

(Formula Sheet) –given to you on the semester test

| Element | Reaction |
|--|---|
| Li Rb K Ba Ca Na | React with cold H ₂ O and acids, replacing hydrogen |
| Mg Al Mn Zn Fe | React with acids or steam, but usually not liquid water to replace hydrogen |
| Ni Sn Pb | React with acids but not water to replace hydrogen |
| H ₂ Cu Hg | React with oxygen to form oxides |
| Ag Pt Au | Mostly unreactive |
| F ₂ Cl ₂ Br ₂ I ₂ | Listed from most reactive to least |

| Solubility Rules |
|---|
| NO ₃ ¹⁻ All nitrates are soluble . |
| Cl ¹⁻ All chlorides are soluble except AgCl, Hg ₂ Cl ₂ , PbCl ₂ |
| NH ₄ ⁺ All Ammoniums are soluble |
| C ₂ H ₃ O ₂ ⁻ All Acetates are soluble |
| Group 1 All group one (alkali metals) are soluble |
| SO ₄ ²⁻ Most sulfates are soluble ; exceptions include: SrSO ₄ , BaSO ₄ , and PbSO ₄ , CaSO ₄ is slightly soluble. |
| *Assume all other ionic compounds are insoluble |

Other information and tips

- There are **85 multiple-choice questions** on the district semester test.
- Test is on the computer.
- There is a **28 point district performance task**
- You will have 50 minutes for the performance task and 90 minutes for the multiple choice test.
- Bring two #2 lead pencils, a good eraser, AND a **calculator**.
- Bring something to study or read after you finish the test
- Try to get a good night's sleep
- Eat a good breakfast. This will help put you in a good mood and help your brain function
- Drink water (H₂O). Avoid caffeine (C₈H₁₀N₄O₂) and sugar (C₁₂H₂₂O₁₁)

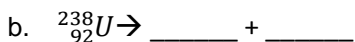
| Standards | Number of test questions |
|---|--|
| HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. | 11 Multiple Choice & Performance Task |
| HS-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties | 17 Multiple Choice & Performance Task |
| HS-PS1-3 Plan and carry out an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles | 27 Multiple Choice & Performance Task |
| HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction | 13 Multiple Choice & Performance Task |
| HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay | 5 Multiple Choice & Performance Task |
| HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements | 9 Multiple Choice & Performance Task |
| DD-CHEM1-1 General Scientific Practices (Significant Figures) | 3 Multiple Choice Questions & Performance Task |

A. Unit 1 & 2 Atomic Structure/Electron Configuration

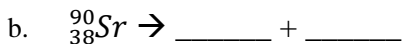
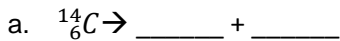
Be able to:

- differentiate between and determine the number of protons, neutrons, & electrons in an atom
- discuss the history of the atomic theory
- define & determine the atomic #, mass #, and the average atomic mass of different isotopes
- write, interpret, & relate electron configuration orbital notation & electron dot structure based on the location on the periodic table
- relate chemical stability & the octet rule

1. What is the difference between fusion and fission?
2. What elements are most abundant in the universe?
3. Describe how elements are formed in stars.
4. What is an alpha particle?
5. What is a beta particle?
6. What type of radiation is the most penetrating: alpha, beta or gamma?
7. Both of the isotopes below are undergoing alpha decay. Complete the reaction.



8. Both of the isotopes below are undergoing beta decay. Complete the reaction.



9. Write the nuclear reaction for the bombardment (fusion) of uranium-232 with an alpha particle. _____
10. The smallest particle of any element is called a(n) _____.
11. Within an atom, the area of most mass is the _____.
12. Within an atom, the area that takes up the most space is the _____.
13. Circle “p” proton, “n” neutron, and/or “e” electron. There may be more than one answer.

p n e 1+ charge

p n e located in “empty space” around nucleus

p n e 1- charge

p n e must be the same in an element and its ion

p n e changes to gain stability (form an ion)

p n e no charge

p n e contributes to most of an element’s mass

p n e relatively “big” particle(s) (~1 amu)

p n e determines element’s identity

p n e same in different isotopes of the same element

p n e determines element’s reactivity

p n e varies in different isotopes of an element

p n e located in nucleus

p n e very small particle(s) (1/1840 amu)

