What conclusion about atoms was based directly on observations of cathode ray tubes, like the ones shown here?
19. Atoms contain negatively charged particles
20. Atoms contain divisible particles
21. Atoms contain positively charged particles
22. Atoms are electrically neutral
23. What is the best description of an atom with the following symbol?
24. The atom has a total of 17 particles, including 8 protons
25. The atom has 8 protons, 17 electrons and 9 neutrons
26. The atom has 8 protons, 17 electrons and 9 neutrons
27. The atoms has 17 protons, 8 electrons and 9 neutrons
28. What is the best description of the electrons in a fluorine atom, according to Borh’s theory of energy levels?
29. 19 electrons in the same energy level
30. 19 electrons in two different levels
31. 9 electrons in the same energy level
32. 9 electrons in two different levels
33. Identify the isotope whose atom fits this description: mass number 30: atomic number 14.
34. Silicon – 30 C. Silicon – 14
35. Zinc – 14 D. Zinc – 30
36. An atom has a mass number of 24 and atomic number 11. Which description below would be part of Bohr’s model of this atom?
37. The atom has 11 protons C. The atom has 11 electrons
38. The atom has 13 neutrons D. The atom has electrons in three energy levels
39. An element is a solid, shiny, malleable, and ductile at room temperature. What other properties would it most likely have?
40. It conducts both heat and electricity well C. It conducts heat well, but not electricity
41. It conducts electricity well but not heat D. It does not conduct heat or electricity



1. What is the best description of electrons in the element shown to the right?
A. The electrons fill three energy levels
2. There are three valence electrons
3. There is one staple octet
4. There are two valence electrons
5. What feature is common to elements in the same group (vertical column) of the periodic table?
6. The atoms have the same number of protons
7. The atoms have the same number of energy levels
8. The atoms have the same number of valence electrons
9. The atoms have the same number of neutrons
10. Predict the number of valence electrons and their behaviour in an atom of rubidium (atomic number 37). Rubidium is just below potassium on the periodic table.
11. The atom has 1 valence electron and gains 7 electrons in chemical reactions
12. The atom has 1 valence electron and loses it in chemical reactions
13. The atom has 7 valence electrons and gains 1 more in chemical reactions
14. The atom has 7 valence electrons and loses all of them in chemical reactions.
15. What does an atom that loses electrons become?
16. A positively charged ion called a cation C. A negatively charged ion called a cation
17. A positively charged ion called a anion D. A negatively charged ion called an anion
18. What are the proper names for the ions shown in the diagram?
19. Aluminum ion and oxygen ion C. Aluminide ion and oxygen ion
20. Aluminide ion and oxide ion D. Aluminum ion and oxide ion
21. What happens when an atom of potassium reacts with an atom of fluorine to form the ionic compound potassium fluoride KF?
22. An electron is transferred from the metallic atom to the non-metallic atom
23. An electron is transferred from the non-metallic atom
24. A single electrons is shared
25. Several electrons are share
26. What type of binary compound would the chemical CF4, most likely be?

A Ionic, because it is formed from a metal and a non-metal

B. ionic, because it is formed from two non-metals

C. molecular, because it is formed from a metal and a non-metal

D. molecular, because it is formed from two non-metals

1. Which description is most appropriate for a sample of the compound sulphur dioxide, SO2?
2. A crystal lattice formed by electron transfer
3. A crystal lattice formed by electron sharing
4. Independent molecules formed by electron transfer
5. Independent molecules formed by electron sharing
6. What is the maximum number of covalent bonds a phosphorus atom can form?
7. 1
8. 3
9. 7
10. 15

**Answers:**

1. D 2. A 3. C 4. D 5. C 6. A 7. B 8. C 9, A

10. B 11. D 12.A 13.D 14.A 15.C 16.C 17.B 18. A

19. D 20. A 21.D 22.D 23. C

**Chapter 1: Quiz Review**

1. Approximately how much time did you spend preparing for this quiz? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What percentage of your quiz-preparation was spent in each of these activities?
3. Reading Chapter 1 for the first time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Rereading Chapter 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Reviewing homework \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Completing practice multiple choice questions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Completing Chapter 1 questions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Reviewing your own notes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Making your own summary notes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Nowthat you have looked over your graded quiz, estimate the percentage of points you lost due to each of the following
2. Trouble with remembering\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Lack of the understanding of the concept \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Careless mistakes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Please specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Based on your response to the questions above, name at least three things you plan to do differently in preparing for the next quiz. For instance, you will spend more time studying, change a specific study habit or try a new one (if so, name it) or something else?
2. What can I do to help support your learning and your preparation for the next quiz?
3. Jot down any points that you want to remember for studying purposes.

