

## CH 151 Problem Set #2

Complete problem set on separate pieces of paper showing all work, circling final answers, etc.

Covering: **Chapter One**

Important Tables and/or Constants: none

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- The following are properties of the metal beryllium. Classify them as **physical** or **chemical**.
  - In powdered form, it burns brilliantly on ignition.
  - Bulk metal melts at 1287 °C
  - It has a density of 1.85 g/cm<sup>3</sup> at 20 °C.
  - It is a relatively soft silvery white metal.
- Consider the following classifications of matter: **heterogeneous mixture**, **homogeneous mixture** and **pure substance**
  - In which of these classifications must the composition be constant?
  - In which of these classifications is separation into simpler substances using physical means possible?
- Based on the information given, classify each of the pure substances A through D as **elements** or **compounds**, or indicate that no such classification is possible because of insufficient information.
  - Substance A cannot be broken down into simpler substances by chemical means
  - Substance B cannot be broken down into simpler substances by physical means
  - Substance C readily dissolves in water
  - Substance D readily reacts with the element chlorine
- Indicate whether each of the following statements is **true** or **false**.
  - Compounds can be separated into their constituent elements using chemical means.
  - Elements can be separated into their constituent compounds using physical means.
  - A compound must contain at least two elements.
  - A compound is a physical mixture of different elements
- Give the name of the element associated with each of the following chemical symbols, or vice versa.
  - Li
  - He
  - F
  - Zn
  - mercury
  - chlorine
  - gold
  - selenium
- Write the chemical symbol for each member of the following pairs of elements:
  - copper and cobalt
  - potassium and phosphorus
  - iron and iodine
  - silicon and silver

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7. Each of the following names of elements is spelled incorrectly. Correct the misspellings.
  - a. phosphorous
  - b. murcury
  - c. clorine
  - d. argone
8. On the basis of its formula, classify each of the following substances as an element or a compound.
  - a. AlN
  - b. CO<sub>2</sub>
  - c. Co
  - d. O<sub>3</sub>
9. Write the chemical formulas for compounds in which the combining ratio of atoms is as follows:
  - a. carbon:hydrogen:oxygen, 10:14:2
  - b. carbon:hydrogen:oxygen, 2:6:1
  - c. sodium:oxygen:hydrogen, 1:1:1
  - d. potassium:nitrogen:oxygen, 1:1:3
10. The following molecular formulas are *incorrectly* written. Rewrite each formula in the correct manner.
  - a. H<sub>2</sub>CO<sub>3</sub>
  - b. ALBR<sub>3</sub> (an aluminum-bromine compound)
  - c. HSH
  - d. 2NO<sub>2</sub> (two N atoms and four O atoms)
11. Match the terms proton, neutron, and electron to each of the following subatomic particle descriptions. It is possible that more than one term may apply in a given situation.
  - a. has no charge
  - b. has a charge equal to but opposite in sign to that of an electron
  - c. is not found in the nucleus
  - d. has a positive charge
12. Indicate whether each of the following statements about the nucleus of an atom is true or false.
  - a. The nucleus accounts for almost all the volume of an atom.
  - b. The nucleus can be positively or negatively charged, depending on the identity of the atom.
  - c. The nucleus of an atom contains an equal number of protons, neutrons and electrons.
  - d. The nucleus of an atom is always positively charged.
13. What is the complete symbol ( ${}^A_ZX$ ) for atoms composed of the following sets of subatomic particles?
  - a. 4 protons, 4 electrons and 5 neutrons
  - b. 7 protons, 7 electrons and 8 neutrons
  - c. 15 protons, 15 electrons and 16 neutrons
  - d. 20 protons, 20 electrons and 28 neutrons

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14. Determine the number of protons, electrons, and neutrons in each of the following atoms.
- ${}_{17}^{35}\text{Cl}$
  - ${}_{25}^{55}\text{Mn}$
  - ${}_{53}^{127}\text{I}$
  - ${}_{83}^{209}\text{Bi}$
15. What are the names of the elements that each of the following atoms represents?
- mass number = 60, 32 neutrons are present
  - Ca atom with three more neutrons than  ${}_{20}^{40}\text{Ca}$
  - atomic number = 14, 14 neutrons are present
  - atom with one more proton and one more electron than  ${}_{18}^{40}\text{Ar}$
16. Four naturally occurring isotopes of the element strontium exist. Knowing that the lightest isotope has a mass number of 84 and that the other isotopes have, respectively, 2, 4, and 5 more neutrons, write the complete symbol ( ${}_{Z}^{\text{A}}\text{X}$ ) for each of the four isotopes.
17. Indicate whether the members of each of the following pairs of atoms are isotopes, isobars or neither.
- ${}_{30}^{64}\text{X}$  and  ${}_{29}^{64}\text{Q}$
  - ${}_{10}^{20}\text{X}$  and  ${}_{10}^{22}\text{Q}$
  - ${}_{16}^{36}\text{X}$  and  ${}_{17}^{35}\text{Q}$
  - ${}_{28}^{60}\text{X}$  and  ${}_{26}^{60}\text{Q}$
18. Indicate whether each of the following statements concerning magnesium isotopes is *true* or *false*.
- ${}_{12}^{24}\text{Mg}$  has one more proton than  ${}_{12}^{25}\text{Mg}$
  - ${}_{12}^{24}\text{Mg}$  and  ${}_{12}^{25}\text{Mg}$  contain the same number of subatomic particles in their nucleus
  - ${}_{12}^{24}\text{Mg}$  has one fewer neutron than  ${}_{12}^{25}\text{Mg}$
  - ${}_{12}^{24}\text{Mg}$  and  ${}_{12}^{25}\text{Mg}$  have different mass numbers
19. Each of the following elements has only two naturally occurring isotopes. Determine, in each case, which isotope is more abundant, using only the atomic mass value for the element that is listed on the periodic table.
- ${}_{5}^{10}\text{B}$  and  ${}_{5}^{11}\text{B}$
  - ${}_{31}^{69}\text{Ga}$  and  ${}_{31}^{71}\text{Ga}$
  - ${}_{47}^{107}\text{Ag}$  and  ${}_{47}^{109}\text{Ag}$
  - ${}_{81}^{203}\text{Tl}$  and  ${}_{81}^{205}\text{Tl}$
20. Calculate the atomic mass of copper on the basis of the following percent composition and isotopic mass data for the naturally occurring isotopes: **copper-63** : 69.09% (62.9298 amu) , and **copper-65** : 30.91% (64.9278 amu)

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