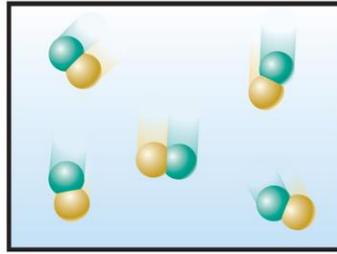


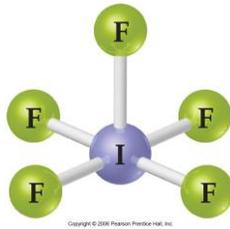
(i)



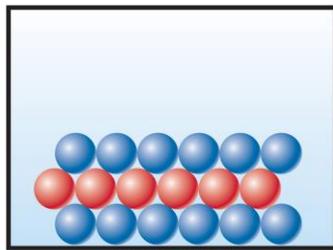
(ii)

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5. Write the chemical formula for the following compound. Is the compound ionic or molecular? Name the compound.



6. The following diagram represents an ionic compound in which the cations (positive ions) are indicated by the red spheres and the anions (negative ions) are indicated by the blue spheres. Which of the following formulas is consistent with the drawing: KBr , K_2SO_4 , $\text{Ca}(\text{NO}_3)_2$, $\text{Fe}_2(\text{SO}_4)_3$? Name the compound.



7. Determine whether each of the following statements is true or false; if false, correct the statement to make it true.
- The nucleus has most of the mass and comprises most of the volume of an atom.
 - Every atom of a given element has the same number of protons.
 - The number of electrons in an atom equals the number of neutrons in an atom.
 - The protons in the nucleus of the helium atom are held together by a force called the strong nuclear force.
8. Define atom number and mass number. Which of these can vary without changing the identity of the element?

9. Fill in the gaps for this table, some columns may represent neutral atoms, some ions.

Symbol	$^{59}\text{Co}^{3+}$				$^{75}\text{As}^{3-}$	
Protons		34	76	80		
Neutrons		46	116	120		118
Electrons		34		78		79
Net charge			2+			0

10. Using the periodic table, predict the chemical formula, and name, the compound formed with these elements:

- Ga and F
- Li and O
- Al and I
- K and S
- Na and P

11. State whether each of the following compounds is molecular or ionic:

- a) B_2H_6 b) CH_3OH c) LiNO_3 d) Sc_2O_3 e) CsBr f) NOCl
 g) NF_3 h) Ag_2SO_4

12. Write chemical formulas for the following compounds:

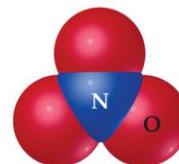
- aluminum hydroxide
- potassium sulfate
- copper(I)oxide
- zinc nitrate
- mercury(II)bromide
- iron(III)carbonate
- barium hydrogen carbonate

13. Name each of the following oxides. Assuming that the compounds are ionic, what charge is associated with the metallic element in each case?

- a) NiO b) MnO_2 c) Cr_2O_3 d) MoO_3

14. From the molecular structures shown here, identify the one that corresponds to each of the following species:

- chlorine gas
- propane
- nitrate ion
- sulfur trioxide
- methyl chloride



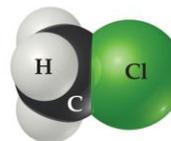
(i)



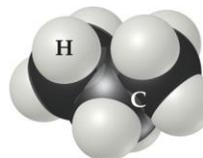
(ii)



(iii)



(iv)



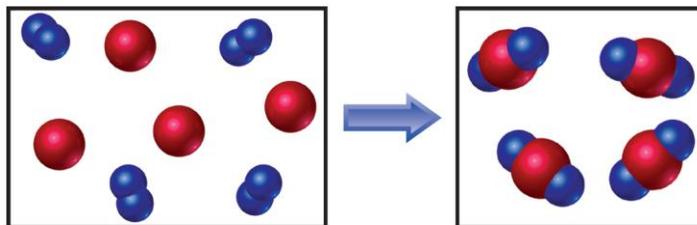
(v)

15. Draw a possible structure for cyclohexane (C₆H₁₂). Is the molecular formula for cyclohexane the same as it is for n-hexane, the straight chained version? Explain. Propose a structural formula for cyclohexanol, the alcohol derived from cyclohexane. (alcohols are organic molecules with at least one -OH group.)

16. The reaction between reactant A (red spheres) and reactant B (blue spheres) is shown in the following diagram:

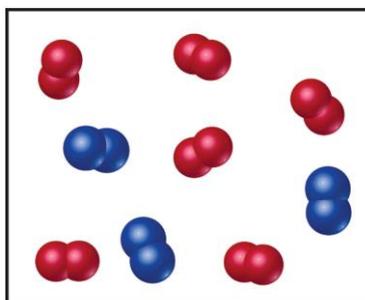
Based on this diagram, which equation best describes the reaction?