14. Define isotope. _____

15. What is another name for the electrons in the outer energy level? _____

16. Fill in the tables with the correct information

| Name Notation | Symbol Notation | Protons | Electrons | Neutrons | Mass # | Atomic # |
|---------------|---------------------------------|---------|-----------|----------|--------|----------|
| Chromium-53 | | | 24 | | 53 | |
| | Complete electron configuration | | | | | |

| Name Notation | Symbol Notation | Protons | Electrons | Neutrons | Mass # | Atomic # |
|---------------|------------------|---------|-----------|----------|--------|----------|
| | | | | 23 | | 19 |
| | Orbital notation | | | | | |

| Name Notation | Symbol Notation | Protons | Electrons | Neutrons | Mass # | Atomic # |
|---------------|--------------------|---------|-----------|----------|--------|----------|
| | | | 19 | | 41 | |
| | Nobel Gas notation | | | | | |

17. Write the electron configurations for the following **ions**:

O _____ Ca _____ Ti^{2+} _____

18. There are 2 isotopes of Boron: Boron-10 and Boron-11. Which isotope is more abundant and why?

19. Element X has a mass of 19.90 amu. There are 3 isotopes. X – 18, X – 19 and X – 20. Which isotope is more abundant and why?

B. Unit 2 Periodic Table

Be able to:

- describe the properties of major groups on the periodic table
- identify properties of metals, non-metals, and metalloids
- identify and use the trends on the periodic table (electronegativity, ionization energy, atomic radius, shielding effect, nuclear charge, oxidation number)
- relate electron configuration and ion formation and oxidation number based on the location on the periodic table

Match the family name to the electron configuration

20. ____ alkali metal a. $1s^22s^22p^6$
21. ____ alkaline-earth metal b. $1s^22s^22p^63s^1$
22. ____ transition metal c. $1s^22s^22p^5$
23. ____ halogen d. $1s^22s^22p^63s^23p^64s^23d^{10}$
24. ____ noble gas e. $1s^22s^22p^63s^2$

25. Circle “m” metal, “md” metalloid, or “nm” nonmetal.

- | | |
|--|---|
| a. m md nm usually brittle solids and gases | f. m md nm malleable and ductile |
| b. m md nm forms negative ions | g. m md nm poor conductors |
| c. m md nm form positive ions | h. m md nm semiconductors |
| d. m md nm good conductors | i. m md nm shiny, hard, dense |
| e. m md nm like metals and nonmetals | |

26. Identify what type of element is present: circle Metal (m), Metalloid (md), or Nonmetal (nm), then identify the family the element belongs to.

- a. Fe **m md nm** _____ b. Si **m md nm** _____ NA

- c. Na **m md nm** _____ f. U **m md nm** _____
- d. He **m md nm** _____ g. Mg **m md nm** _____
- e. H **m md nm** NA h. Cl **m md nm** _____

27. Elements in the same _____ have similar properties because _____.

28. All _____ are unreactive because they have a full octet (full s and p orbitals)

29. Complete the table concerning Periodic Trends

| Trend | Definition | Period Trend | Group Trend | Choose which element has the larger value |
|-------------------|------------|--------------|-------------|---|
| Atomic Radius | | | | a. N or O b. Rb or Fr c. P or Mg |
| Ionization Energy | | | | d. Ca or Mg e. Mg or S f. F or He |
| Electronegativity | | | | g. Al or B h. Fe or Cu i. Br or Cl |

C. Unit 3 Ionic Compounds

Be able to:

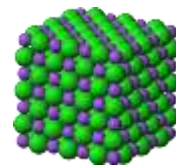
- determine the properties of ionic & metallic bonds
- determine whether if bond is ionic based on the location on the periodic table
- write formulas and names for ions & ionic compound

