

Name: _____ Class: _____ Date: _____

Instructions: Answer the following questions. Show ALL work for problems to receive full credit. Make sure to include proper units and significant figures for all answers.

- [25 pt] 1. Name the scientist associated with each of the following discoveries or statements. Scientists may be used more than once, or not at all. (Options are: Aristotle, Arrhenius, Boyle, Chadwich, Cthulhu, Dalton, Democritus, Empedocles, Faraday, Goldstein, Lavoisier, Mendeleev, Priestly, Proust, Rutherford, Stoney, Thomson)
- (a) Shot alpha particles at gold foil. 1(a) _____
- (b) Electrons are deflected by electric and magnetic fields. 1(b) _____
- (c) Matter is composed of the elements Fire, Wind, Earth, and Water 1(c) _____
- (d) Discovered the neutron. 1(d) _____
- (e) Substances dissolved in water form cations and anions. 1(e) _____
- (f) Conservation of Mass 1(f) _____
- (g) Atoms combine to form compounds in simple whole number ratios. 1(g) _____
- (h) Disproved Phlogiston theory. 1(h) _____
- (i) First define an Element (also compounds and mixtures). 1(i) _____
- (j) The nucleus of the atom is small, dense, and positively charged. 1(j) _____
- (k) Protons were first observed by this German physicist. 1(k) _____
- (l) Discovered electrons 1(l) _____
- (m) Solved the missing mass problem and discovered the 3rd fundamental particle. 1(m) _____
- (n) Father of Chemistry. 1(n) _____
- (o) Arranged elements in rows and columns 1(o) _____
- (p) Plum Pudding Model (or Chocolate Chip Cookie Model) 1(p) _____
- (q) Formulated a model to describe the properties of atoms (5 statements). 1(q) _____
- (r) Great philosopher, horrible chemist. 1(r) _____
- (s) The nucleus of the atom is small. 1(s) _____
- (t) Matter is composed of tiny indivisible particles called "atomos" 1(t) _____
- (u) Studied gases, defined atoms, elements, compounds and mixtures. 1(u) _____
- (v) Performed experiments using a cathode ray tube to discover electrons. 1(v) _____
- (w) Highlighted Quantitative measurements as being superior to Qualitative 1(w) _____
- (x) Observed that alpha particles pass through gold foil 99.999% of the time and concluded that the atom is mostly empty space. 1(x) _____
- (y) Everything is made up of Earth, Air, Wind, and Fire 1(y) _____

[10 pt] 2. Do the following statements best describe a (S)olid, (L)iquid, or (G)as?

- (a) A substance which always fills its container. 2(a) _____
- (b) The most compact state of matter 2(b) _____
- (c) The particles are mobile, yet cohering. 2(c) _____
- (d) Indefinite shape, definite volume. 2(d) _____
- (e) Highly compressible. 2(e) _____
- (f) Least compact state of matter 2(f) _____
- (g) Indefinite shape and indefinite volume 2(g) _____
- (h) The attractive forces (IMFs) are much stronger than the Kinetic Energy (Temperature) 2(h) _____
- (i) The atoms are held rigidly in place in a lattice 2(i) _____
- (j) Definite shape and definite volume 2(j) _____

[10 pt] 3. Are the following statements true or false. For the false statements change them to be a true statement in the space provided.

- (a) Solids are the most compact form of matter 3(a) _____
- (b) Liquids have indefinite shape and indefinite volume 3(b) _____
- (c) In gases the attractive forces (IMFs) are much stronger than the Kinetic Energy (Temperature) 3(c) _____
- (d) In liquids the atoms are held rigidly in place in a lattice 3(d) _____
- (e) In a liquid the attractive forces (IMF's) are similar in strength to the Kinetic Energy (Temperature) 3(e) _____

[5 pt] 4. Do the following statements **BEST** describe an (E)lement, (C)ompound or (M)ixture? There may be more than one correct answer for each question.