**Chapter 2: Summary**

**Chapter 2: Review**

1. What is true about the composition of one formula unit of an ionic compound, such as zinc oxide?
2. The total positive charge on the cations equals the total negative charge on the anions.
3. There are more positive charge
4. There is more negative charge
5. The charge depends upon the compound
6. What is unusual about pure substance whose formulas begin with hydrogen such as HBr (hydrogen bromide)?
7. They are ionic, but their names contain prefixes
8. They are molecular, but their names contain prefixes
9. They are neither ionic nor molecular
10. They are named with a unique set of rules
11. Which statement about polyatomic ions is FALSE?
12. They contain atoms of more than one element C. They are held together by covalent bonds
13. They have an overall + or – electrical charge D. They form molecular compounds
14. A binary ionic compound is formed from elements A and B. The formula is A2B. What inference can you make about this substance from the formula.
15. A is a metal and B is a non-metal C. B is a metal and A is a non-metal
16. The name will contain the prefixes di and mono D. The compound contains a polyatomic ion
17. What statement about binary compounds is FALSE?
18. Binary compounds are formed from only two elements.
19. The name of a binary compound ends in –ide
20. Binary compounds contain atoms of a metal and atoms of a non-metal
21. Binary compounds may be ionic or molecular
22. A binary molecular compound is formed from two elements, X and Y. The formula is X5Y8. What is true about the systematic (IUPAC) name for this compound?
23. Has the form penta X octaY C. Ends in –ate
24. Has the form octa Y penta X D. Does not contain any prefixes
25. Which of these features of a substance CANNOT be inferred from its systematic (IUPAC) name?
26. Composition – what it is made of C. Properties – its physical and chemical features
27. Identify – what substance it is D. Source – where the chemical can be obtained
28. Which combination of properties would be typical of a molecular compound, such as sucrose (table sugar)?
29. Low melting point, electrolyte C. High melting point, electrolyte
30. Low melting point, non-electrolyte D. High melting point, non-electrolyte
31. Calcium bromide is an electrolyte. In solid form, it is crystalline. What other combination of properties is calcium bromide likely to possess?
32. Electrical conductor in solid state, high melting point
33. Electrical conductor in solid state, low melting point
34. Non-conductor of electricity in solid state, high melting point
35. Non-conductor of electricity in solid state, low melting point
36. What property is common to the chemical nicotine (found in cigarettes), caffeine (found in coffee, tea and many soft drinks), and ethanol (found in alcoholic beverages?
37. Have no know toxic effects
38. Are government regulated
39. Are absorbed in such small amounts that they produce no serious physical effects
40. Pose a health hazard if used excessively
41. A pure substance is not a metal, but it conducts electricity somewhat when dissolved. What can you infer about its composition?
42. It either an ionic or a molecular compound C. Is neither ionic or molecular
43. Is definitely ionic D. Is definitely molecular
44. Why are most pure molecular substance non-conductors of electricity?
45. They are made of ions C. They are made of neutral molecules
46. They are made of uncharged neutrons D. Their positive and negative molecules cancel out
47. What does the low melting point of a molecular compound suggest about the forces between particles in the substance?
48. Strong forces between molecules C. Weak forces between molecules
49. Strong forces within molecules D. Weak forces within molecules
50. Most ionic compounds have relatively high melting points. What inference about the structure of ionic compounds does this observation suggest?
51. They are made up of individual molecules A.They are made of ions arranged in a crystal lattice
52. The bonding forces in they are very weak D. The bonding forces in them are very strong
53. Which property of ionic substance leads scientists to infer that ionic substance can break down into mobile, electrically charged particles?
54. Regular crystalline form in solid state C. Relatively high melting point
55. Conduct electricity when melted or dissolved D. Do not conduct electricity in solid state

**Matching Quiz #1**

Identify the term which best matches each description below.