30. An ionic bond is between a _____ and a _____ element.

31. What is a cation? _____ an anion? _____

Determine if the property describes Ionic, Covalent or Metallic Bonding

- | | |
|--|---|
| 32. I C M Created through the transfer of electrons | 42. I C M Attraction of + and – ions |
| 33. I C M Created through the sharing of electrons | 43. I C M Conducts electricity when dissolved in water |
| 34. I C M Conductor of electricity in the solid state | 44. I C M Individual molecules |
| 35. I C M Malleable, ductile and lustrous | 45. I C M Combination of a metal and a nonmetal |
| 36. I C M Hard yet brittle solids | 46. I C M Never conducts electricity |
| 37. I C M High melting and boiling points | |
| 38. I C M Low melting and boiling points | |
| 39. I C M Poor conductor of heat | |
| 40. I C M Always solids at room temperature | |
| 41. I C M All states of matter at room temperature | |



47. What is the basic structure of all ionic compounds? _____. (see the picture above for a hint)

D. Unit 3 & 4 Covalent Bonding

Be able to:

- determine the properties of covalent bonds
- use Lewis Structures to determine shapes of molecules (including expanded octets)
- use Lewis Structures to determine polarity
- use electronegativity to determine the bond type
- Determine the orbital hybridization, sigma and pi bonding in covalent compounds

- determine the type of bond based on electronegativity differences
- write formulas and names for covalent molecules

48. In covalent compounds, electrons are _____ in order to complete the atom's _____.

49. Covalent bonds normally form between 2 _____ elements.

50. Another name for covalent compounds is _____.

Fill in the chart with the correct name of the substance

| <u>Name</u> | <u>Formula</u> |
|----------------------|-----------------------------|
| nitrogen trioxide | 51. |
| calcium nitrate | 52. |
| trisulfur heptoxide | 53. |
| 54. | NH_4Cl |
| 55. | P_2O_5 |
| ammonium oxide | 56. |
| 57. | Na_2SO_4 |
| 58. | K_3PO_4 |
| zinc hydroxide | 59. |
| iron (II) chloride | 60. |
| 61. | MnCO_3 |
| 62. | $\text{Sn}(\text{HCO}_3)_4$ |
| Silver nitrite | 63. |
| Nickel (III) sulfite | 64. |
| 65. | CO_2 |
| 66. | NH_3 |
| 67. | CH_4 |
| Aluminum acetate | 68. |

69. Which elements need Roman numerals included in the name? _____

70. What does a Roman numeral in a name represent? _____

71. Describe the difference between a polar bond and a nonpolar bond. _____

72. Between covalent and ionic compounds, which has the higher boiling point? _____

73. Between covalent and ionic compounds, which will most likely be gases at room temperature? _____

74. Determine if the following bonds are nonpolar, polar or ionic.

i. H-H _____

ii. Na-F _____

iii. H-Cl _____

75. Ionic bonds are always between a _____ and a _____.
76. What are the requirements for a nonpolar molecule? _____
77. Which shapes could fit the above requirements? _____
78. What are the requirements for a polar molecule? _____
79. What shapes could fit the above requirements? _____
80. Complete the chart below

| Formula <i>Name the substance</i> | Lewis Structure(s) <i>Include resonance structures if necessary.</i> | Shape Name | Polar or Nonpolar Molecule? <i>(If the compound is polar, please draw in the δ^+ & δ^-)</i> |
|---|--|-------------------|---|
| N ₂ | | | |
| CO ₂ | | | |
| SCl ₂ | | | |
| SO ₃ | | | |
| NF ₃ | | | |
| CH ₄ | | | |

E. Unit 5 Chemical Reactions Be able to:

- distinguish between the five types of chemical reactions
- write and balance chemical reactions
- interpret the law of conservation of mass
- apply the rules of solubility for writing net ionic equations

81. List the 7 diatomic elements. _____
82. We balance chemical equations because _____ cannot be created or destroyed according to the law of conservation of _____.
- i. When a reaction is balanced, the number of _____ are the same on the reactants side and the product side.
 - ii. When balancing a reaction, only the _____ can be changed.

