Name _____ **AP Chemistry** **September 8, 2020**

AP Chemistry Homework #1

1. How many grams of carbon are present in 27.0 grams of glucose, $C_6H_{12}O_6$?
(A) 1.20 grams (B) 1.80 grams (C) 6.75 grams (D) 7.20 grams (E) 10.8 grams

2. When a 2.50 g sample of an unknown hydrate of sodium sulfate, $Na_2SO_4 * x\ H_2O(s)$, is heated, H_2O (molar mass 18 g) is driven off. The mass of the anhydrous $Na_2SO_4(s)$ (molar mass 142 g) that remains is 1.42 g. The value of *x* in the hydrate is
(A) 0.013 (B) 1.8 (C) 6.0 (D) 10. (E) 20.

3. What is the percent composition by mass of the elements in the compound $NaNO_3$?
(A) Na 36%, N 28%, O 36% (B) Na 27%, N 16%, O 57% (C) Na 23%, N 14%, O 63%
(D) Na 20%, N 20%, O 60% (E) Na 23%, N 14%, O 48%

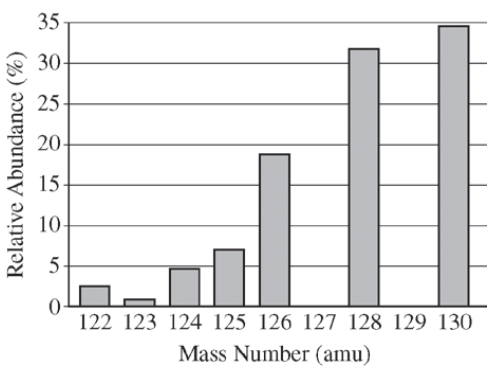
4. A 8.0 g sample of which of the following contains the greatest mass of oxygen?
(A) CaO (B) Rb_2O (C) K_2O (D) Na_2O (E) MgO

5. What is the empirical formula of an oxide of chromium that is 37 percent oxygen by mass?
(A) CrO (B) CrO_2 (C) CrO_3 (D) Cr_2O (E) Cr_2O_3

6. There are three naturally occurring isotopes of oxygen: oxygen-16, oxygen-17, oxygen -18. The atomic mass of oxygen is 16.00 amu. From this data it may be concluded that:
(A) very few of the atoms are ^{17}O and ^{18}O (B) most of the oxygen atoms are ^{18}O
(C) most of the oxygen atoms are ^{17}O (D) there is equal abundances of all three isotopes in nature
(E) more than half of the atoms are ^{18}O

7. A 23.0 g sample of a compound contains 12.0 g of C, 3.0 g H, and 8.0 g of O. Which of the following is the empirical formula of the compound?
(A) $C_3H_8O_3$ (B) CH_3O (C) C_2H_6O (D) $C_3H_9O_2$ (E) $C_4H_{12}O_2$

8. The elements I and Te have similar average atomic masses. A sample that was believed to be a mixture of I and Te was run through a mass spectrometer, resulting in the data above. All of the following statements are true. Which one would be the best basis for concluding that the sample was pure Te?
(A) I consists of only one naturally occurring isotope with 74 neutrons, whereas Te has more than one isotope.
(B) Te is more abundant than I in the universe.
(C) Te forms ions with a −2 charge, whereas I forms ions with a −1 charge.
(D) I is diatomic, Te is not.
(E) I has a higher first ionization energy than Te does.

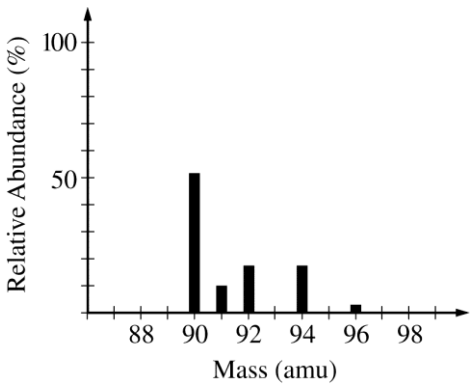


9. A sample of a compound that contains only the elements C, H, and N is completely burned in O_2 to produce 44.0 g CO_2, 45.0 grams of H_2O, and some NO_2. A possible empirical formula of the compound is
(A) CH_2N (B) CH_5N (C) C_2H_5N (D) $C_3H_3N_2$ (E) C_5HN_2

10. The molecular formula for the hydrated ferric oxide is generally written as $Fe_2O_3 * x\ H_2O$ because the water content in rust can vary. If a 0.500-molar sample of hydrated ferric oxide is found to contain 108 g of H_2O, what is the molecular formula of the compound?
(A) $Fe_2O_3 * H_2O$ (B) $Fe_2O_3 * 3H_2O$ (C) $Fe_2O_3 * 6H_2O$ (D) $Fe_2O_3 * 10H_2O$ (E) $Fe_2O_3 * 12H_2O$

11. The mass spectrum of element X is presented in the diagram to the right. Based on the spectrum, which of the following can be concluded about element X?

(A) X is a transition metal, and each peak represents an oxidation state of the metal.
(B) X contains five electron sublevels.
(C) The atomic mass of X is 90.
(D) The atomic mass of X is 92.
(E) The atomic mass of X is between 90 and 92.



12. How many protons, neutrons, and electrons are in an $^{56}_{26}Fe$ atom?

	Protons	Neutrons	Electrons
(A)	26	56	26
(B)	26	30	26
(C)	30	26	30
(D)	56	26	26
(E)	56	82	56

13. Which of the following represents a pair of isotopes?

		Atomic Number	Mass Number
(A)	I. II.	6 7	14 14
(B)	I. II.	6 14	7 14
(C)	I. II.	6 14	14 28
(D)	I. II.	7 7	13 14
(E)	I. II.	8 16	16 20

14. How many grams of calcium nitrate, $Ca(NO_3)_2$, contains 24 grams of oxygen atoms?

(A) 164 grams (B) 96 grams (C) 62 grams (D) 50. grams (E) 41 grams

15. The simplest formula for an oxide of nitrogen that is 36.8 percent nitrogen by weight is:

(A) N_2O (B) NO (C) NO_2 (D) N_2O_3 (E) N_2O_5

16. Mass of an empty container = 3.0 grams
Mass of the container plus the solid sample = 25.0 grams
Volume of the solid sample = 11.0 cubic centimeters
The data above were gathered in order to determine the density of an unknown solid. The density of the sample should be reported as

(A) 0.5 g/cm^3 (B) 0.50 g/cm^3 (C) 2.0 g/cm^3 (D) 2.00 g/cm^3 (E) 2.27 g/cm^3