1. Type of chemical compound composed of cations and anions a. Ionic compound
2. Type of chemical compound formed by the reaction of two non-metals b. binary compound
3. Type of chemical compound formed from only two elements c. molecular compound

**Matching Quiz #2**

Identify the term which best matches each description below.

1. Force between particles a. polar bond
2. Strong attraction between a hydrogen atom b. Hydrogen bond

in one molecule and a different type of atom c. Intermolecular bond

1. Forces within a single molecule d. Intramolecular bond
2. Permanent difference in electric charge across a chemical bond

**Answers:**

1. A 2. B 3. D 4. A 5. C 6. A 7. D 8. B 9. C 10. D 11. A 12. C 13. C

14. D 15. B

Matching #1 a, c, b Matching #2 c, b, d, a

**Chapter 2: Quiz Review**

1. Approximately how much time did you spend preparing for this quiz? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What percentage of your quiz-preparation was spent in each of these activities?
3. Reading Chapter 2 for the first time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Rereading Chapter 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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10. Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Please specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Lack of the understanding of the concept \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Careless mistakes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Please specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. What can I do to help support your learning and your preparation for the next quiz?
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**Chapter 3: Summary**

**Chapter 3: Review**

1. Which of the following descriptions best describes the ionic compounds formed from the acetate ion, CH3COO–.
2. All acetate compounds dissolve well.
3. All acetate compounds, except silver acetate and mercury (I) acetate, dissolve well
4. The only acetate compounds that dissolve well are silver acetate and mercury (I) acetate
5. No acetate compounds dissolve well
6. John predicts that the compound calcium sulphate, CaSO4, will be produced when two solutions are mixed. What would John expect to observe when he mixes the two solutions?
7. The mixed solution turns cloudy, because CaSO4, has low solubility.
8. The mixed solution turns cloudy, because CaSO4 has high solubility.
9. The mixed solutions stays clear, because CaSO4, has low solubility.
10. The mixed solutions stays clear, because CaSO4, has high solubility.
11. When combining two solutions, Jill observes carefully for temperature change, light being produced, and sound being produced. Which of these observations indicated an energy change and thus a possible chemical reaction?
12. All three observations involve energy changes
13. All observations except temperature change involve energy changes
14. All observations except light being produced involve energy changes
15. None of these observations indicate energy changes
16. Which of the following physical changes does NOT provide evidence that a chemical reaction has occurred?
17. A solid forms when solutions are mixed
18. Bubbles of gas form when two liquids are mixed
19. A different odour is detected after a solid chemical is heated
20. A chemical changes state when heated
21. Examine the chemical equation below.

Nitrogen gas + oxygen gas → nitrogen dioxide gas

Reading from left to right, which is the correct classification of the chemicals in this equation?

1. Product, product, reactant C. Reactant, reactant, product
2. Reactant, product, product D. Product, product, product
3. Paul reads a chemical equation as “Diammonia produces nitrogen gas and hydrogen gas”. The equation is: 2 NH3(g) → N2(g) + 3 H2(g)

How should Paul’s error be corrected?

1. Instead of “diammonia”, Paul should have said “ammonia”.
2. Instead of “diammonia”, Paul should have said “nitrogen trihydride”.
3. Instead of “hydrogen gas”, Paul should have said “dihydride”.
4. Instead of “hydrogen gas”, Paul should have said, “trihydrogen”.
5. What is the correct chemical formula of the first product in the following reaction:

Calcium metal + hydrochloric acid → calcium chloride + hydrogen gas

1. CaCl C. 2CaCl
2. 2CaCl2 D. CaCl2
3. What are the coefficients of the reactants and products, in the order listed, when the following skeleton chemical equation is balanced?

K(s) + H2O (l) → KOH (aq) + H2(g)

1. 1, 1, 1, 1 C. 2, 2, 2, 2
2. 2, 2, 2, 1 D. 1, 2, 2, 2
3. What is the best description of this chemical equation?