83. What is another name for the solid created during a double replacement reaction? _____

84. List the 4 states of matter used during a chemical reaction. _____

85. What are the 5 indicators of a Chemical Change? _____

Matching – What type of reaction is shown?

86. ____ $A + BY \rightarrow AY + B$ a. combustion
87. ____ $A + B \rightarrow AB$ b. synthesis
88. ____ $AY + BX \rightarrow AX + BY$ c. decomposition
89. ____ C_xH_x (hydrocarbon) + $O_2 \rightarrow CO_2 + H_2O$ d. single displacement
90. ____ $AB \rightarrow A + B$ e. double displacement

Balance and identify the type of reaction for each of the following:

91. ____ $C + O_2 \rightarrow CO_2$ _____
92. ____ $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ _____
93. ____ $H_2O_2 \rightarrow H_2O + O_2$ _____
94. ____ $Pb + Hg_2SO_4 \rightarrow PbSO_4 + Hg$ _____
95. ____ $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$ _____
96. ____ $Cr + SnCl_4 \rightarrow Sn + CrCl_2$ _____

Predict the products for the following reactions and balance them correctly. If there is no reaction, write NR.

97. *Combustion:* Propane gas (C_3H_8) combusts.

98. *Synthesis:* The synthesis of potassium bromide KBr.

99. *Single Replacement:* Zinc reacts with a solution of silver acetate.

100. *Single Replacement:* $NaCl + F_2 \rightarrow$

101. *Double Replacement:* The reaction of barium chloride solution and sodium carbonate solution.

102. Write the net ionic for: A solution of sodium hydroxide reacts with a solution of copper (II) sulfate.

103. Two beakers containing solutions are mixed together in an empty beaker. If lead (II) iodide precipitates out (it's yellow), write the net ionic equation that shows the creation of lead (II) iodide.

F. Unit 6- Data Analysis

Be able to:

- Identify the correct significant digits within a number
- Round a number to correct significant digits
- Convert a number into correct scientific notation
- Use a graph to determine density
- Use the density formula to solve for mass or volume
- Determine if a dimensional analysis problem has been solved correctly

104. Turn the following numbers into the correct scientific notation format

- a. 0.000909 meters _____ c. 96.56 grams _____
b. 12,000,000 liters _____ d. 0.000,000,000,000657 kg _____

Determine the number of significant digits in each number.

105. 3.204 _____ 107. 0.000001 _____ 109. 0.10100 _____
106. 1,000 _____ 108. 101.010 _____ 110. 89.250 _____

Round each number to the specified significant digits.

111. 569 → 1 sig. dig. _____ 112. 0.02509 → 2 sig. dig. _____ 113. 865,900 → 3 sig. dig. _____ 114. 100.0023 → 4 sig. dig. _____

Adding with Significant Digits

115. Three students had peanuts and placed them in a jar after measuring the mass of their sample. What is the total mass of the peanuts in the jar? Student 1: 15.23 g, Student 2: 16.2 g and Student 3: 17 g.

Dimensional analysis – error recognition – Find the error in the dimensional analysis problem, then fix the error and come up with the correct answer.

116. How many kilograms are equal to 9.65 oz?

$$\begin{array}{r|l|l} 9.65 \text{ oz} & 28.35 \text{ g} & 1000 \text{ kg} \\ \hline & 1 \text{ oz} & 1 \text{ g} \end{array} = 2.74 \times 10^5 \text{ kg}$$

117. How many liters are equal to 10.32 cm³?

$$\begin{array}{r|l|l} 10.32 \text{ cm}^3 & 1 \text{ mL} & 1000 \text{ mL} \\ \hline & 1 \text{ cm}^3 & 1 \text{ L} \end{array} = 10320 \text{ L}$$

G. Unit 6-The Mole

Be able to:

- Using the mole and molar mass, make conversions between moles, mass, and number of particles
- Use molar mass to calculate percent composition, empirical, and molecular formulas

118. 1 mole Fe = _____ atoms Fe = _____ grams Fe

119. Calculate the number of atoms in a gold sample containing 333 grams.

120. Calculate the mass (g) of 1.34×10^{25} atoms of Lead.

121. Determine the mass (g) of 1.17×10^{25} formula units of ammonium dichromate (NH₄)₂Cr₂O₇.

122. Circle the empirical formulas, square the molecular formulas. C₃H₆O₃, CH₂O, C₆H₁₂O₆
123. C₆H₁₂O₆ – This compound contains _____ atoms of carbon, _____ atoms of hydrogen and _____ atoms of oxygen.