- (a) Chemically and physically separable 4(a) _____
- (b) Can be separated chemically 4(b) _____
- (c) Fixed Composition 4(c) _____
- (d) Inseparable 4(d) _____
- (e) Can be Homogeneous or Heterogeneous 4(e) _____

- [10 pt] 5. Are the following statements true or false. For the false statements change them to be a true statement in the space provided.
- (a) Mixtures are chemically and physically separable 5(a) _____
 - (b) Elements can be separated chemically 5(b) _____
 - (c) A mixture is 2 or more elements chemically combined. 5(c) _____
 - (d) Compounds can have a variable composition 5(d) _____
 - (e) Compounds can be separated physically 5(e) _____
- [5 pt] 6. Are the following statements true or false. For the false statements explain why they are false or change them to be a true statement in the space provided.
- (a) Compounds are physically separable. 6(a) _____
 - (b) Mixtures are physically and chemically separable. 6(b) _____
 - (c) Elements can be homogeneous or heterogeneous. 6(c) _____
 - (d) Compounds have a fixed composition 6(d) _____
 - (e) Mixtures are pure substances 6(e) _____
- [20 pt] 7. Are the following statements true or false. For the false statements explain why they are false or change them to be a true statement in the space provided.
- (a) Electrons have a neutral charge. 7(a) _____
 - (b) An electron is about 2000 times heavier than a proton. 7(b) _____
 - (c) Electrons are primarily responsible for forming bonds between atoms. 7(c) _____
 - (d) The difference between elements is the number of protons each has. 7(d) _____
 - (e) All atoms of a specific element have the same mass and size. 7(e) _____
 - (f) Cations are formed by gaining electrons. 7(f) _____
 - (g) A neutral atom has the same number of electrons and neutrons. 7(g) _____
 - (h) The nucleus of the atom contains the protons and electrons. 7(h) _____
 - (i) Opposite charges repel. 7(i) _____
 - (j) Isotopes differ by the number of electrons each has. 7(j) _____
 - (k) Neutrons have a positive charge. 7(k) _____
 - (l) An electron is about 2000 times heavier than a proton. 7(l) _____
 - (m) Neutron are primarily responsible for forming bonds between atoms. 7(m) _____

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- (n) The difference between elements is the number of protons each has. 7(n) _____
- (o) Isotopes are atoms which have the same number of protons but a different number of neutrons. 7(o) _____
- (p) Cations are formed by gaining electrons. 7(p) _____
- (q) A neutral atom has the same number of protons and electrons. 7(q) _____
- (r) The nucleus of the atom contains the protons and electrons. 7(r) _____
- (s) Opposite charges repel 7(s) _____
- (t) The nucleus is small, dense and negatively charged. 7(t) _____

[5 pt] 8. Do the following statements best describe (p)rotons, (n)eutrons or (e)lectrons. There may be more than one correct answer for each question.

- (a) Has a positive charge. 8(a) _____
- (b) Responsible for the majority of the mass of an atom. 8(b) _____
- (c) Forms bonds between atoms to form molecules. 8(c) _____
- (d) Has the smallest mass. 8(d) _____
- (e) Is contained in the nucleus of the atom. 8(e) _____

[4 pt] 9. Given the following isotope, ${}^{17}_8\text{O}^{-2}$, answer the following:

(a) Number of Protons 9(a) _____

(b) Number of Neutrons 9(b) _____

(c) Number of Electrons 9(c) _____

(d) Is this an example of a cation or anion? 9(d) _____

[4 pt] 10. Write the isotope notation for an atom with 38 protons, 40 neutrons and 36 electrons:

10. _____

[5 pt] 11. Given the following isotope, ${}^{42}_{17}\text{X}^{+2}$, list the number of:

(a) Protons 11(a) _____

(b) Neutrons 11(b) _____

(c) Electrons 11(c) _____

(d) What Element is this 11(d) _____

(e) Is this an example of a cation or anion? 11(e) _____

[4 pt] 12. Given the following isotope, ${}^{30}_{14}\text{X}^{-3}$, list the number of:

(a) Protons 12(a) _____

(b) Neutrons 12(b) _____

(c) Electrons 12(c) _____

(d) What Element is this 12(d) _____

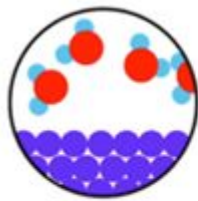
[3 pt] 13. Given the following isotope, ${}^{60}_{32}\text{Ge}^{+2}$, list the number of:

(a) Protons 13(a) _____

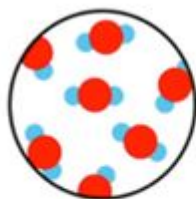
(b) Neutrons 13(b) _____

(c) Electrons 13(c) _____

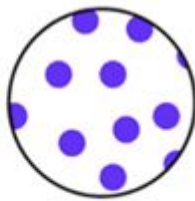
- [5 pt] 14. Sketch or write a chemical reaction showing the formation of a Al^{+3} cation from a neutral Al atom.
- [5 pt] 15. Sketch or write a chemical reaction showing the formation of a Cl^- anion from a neutral chlorine atom.
- [4 pt] 16. Sketch or write a chemical reaction showing the formation of a Mg^{+2} cation from a neutral Mg atom.
- [4 pt] 17. Sketch or write a chemical reaction showing the formation of a Br^- anion from a neutral Bromine atom.
- [3 pt] 18. Sketch or write a chemical reaction showing the formation of a Lithium cation from a neutral Lithium atom.
- [3 pt] 19. Sketch or write a chemical reaction showing the formation of a Phosphorus anion from a neutral Phosphorus atom.
- [4 pt] 20. Give the name or symbols for the 7 elements that are **Metalloids**. Why are these elements important to know?
- [4 pt] 21. Give the name or symbols for the elements known as the **Noble Gases**. Why are these elements in the same column on the periodic table?
- [4 pt] 22. Give the name or symbols for the elements known as the **Halogens**. Why are these elements in the same column on the periodic table?
- [4 pt] 23. Which of the following pictures best illustrates a:



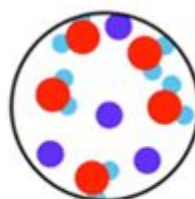
A



B



C



D

- (a) Element _____
- (b) Compound _____
- (c) Homogeneous Mixture _____
- (d) Heterogeneous Mixture _____

[5 pt] 24. Do the following statements **BEST** describe an (I)onic, (M/C) Molecular/Covalent or (B)oth compound?

- (a) Two or more elements chemically combined. 24(a) _____

- (b) Gain/Lose electrons forming ions 24(b) _____
- (c) Low boiling points and melting points.. 24(c) _____
- (d) Conduct electricity when dissolved in water. 24(d) _____
- (e) Are formed between Non-metals and Non-metals. 24(e) _____

[10 pt] 25. Are the following statements true or false. For the false statements change them to be a true statement in the space provided.

- (a) Ionic compounds form discrete molecules 25(a) _____
- (b) Molecular compounds have lower melting points than ionic compounds 25(b) _____
- (c) Molecular compounds gain/lose electrons to form bonds. 25(c) _____
- (d) Ionic compounds conduct electricity when dissolved in water 25(d) _____
- (e) A cation is formed when a neutral atom gains electrons 25(e) _____

[10 pt] 26. **Explain** how you determine the difference between (I)onic or (C)ovalent/Molecular compounds. Also, correctly identify the following compounds as either (I)onic or (C)ovalent/Molecular

- (a) $\text{Mg}(\text{OH})_2$ 26(a) _____
- (b) CO_2 26(b) _____
- (c) HNO_3 26(c) _____
- (d) C_2H_6 26(d) _____
- (e) Na_2O 26(e) _____
- (f) $\text{Ba}(\text{NO}_3)_2$ 26(f) _____
- (g) C_6H_{12} 26(g) _____
- (h) HCl 26(h) _____
- (i) P_4O_{10} 26(i) _____
- (j) KCl 26(j) _____

[5 pt] 27. How many atoms of the indicated element are in each formula:

- | | |
|--|-------------|
| (a) Na in Na_2CO_3 | 27(a) _____ |
| (b) H in $(\text{NH}_4)_2\text{SO}_4$ | 27(b) _____ |
| (c) Cl in FeCl_3 | 27(c) _____ |
| (d) H in $\text{HC}_2\text{H}_3\text{O}_2$ | 27(d) _____ |
| (e) O in $\text{Al}(\text{NO}_3)_3$ | 27(e) _____ |
| (f) C in Na_2CO_3 | 27(f) _____ |
| (g) H in $(\text{NH}_4)_3\text{PO}_4$ | 27(g) _____ |
| (h) Cl in MgCl_2 | 27(h) _____ |
| (i) H in $2 \text{H}_2\text{O}$ | 27(i) _____ |
| (j) O in $\text{Mg}(\text{NO}_3)_2$ | 27(j) _____ |