H2(g) + Cl2(g) → 2HCl(g)

1. Balanced, because the number of atoms of each element is the same on the left side and the right side of the equation
2. Balanced, because the total number of molecules stays the same on the left side and the right side of the chemical equation.
3. Unbalanced, because there are two reactants and only one product
4. Unbalanced, because the reactants do not have any coefficients
5. Tania pours hydrochloric acid over a piece of magnesium ribbon in an open beaker. She notices that heat is released, along with bubbles of gas. What is the best description of Tania’s experimental setup?
6. An open system, so observations will support the law of conservation of mass
7. An open system, so observations will not support the law of conservation of mass
8. A closed system, so observations will support the law of conservation of mass
9. A closed system, so observations will not support the law of conservation of mass
10. An acid-base neutralization reaction is represented by this equation:

HCl(aq) + KOH(aq) → KCl (aq) + H2O(l) + energy

1. Endothermic, causing the surroundings to warm up
2. Endothermic, causing the surroundings to cool down
3. Exothermic, causing the surroundings to warm up
4. Exothermic, causing the surrounds to cool down
5. The highly reactive gas fluorine reactions with the compound potassium bromide. What is the best description of this reaction and its chemical equation?
6. Double replacement, with products KF(aq) + Br(l)
7. Double replacement, with products KF(aq) + Br2(l)
8. Single replacement with products KF(aq) + Br2(l)
9. Single replacement, with products 2KF(aq) + Br2(l)
10. A neutralization reaction occurs between potassium hydroxide and nitric acid. What is the best description of this reaction?
11. Double-replacement, with water as one of the products
12. Double replacement, with hydrogen gas as one of the products
13. Single-replacement, with hydrogen gas as one of the products
14. Single- replacement, with water as one of the products
15. A reaction occurs between two chemicals. Neither chemicals are oxygen, but one chemical is another element. What type of reaction could this be?
16. Decomposition C. Double-replacement
17. Hydrocarbon combustion D. Single replacement
18. What is the best description of the reaction between silver metal and chlorine gas?
19. Formation reaction, producing AgCl2(s)
20. Formation reaction, producing AgCl(s)
21. Single replacement, producing AgCl(s) + Cl(g)
22. Single-replacement reaction, producing AgCl(s) + Cl2(g)
23. Hydrogen peroxide, H2O2(l) breaks down into water and oxygen gas. Which description below best fits this reaction.
24. single-replacement reaction, with products 2H2O(l) + O2(g)
25. single-replacement reaction, with products H2O(l) + O(g)
26. decomposition reaction, with products 2H2O(l) + O2(g)
27. decomposition reaction, with products H2O(l) + O(g)
28. What products would be produced by the complete combustion of octane, C8H18(l), a component of gasoline?
29. Carbon and water vapour
30. Carbon monoxide and water vapour
31. Carbon dioxide, carbon monoxide, and water vapour
32. Carbon monoxide and water vapor

**Answers:**

1. B 2. A 3. A 4. D 5. C 6. A 7. D 8. B 9. A 10. B 11. C 12. D 13. A

14. D 15.D 16.C 17. C

**Chemistry Unit Review**

1. Which of the following is a chemical property
2. Melts at 200 degrees celcius C. Conducts an electric current
3. Turns blue litmus red D. Solid at room temperature
4. The melting point of a substance is an example of a
5. Physical property B. Chemical property
6. In a physical change, only the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ changes
7. State C. Reactants
8. Products
9. According the model proposed by John Dalton, the atom
10. Is like a plum pudding C. Is solid and indivisible
11. Has electron existing in energy levels D. Has electrons spinning in circular orbits
12. Current scientific understanding of the atom suggests that
13. Most of the volume is taken up by the nucleus C. The nucleus contains only neutrons
14. Most of the mass is in the nucleus D. The nucleus contains only protons
15. The atomic number of an atom refers to how many
16. Protons it has C. Neutrons it has
17. Protons and neutrons it has D. Protons, neutrons and electrons it has
18. All electrons
19. have a positive charge. C. have a negative charge.
20. are found in the nucleus of the atom D. are motionless around the nucleus.
21. Which subatomic particles are found in the nucleus of atoms?
22. protons and electrons C. protons and neutrons
23. neutrons and electrons D. electrons only
24. Lithium and sodium are metals that react strongly with water, producing hydrogen gas. Which of the

following metals would also be expected to have similar properties?