124. If the molecular compound is $C_6H_{14}O_6$, what is the empirical formula? _____
125. Determine the empirical formula for a compound having 80.68% mercury, 6.45% sulfur, and 12.87% oxygen.
126. Caffeine is a compound that was found to have the empirical formula – $C_4H_5N_2O$. If its molar mass is 194.19 g/mol calculate its molecular formula.
127. Determine the molecular formula for a compound that has an empirical formula of CH_2O and a molar mass of 180 g/mol.
128. Calculate the percent composition of Lead (II) chloride $PbCl_2$.

H. Unit 6-Stoichiometry

Objectives

- Use stoichiometry to convert between substances in chemical reactions
 - Identify the limiting reactant (reagent) and be able to solve problems based upon it
 - Calculate the theoretical and percent yield of a chemical reaction
129. For the reaction: $2KClO_3 \rightarrow 2KCl + 3O_2$ How many grams of $KClO_3$ must be decomposed to yield 30.0 grams of oxygen.
130. If 20.5 moles of Zn react with excess H_2SO_4 in the following reaction: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
- a. How many grams of $ZnSO_4$ will be produced?
 - b. How many formula units of zinc sulfate will be produced?
 - c. If the density of hydrogen gas is 0.886 g/L, what volume of hydrogen gas will be produced?
131. How many grams of hydrogen gas are formed if 4.21 g of Zinc react with 2.75 g hydrochloric acid according to the following equation: $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
132. How many grams of ammonium sulfate can be produced if 30.0 mol of H_2SO_4 are reacted with excess NH_3 according to the following equation: $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
133. Describe the following:
- a. Limiting reactant

- b. Excess reactant
- c. Theoretical Yield
- d. Percent Yield
134. For the reaction $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$, if 10.0 grams of both sodium chloride and silver nitrate react:
- Identify the limiting and excess reactants.
 - How many grams of silver chloride are produced?
135. When you determine actual yield you do a(n) (Experiment/Calculation)? When you determine theoretical yield you do a(n) (Experiment/Calculation)?
136. Which is generally greater, the actual yield or the theoretical yield?

137. In the production of lead (II) chloride 24.6 grams were produced. It was calculated that the theoretical yield of the reaction was 28.9 g. Calculate the percent yield.
138. What is the percent yield if 9.05 g of zinc react with excess hydrochloric acid to produce 0.259 g hydrogen gas according to the following equation: $2 \text{HCl (aq)} + \text{Zn (s)} \rightarrow \text{ZnCl}_2 \text{(aq)} + \text{H}_2 \text{(g)}$
139. For the reaction $\text{NaCl (aq)} + \text{AgNO}_3 \text{(aq)} \rightarrow \text{NaNO}_3 \text{(aq)} + \text{AgCl (s)}$ If 10.0 grams of both sodium chloride and silver nitrate react, identify the limiting and excess reactants. How many grams of silver chloride are theoretically produced? If 8.06 grams of precipitate were collected in the lab after filtration and proper drying time, what is the percent yield?
140. In a chemical reaction the total mass of the _____ must equal the total mass of the _____.
141. In an experiment a student heated 5.00 grams of a compound and recorded the mass of the product to be 3.88 grams. Describe what happened in this reaction and how it appears that mass was lost.