- a. $A_2 + B \rightarrow AB$
- b. $A_2 + 4B \rightarrow 2 AB_2$
- c. $2 A + B_4 \rightarrow 2 AB_2$
- d. $A + B_2 \rightarrow AB_2$



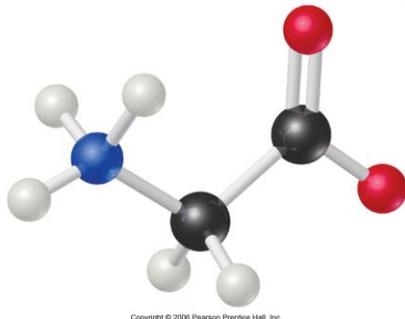
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17. The following diagram represents the collection of elements formed by a decomposition reaction. If the blue spheres represent N atoms, and the red ones represent O atoms, what was the empirical formula of the original compound?



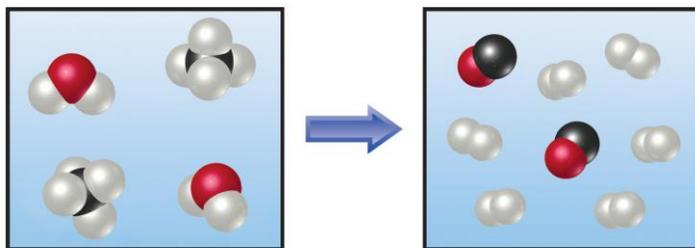
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18. Glycine, an amino acid used by organisms to make proteins, is represented by the molecular model below. a) Write its molecular formula. b) Determine its molecular mass. c) Calculate the percentage composition of glycine.



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19. The following diagram represents a high-temperature reaction between CH_4 and H_2O . Based on this reaction, how many moles of each product can be obtained starting with 4.0 mole CH_4 ?



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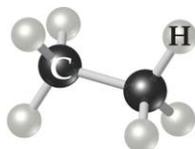
20. Calculate the percentage of carbon by mass in each of the compounds represented by the following models:



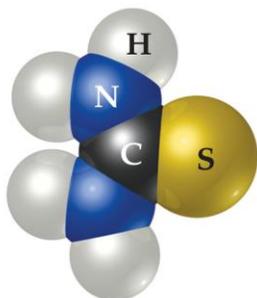
(a)



(b)



(c)

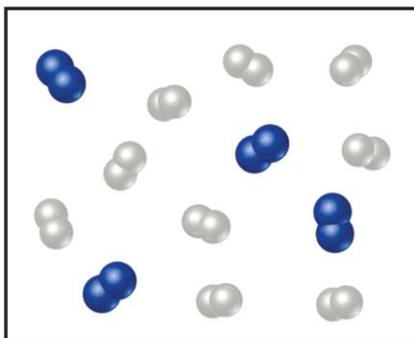


(d)

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21. Nitrogen (N_2) and hydrogen (H_2) react to form ammonia (NH_3). Consider the mixture of N_2 and H_2 shown in the accompanying diagram. The blue spheres represent N and the white ones represent H.

a) Draw a representation of the product mixture, assuming that the reaction goes to completion. b) How did you arrive at your representation? c) What is the limiting reactant in this case?



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22. Balance the following equations, and indicate whether they are synthesis, decomposition, combustion, or replacement reactions:

- a. $\text{Al} + \text{Cl}_2 \rightarrow \text{AlCl}_3$
- b. $\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- c. $\text{Li} + \text{N}_2 \rightarrow \text{Li}_3\text{N}$
- d. $\text{PbCO}_3 \rightarrow \text{PbO} + \text{CO}_2$
- e. $\text{C}_5\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- f. $\text{Al} + \text{FeCO}_3 \rightarrow \text{Al}_2(\text{CO}_3)_3 + \text{Fe}$
- g. $\text{K}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{KOH}$
- h. $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$

23. Given: $\text{Cu}_{(s)} + 4 \text{HNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_{2(aq)} + 2 \text{NO}_{2(g)} + 2 \text{H}_2\text{O}_{(l)}$

Determine the mass of copper that would be required to produce 4.00L of nitrogen dioxide gas at 102.5 kPa and 22°C.

24. Given: $2 \text{H}_{2(g)} + \text{O}_{2(g)} \rightarrow 2 \text{H}_2\text{O}_{(g)}$

How many liters of water vapor at STP can be made from 55.0 grams of oxygen gas and an excess of hydrogen?

25. Calcium carbonate decomposes at high temperatures to form carbon dioxide and calcium oxide according to the following equation:



How many grams of calcium carbonate will be needed to form 3.45 liters of carbon dioxide gas if collected at a pressure of 1.10 atm and a temperature of 299K?