1. Mg C. Al
2. Be D. Cs
3. Potassium has an atomic number of 19 and an atomic mass of 39. This means that each neutral atom

of potassium contains

1. 19 protons, 19 electrons, 19 neutrons C. 19 protons, 19 electrons, 20 neutrons
2. 19 protons, 19 electrons, 39 neutrons D. 19 protons, 39 electrons, 39 neutrons
3. When the outer electron shell of an atom is full it means it is

A. Reactive C. Stable

B. a charged particle D. Chlorine

*Use the following information to answer the next question.*



1. Which of the following is the name and sub-atomic particle arrangement for a neutral atom of the element?

Element Sub-Atomic Particles

A. Scandium 24 neutrons, 21 electrons

B. Scandium 21 neutrons, 24 protons

C. Rhodium 45 protons, 24 neutrons

D. Rhodium 45 protons, 45 electrons

1. The noble gases are
2. stable. C. unstable.
3. not on the periodic table. D. not found in nature.



1. Which of the following is represented by the diagram to the right?
2. neon atom
3. carbon ion
4. magnesium ion
5. magnesium atom

**

*Use the following Bohr model diagram to answer the next question*

1. How many valence electrons are illustrated?
2. 1 C. 7
3. 16 D. 17
4. Different isotopes of an element have different numbers of neutrons.

A. True

B. False

1. Carbon-12 and Carbon-14 have the same number of protons.

A. True

B. False

1. Which of the following elements is more reactive than sodium?

A. neon C. lithium

C. potassium D. magnesium

1. A charged atom is called
2. an ion C. a photon
3. a molecule D. a subatomic particle
4. Elements that have a charge of – 1 are from group
5. 1 C. 2
6. 17 D. 18
7. Which of the following statements about Li+1 are true?

I Li+1 is a symbol for a lithium ion.

II Li+1is a symbol for a lithium atom.

III Li+1has lost one electron.

IV Li+1has gained one electron.

A. I and III C. I and IV

C. II and III D. II and IV

1. Which atom will produce an ion with 33 protons, 42 neutrons and 36 electrons?

A. arsenic C. krypton

C. rhenium D. molybdenum

1. A new element Xg has been recently discovered. It forms compounds with the following formulæ:

XgCl2,XgF and XgN

What are the likely ion charges for Xg?

A. +2, –2 C. +1, +2

B.+1, +2, +3 D. +1, +2, +3, –1, –2, –3

1. A single atom of which of the following elements may combine with two fluorine atoms?
2. lithium C. calcium
3. helium D. sodium
4. Nitrate (NO3) is an example of

A. a polyatomic molecule C.an acid

B. a base D. an element

1. A new element, Yo, has been discovered. It forms compounds with the following formulas: YoCl2,

andYoS. Yo is

1. Alkali metal C. Alkaline earth metal
2. Transition metal D. Metalloid
3. Which of the following is the name for Na2(CO3)

A. sodium (II) carbonate C. sodium cobalt

 B. sodium carbon oxide D. sodium carbonate

1. The correct chemical formula for the compound ammonium sulphate would be
2. NH4SO4 C. NH4(SO4)2

B. (NH4)2SO4 D. (NH4)2(SO4)2

1. The chemical formula for the compound copper (II) phosphate would be
2. CuPO4 C. Cu2(PO4)3
3. Cu(PO4)2 D.  Cu3(PO4)2
4. Which of the following is an ionic compound
5. H2 C.NH3
6. CO32- D. K2Cr2O7
7. What is the name of the compound MnS2 ?
8. manganesesulphide C. magnesium sulphide
9. manganese (II) sulphide D. manganese (IV) sulphide
10. A new element has been discovered, element Z (symbol = Z). All we know is that it is a halogen

(like Cl and F). What is its formula when it combines with calcium?