I. Multiple Choice Practice Questions for the Semester Test

1. The density of silver is 10.5 g/cm^3 . A piece of silver that occupies a volume of 23.6 cm^3 would have a mass of ____ g.
- | | |
|----------|---------|
| a. 248 | c. 2.25 |
| b. 0.445 | d. 112 |

2. In which of the following numbers are all the zeros significant?
- 100.090090
 - 0.143290
 - 0.05843
 - 1000
3. The correct formula of Iron (III) bromide is ____.
- FeBr₂
 - FeBr₃
 - FeBr
 - Fe₃Br
4. The formula for ammonium carbonate is ____.
- (NH₄)₂CO₃
 - NH₄CO₂
 - (NH₃)₄CO₄
 - (NH₃)₂CO₃
5. Chromium and chlorine form an ionic compound whose formula is CrCl₃. The name of this compound is ____.
- chromium chlorine
 - chromium (III) chloride
 - monochromium trichloride
 - chromium (III) trichloride
6. The formula for aluminum hydroxide is ____.
- AlOH
 - Al₃OH
 - Al₂(OH)₃
 - Al(OH)₃
7. The name of the ionic compound (NH₄)₃PO₄ is ____.
- ammonium phosphate
 - nitrogen hydrogen phosphate
 - tetrammonium phosphate
 - ammonium phosphide
8. Which formula/name pair is incorrect?
- Mn(NO₂)₂ - manganese (II) nitrite
 - Mg(NO₃)₂ - magnesium nitrate
 - Mn(NO₃)₂ - manganese (II) nitrate
 - Mg₃N₂ - magnesium nitrite
9. Which formula/name pair is incorrect?
- FeSO₄ - iron (II) sulfate
 - Fe₂(SO₃)₃ - iron (III) sulfite
 - FeS - Iron (II) sulfide
 - Fe₂(SO₄)₃ - iron (III) sulfide
10. The suffix -ide is used ____
- for monoatomic anion names
 - for polyatomic cation names
 - for the name of the first element in a molecular compound
 - for monoatomic cations
11. The formula for the compound formed between aluminum ions and phosphate ions is ____.
- Al₃(PO₄)₃
 - AlPO₄
 - Al(PO₄)₃
 - AlP
12. Which metal doesn't require having its charge specified in the name of an ionic compound it forms?
- Mn
 - Fe
 - Cu
 - Ca
13. The nucleus of an atom contains ____.
- electrons
 - protons, electrons, neutrons
 - protons and neutrons
 - protons and electrons
14. The element ____ is the most similar to strontium in chemical and physical properties.
- Li
 - Rb
 - Ba
 - Cs
15. Horizontal rows of the periodic table are known as ____.
- periods
 - groups
 - metalloids
 - families
16. Vertical columns of the periodic table are known as ____.
- metals
 - periods
 - groups
 - octaves
17. Elements in group 1 are known as ____.
- chalcogens
 - alkali metals
 - alkaline earth metals
 - halogens

18. Potassium is a ___ and chlorine is a ___.
- metal, nonmetal
 - metal, metalloid
 - nonmetal, metal
 - nonmetal, metalloid
19. ___ are found uncombined, as monatomic species in nature.
- noble gases
 - alkali metals
 - halogens
 - transition metals
20. When a metal and a nonmetal react, the ___ tends to lose electrons to form a(n) ___.
- metal, cation
 - nonmetal, cation
 - metal, anion
 - nonmetal, anion
21. When a metal and a nonmetal react, the ___ tends to gain electrons to form a(n) ___.
- metal, cation
 - nonmetal, cation
 - metal, anion
 - nonmetal, anion
22. The empirical formula of a compound with molecules containing 14 carbon atoms, 16 hydrogen atoms and 8 oxygen atoms is ___.
- $C_{14}H_{16}O_8$
 - $C_7H_8O_4$
 - CHO
 - $C_{3.5}H_4O_2$
23. What is the formula of the compound formed between strontium ions and nitrogen ions?
- SrN
 - Sr_3N_2
 - Sr_3N_4
 - SrN_2
24. The formula of a salt is XCl_2 . The X-ion in this salt has 28 electrons. The metal X is ___.
- Ni
 - Fe
 - Zn
 - Pd
25. The charge on the manganese in the salt MnF_3 is ___.
- +1
 - 2
 - 1
 - +3
26. Aluminum reacts with a certain nonmetallic element to form a compound with the general form AlX . Element X is a natural diatomic gas at room temperature. Element X must be ___.
- oxygen
 - fluorine
 - sulfur
 - nitrogen
27. All atoms of a given element have the same ___.
- mass
 - number of protons
 - number of neutrons
 - number of electrons and neutrons
28. Vanadium has two naturally occurring isotopes, ^{50}V and ^{51}V . The percent abundance of ^{50}V is ___ and of ^{51}V is ___.
- 6.00%, 94.00%
 - 49.00%, 51.00%
 - 99.00%, 1.00%
 - 25.00%, 75.00%
29. An unknown element is found to have three naturally occurring isotopes with atomic masses of 35.9675 (0.337%), 37.9627 (0.063%) and 39.9624 (99.600%). Which of the following is the known element?
- Ar
 - Cl
 - K
 - Ca
30. Of the following, only ___ is not a metalloid.
- B
 - Si
 - Al
 - Ge
31. Of the choices below, which one is not an ionic compound?
- PCl_5
 - RbCl
 - $MoCl_6$
 - $PbCl_2$
32. Which metal does not form cations of differing charges?
- Na
 - Co
 - Cu
 - Fe
33. Compared to the charge and mass of a proton, an electron has
- the same charge and a smaller mass
 - the same charge and the same mass
 - an opposite charge and a smaller mass
 - an opposite charge and the same mass

