

Isotope Mass Number	Abundance
69	61%

4. The element gallium (Ga) occurs naturally as a mixture of two stable isotopes. Information about one of the two naturally-occurring isotopes of Ga is shown in the table above.

(a) What is the average atomic mass of Ga? _____

(b) Fill in the missing information in the table above.

5. Calculate the percent composition by mass for each element in phenylhydrazine ($C_6H_8N_2$).

6. A certain compound has the following percent composition by mass.

19.02% C 4.79% H 76.19% S

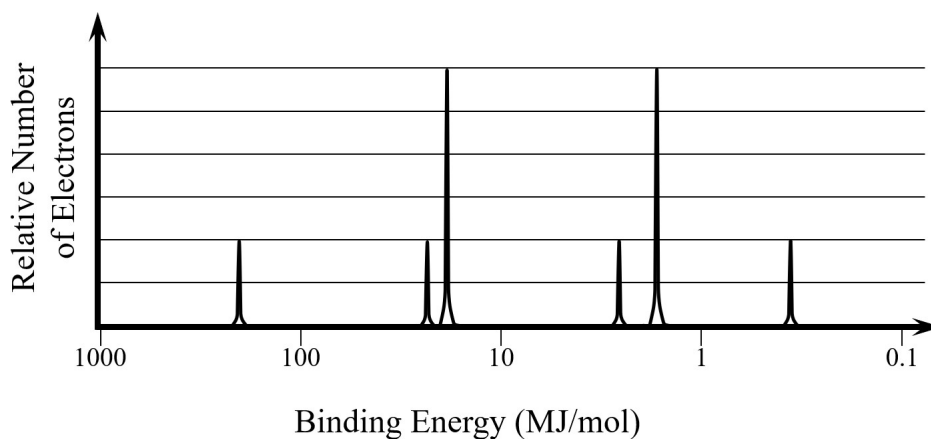
Determine the empirical formula of this compound.

Mass of sample that is burned	17.25 g
Mass of CO ₂ produced	29.17 g
Mass of H ₂ O produced	11.94 g

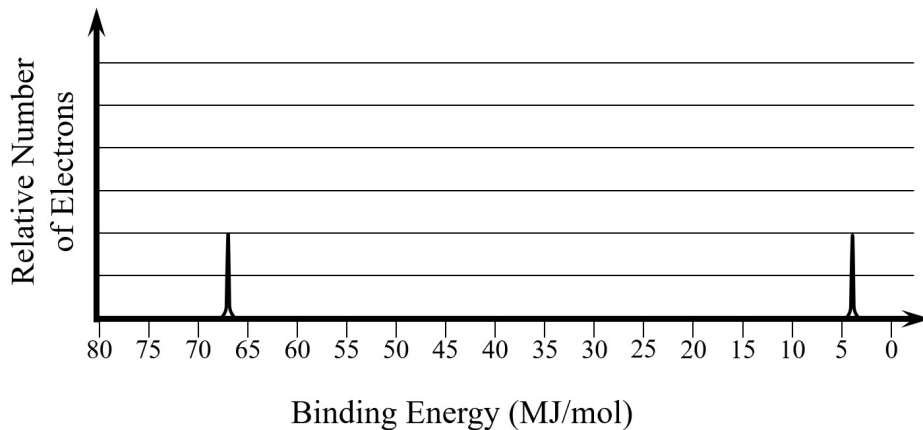
7. A 17.25-g sample of a compound containing C, H, and O is burned completely in excess O₂. Data from the combustion experiment is shown in the table above.
- (a) Determine the mass of carbon (C) present in 17.25 g of the compound.
- (b) Determine the mass of hydrogen (H) present in 17.25 g of the compound.
- (c) Determine the mass of oxygen (O) present in 17.25 g of the compound.
- (d) Determine the empirical formula of the compound.

8. A mixture of CaCl_2 and CaSO_4 contains 28.25% Cl by mass. Calculate the percentage of CaCl_2 by mass in this mixture.
9. A mixture has a mass of 13.50 g, and contains 5.25 g NaNO_3 and 8.25 g Na_2CO_3 . Calculate the percentage of Na by mass in this mixture.
10. Write the ground state electron configuration for each of the following.

Sr	
Sr^{2+}	
Zn	
Zn^{2+}	

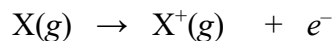


11. Write the correct symbol for the element that is represented by the PES diagram above. _____



12. A partial photoelectron spectrum of pure fluorine (F) is shown above. On the spectrum above, draw the missing peak that corresponds to the electrons in the $2p$ sublevel.
13. Which element, S or Cl, has a smaller value for its atomic radius? Justify your answer in terms of atomic structure and Coulomb's law.

Ionization energy is defined as the energy required to remove one mole of electrons from one mole of gaseous atoms (or ions) in their ground states. Removing the outermost electron from a neutral atom is called the first ionization energy, and is represented by the following equation.



14. Which element, S or Se, has a greater value for its first ionization energy? Justify your answer in terms of atomic structure and Coulomb's law.

15. Arrange the following elements in order of increasing electronegativity.

Carbon (C) Nitrogen (N) Silicon (Si)

smallest electronegativity	----->	largest electronegativity

Successive Values of Ionization Energies (kJ/mol) for Element X						
1 st IE	2 nd IE	3 rd IE	4 th IE	5 th IE	6 th IE	7 th IE
578	1817	2745	11,577	14,842	18,379	23,326

16. The table above represents data for successive ionization energies for a certain element X.

(a) How many valence electrons does element X have? Justify your answer.

(b) Write the empirical formula of the compound that should be formed between element X and oxygen (O). Justify your answer.

(c) A certain element that is located in period 2 of the periodic table has the same number of valence electrons as element X. Write the symbol of this element.