1. CaZ C. CaZ2
2. Ca2Z D. Ca2Z2

*Use the following Lewis diagrams of four unknown elements to answer the next question.*



1. Which element will not combine with oxygen?
2. J C. K
3. L D. M
4. What is the chemical formula for dinitrogen pentoxide?
5. NO C. N2O5
6. N5O2 D. (N2O)5
7. In a covalent bond,
8. electrons are given or accepted C. electrons are shared
9. protons are lost D. neutrons are accepted
10. The property of water that creates its surface tension is its
11. High specific heat capacity C. High boiling point
12. Hydrogen bonds D. Low density
13. Which one of the following salts is least soluble in water?
14. NaCl C. HgCl2
15. NH4Cl D. CaCl2

 *Use the following information to answer the next question*

1. AgCl(s) IV. K2CO3(s)
2. Sr(OH)2(s) V. NiS2 (s)
3. CaSO4(s) VI. PbCl4(s)
4. Which of the following substances would be soluble when placed in water?
5. I, II, III, IV, V and IV C. II and IV
6. II andVI D. II, IV, and VI
7. Which two of the following atomic models represents elements that can easily combine with each

other to form a covalent compound?



1. I and II C. I and IV
2. II and III D. III and IV
3. Which of the following represents the Lewis diagram of the molecule formed in the reaction

shown below?



1. Which of the following is most likely to cause blue litmus paper to turn red?
2. Soap C. table salt
3. lemon juice D. oven cleaner
4. Which of the following is the term given to the scale on which each unit represents a 10-fold

change in the hydrogen ion concentration?

A. pH C. indicator

C. acid/base D. neutralization

*Use the following information to answer the next question.*

A student is given four test tubes. He is asked to determine whether the substance in each test tube is acidic, basic, or neutral. He makes the following observations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| pH indicator | Test tube 1 | Test tube 2 | Test tube 3 | Test tube 4 |
| Red litmus | No color change | Turns blue | No color change | No color change |
| Blue litmus | Turns red | No color change | No color change | Turns red |
| Phenolphthalein | No color change | Turns pink | No color change | No color change |

1. Which of the following conclusions is supported by the observations?
2. Test Tube 1 is basic. C. Test Tube 2 is neutral.
3. Test Tube 3 is acidic. D. Test Tube 4 is acidic
4. An acid can be described as
5. a substance that has a pH of greater than 7 and releases H+ ions
6. a substance that has a pH of less than 7 and releases OH- ions
7. a substance that has a pH greater than 7 and releases OH- ions
8. a substance that has a pH less than 7 and releases H+ ions

*Use the chart to the right to answer the next two questions.*

1. The solution that is most acidic is
2. A C. F
3. E D. G
4. The solutions that are acidic are
5. A, C, E, F, G C. B, C, D, H
6. A, E, F, G D. C only

***Use the following information to answer the next 2 questions.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Solution | Conductivity | Effect on red litmus | Effect on blue litmus | pH |
| 1 | Low | None | Changed to red | 3 |
| 2 |  High | Changed to blue | None | 13 |
| 3 | High | None | None | 7 |
| 4 | High | None | Changed to red | 1 |
| 5 | None | None. | none | 7 |

1. Which solution is most likely NaOH(aq)?

A. solution 2 C. Solution 3

B. Solution 4 D. Solution 5

1. Which solution is most likely glucose, C6H12O6(aq)?

A. solution 1 C. Solution 3

B. Solution 4 D. Solution 5

1. The products of a neutralization reaction
2. are salt and water with a pH greater than 7 C. are salt and water with a pH less than 7
3. are salt and water with a pH equal to 7 D. are acids and bases with a pH equal to 7
4. If you had acid indigestion (heartburn), which of the following products would you take to neutralize the acid?
5. an acid C. a base
6. water D. salt
7. When iron (III) sulfate reacts with lithium hydroxide solution, the precipitate which forms is
8. Fe2(SO4)3 C. Fe(OH)2
9. Li2SO3 D. Fe(OH)3
10. A chemist mixes a solution of potassium iodide and lead (II) nitrate. According to the solubility chart, what precipitate will form?
11. Pb(NO3)2 C. KNO3
12. PbI2 D. KI
13. Which one of the following chemical equations is balanced?

A. SO2 + O2 → SO3 C. 3SO2 + O2 → 3SO3

B. SO2 + 2O2 → 2SO3 D. 2SO2 + O2  → 2SO3

1. What is the coefficient needed in front of O2 in order to balance the following equation?

\_\_\_\_NH4ClO4 → \_\_\_N2 + \_\_\_ Cl2 + \_\_\_\_\_ H2O + \_\_\_\_\_O2

1. 1 C. 2
2. 3 D. 4
3. Which set of ordered coefficients correctly balances the following equation?