34. When alpha particles are used to bombard gold foil, most of the alpha particles pass through undeflected. This result indicates that most of the volume of a gold atom consists of
- deuterons
 - neutrons
 - protons
 - unoccupied space
35. Which symbols represent atoms that are isotopes?
- C-14 and N-14
 - O-16 and O-18
 - I-131 and I-131
 - Rn-222 and Ra-222
36. Atoms of elements in a group on the Periodic Table have similar chemical properties. This similarity is most closely related to the atoms'
- number of principal energy levels
 - number of valence electrons
 - atomic numbers
 - atomic masses
37. What is the molar mass of K_2CO_3 ?
- 138 g/mol
 - 106 g/mol
 - 99 g/mol
 - 67 g/mol
38. What is the total number of atoms contained in 2.00 moles of nickel?
- 58.9
 - 118
 - 6.02×10^{23}
 - 1.2×10^{24}
39. What is the percent by mass of oxygen in magnesium oxide, MgO?
- 20%
 - 40%
 - 50%
 - 60%
40. What is the mass in grams of 3.0×10^{23} molecules of CO_2 ?
- 22 g
 - 44 g
 - 66 g
 - 88 g
41. Which pair of atoms constitutes a pair of isotopes for the same element?
- | | | | |
|----|---|----|---|
| 14 | X | 14 | X |
| 6 | | 7 | |
 - | | | | |
|----|---|----|---|
| 17 | X | 17 | X |
| 9 | | 8 | |
 - | | | | |
|----|---|----|---|
| 20 | X | 21 | X |
| 10 | | 11 | |
| 14 | X | 12 | X |
| 6 | | 6 | |
 - | | | | |
|----|---|----|---|
| 17 | X | 17 | X |
| 9 | | 8 | |
42. The mass number of an atom is equal to:
- protons + electrons
 - electrons + neutrons
 - protons + neutrons
 - protons + neutrons + electrons
43. What term is used to describe the spitting of two nuclei?
- fusion
 - fission
 - ionization
 - deionization
44. Which of the following puts elements in the correct order of increasing atomic radius?
- Cl, Bi, P
 - Sr, Mg, Al
 - Si, F, Cl
 - B, Li, K
45. What particle goes in the blank?
- $${}_{84}^{210}Po \rightarrow {}_{82}^{206}Pb + \text{_____}$$
- alpha particle
 - beta particle
 - gamma ray
 - beta emission
46. This type of radiation is released when Rn – 224 to Po – 220.
- alpha particle
 - beta particle
 - gamma ray
 - beta emission
47. What is the missing product of the following?
- $${}_{90}^{230}Th \rightarrow {}_{-1}^0e + \text{_____}$$
- ${}_{91}^{230}Th$
 - ${}_{89}^{230}Ac$
 - ${}_{89}^{231}Ac$
 - ${}_{91}^{230}Pa$