\_\_\_\_\_\_ K3PO4 + \_\_\_\_ZnSO4→ \_\_\_\_K2SO4 + \_\_\_ Zn3(PO4)2

1. 1, 2, 3, 2 C. 2, 1, 3, 2
2. 2, 2, 1, 3 D. 2, 3, 3, 1
3. Which of the following are balanced?
4. 2Ca + O2 → 2CaO
5. 2CO + O2→ 2CO2
6. H2 + Cl2 → 2 HCl
7. I and II only C. I and III only
8. II and III only D. I, II and III
9. In what type of chemical reaction does one larger molecule react to produce two smaller molecules

A. synthesis C. neutralization

B. decomposition D. single replacement

1. What type of reaction would be expected when sodium phosphate reacts with calcium chloride?

A. synthesis C. combustion

B. decomposition D. double replacement

1. Solid zinc reacts with sulphuric acid to produce hydrogen gas. What is the other product that would result from this reaction?
2. O2 C. H2S
3. H2O D. ZnSO4
4. If the compound HF reacts with KOH, what type of reaction has occurred?
5. Combustion C. neutralization
6. Decomposition D. single replacement
7. The molar mass of oxygen gas is
8. 4.00 g/mol C. 8.00 g/mol
9. 16.00 g/mol D. 32.00 g/mol
10. The molar mass of copper (II) chloride is
11. 116.5 g/mol C. 134.45 g/mol
12. 162.55 g/mol D. 198.45 g/mol
13. What mass of sold sodium carbonate is contained in 2 mole of the compound?
14. 127.46g C. 153.81g
15. 211.98g D. 261.43g
16. What mass of liquid carbon tetrachloride is contained in 6 mol of the compound?
17. 142.01 g C. 547.46 g
18. 853.81 g D. 922.86 g
19. Write out the following reactions as balanced chemical equations. Include the states of matter. In some cases you are told the products. In other cases you must predict the products.

a) solid calcium reacts with liquid water to produce calcium hydroxide and hydrogen gas.

b) methane gas, CH4, is burned with oxygen.

c) solid copper reacts with lead(II) nitrate(aq) to produce solid lead and copper(II) nitrate(aq)

d) solid iron and oxygen gas combine to form iron(III) oxide.

**Answers:**

1. B 11. C 21. A 31. D 41. B 51. D 61. D
2. A 12. A 22. A 32. C 42. A 52. B 62. C
3. A 13. A 23. B 33. D 43. D 53. D 63. B
4. C 14. C 24. C 34. C 44. D 54. C 64. D
5. B 15. C 25. A 35. C 45. B 55. D
6. A 16. A 26. C 36. B 46. B 56. D
7. C 17. A 27. D 37. D 47. A 57. B
8. C 18. C 28. B 38. D 48. D 58. D
9. D 19. A 29. D 39. C 49. D 59. D
10. C 20. B 30. D 40. C 50. C 60. C

65 a) 1 Ca(s) + H2O (l) → Ca(OH)2(s) + H2(g)

 b) CH4(g) + 2O2(g) → CO2(g) + 2 H2O(g)

 c) Cu (s) + Pb(NO3)2(aq) → Pb(s) + Cu(NO3)2(aq)

 d) 4Fe (s) + 3O2(g) → 2Fe2O3(s)

**Chemistry Test Review**

1. Approximately how much time did you spend preparing for this exam? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What percentage of your preparation for the Chemistry Exam was spent studying alone or with others?

i) % alone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii) % with others \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What percentage of your test preparation time was spent in each of these activities?
2. Discussing content with classmates/ students in other sections \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Skimming the textbook \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Reviewing your notes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Reading textbook \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Reviewing homework questions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Doing unit practice questions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. As you look over you exam, think about how and where you lost points. Estimate the percentage of points you lost due to the following:
9. % not understanding a concept or term \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. % not knowing how to begin a question \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. % careless mistakes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. % not remembering the concept \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. Other reasons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Please specify)

1. Based on your response to the questions, list three things you might do differently. For instance, will you spend more time studying or try to sharpen a particular skill. (please be specific).
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. What can I do to help support your learning and prepare you for the next exam?
6. Write down any other points you want to take with you from this exam.