

G9 Science: Class 3 Homework

1. Fill in the following chart by counting the number of atoms of each type:
- [4 marks]**

Formula	Type of Atom	Number of Atoms
NaOH		
	Total	

Formula	Type of Atom	Number of Atoms
BeHCO ₃		
	Total	

Formula	Type of Atom	Number of Atoms
(NH ₄) ₃ PO ₄		
	Total	

Formula	Type of Atom	Number of Atoms
CH ₃ CO ₂ H		
	Total	

2. Consider the following substances: Cl₂ H₂O Na CaCl₂
Which of the following are: **[4 marks]**

- a) Elements _____
- b) Compounds _____
- c) Atom _____
- d) Molecule _____

3. Complete the following table: **[8 marks]**

Chemical Name	Chemical Formula	Atom? Y/N	Molecule? Y/N	Element? Y/N	Compound? Y/N	Total number of atoms
Sulfur dioxide	SO ₂					
	Cl ₂					
	H ₂ O ₂					
	Si					
Carbon dioxide						
Butane	C ₄ H ₁₀					
Cholesterol	C ₂₃ H ₄₆ O					
	O ₃					

4. State whether each of the following is a molecular element, molecular compound or ionic compound: **[7 marks]**

- a) Iodine (I₂) _____
- b) Table Salt (NaCl) _____
- c) Vinegar (CH₃CO₂H) _____
- d) Propane (C₃H₈) _____
- e) Glucose (C₆H₁₂O₆) _____
- f) Ozone (O₃) _____
- g) Calcium chloride (CaCl₂) _____

5. Beryllium (Be) and fluorine gas (F₂) react to form beryllium fluoride (BeF₂). Draw a Bohr-Rutherford diagram to show how the electrons are transferred during this reaction.
[4 marks]

6. Potassium (K) and Oxygen (O_2) react to form K_2O . Draw a Bohr-Rutherford Diagram to show how the electrons are transferred during this reaction. **[3 marks]**

7. List the 7 diatomic molecules. **[7 marks]**

8. Consider the following substances: I_2 N_2O CuS Kr
Which of the following are: **[4 marks]**

- e) Elements _____
f) Compounds _____
g) Atom _____
h) Molecule _____

9. a) Draw the condensed Bohr-Rutherford Diagram for Beryllium atom (Be). **[2 marks]**

- b) Draw the complete Bohr-Rutherford Diagram for Beryllium ion (Be^{2+}) and what element does the Beryllium resemble? **[3 marks]**

10. Why are the noble gases the most stable elements? **[1 mark]**

Challenge Problems

11. A piece of jewelry that is made of 14 kt gold contains 14 parts gold and 10 parts copper.

- a. What percentage of the jewelry is gold? **[2 marks]**
- b. Do gold and copper form compounds in the jewelry? Explain. **[2 marks]**
- c. Explain how the 14 kt gold used to make jewelry is different from the element gold. **[2 marks]**

12. The formula for propane gas, often used as barbeque fuel is C_3H_8 . The formula for butane, the liquid fuel in cigarette lighters is C_4H_{10} . The wax in a candle is a mixture of molecules, one of which is $C_{30}H_{62}$.

- a. What is similar and what is different about the chemical compositions of these three substances? **[2 marks]**
- b. Consider the physical states of these three substances at room temperature and discuss any relationship you see between the formula and physical state. **[1 mark]**
- c. Are these substances considered molecules? Give reasons for your answer. **[2 marks]**

13. Using your knowledge about ions, describe how they are able to form large crystals with high melting points. **[3 marks]**

14. Design a simple fire extinguisher that produces carbon dioxide gas quickly when needed.
[3 marks]

15. The decomposition of hydrogen peroxide can proceed much more quickly if you add a catalyst. The catalyst speeds up the reaction without being consumed or chemically altered. Some contact lens storage cases contain a platinum catalyst. Explain why platinum is added to the storage container and not to the hydrogen peroxide bottle.
[2 marks]

16. Solutions of ionic compounds can conduct electricity, while solutions of covalent compounds often do not. Design a method of identifying a white powder that may either be the simple sugar glucose ($C_6H_{12}O_6$) or the highly poisonous sodium cyanide ($NaCN$). Include all required safety procedures. **[3 marks]**

17. A chemist carries out an experiment in which potassium metal (K) reacts with chlorine gas (Cl_2) to form the salt potassium chloride (KCl), an ionic compound. The salt is then dissolved in water, where it separates into potassium ions (K^+) and chloride ions (Cl^-).

a. Describe what happened in the outermost electron orbits of the potassium and chlorine atoms during the reaction. **[1 mark]**

b. A chloride ion has 17 protons. How many electrons does it have? **[1 mark]**

c. A potassium ion has 19 protons. How many electrons does it have? **[1 mark]**

18. On Planet X, three new elements were discovered. Some of their properties are listed in the table below:

Element Name	# of Protons	# of Neutrons	# of Electrons
A	12	14	12
B	20	21	18
C	9	9	10

- a) Use the table above to find the elements' atomic number and mass number.
[6 marks]

Element Name	Atomic Number	Mass Number
A		
B		
C		

- b) Which element does not have a charge? [1 mark] _____
- c) Which elements are ions? [2 marks] _____
- d) Which element is a cation? [1 mark] _____
- e) Which element is an anion? [1 mark] _____
- f) Draw a condensed Bohr-Rutherford Diagram for Element C below. [4 marks]

19. Hydrolysis is when electricity passes through water to produce hydrogen and oxygen.

- a. Describe a chemical test that could be done to identify which test tube contains oxygen. [2 marks]
- b. Why is it impossible for one of the gases to be carbon dioxide? [1 mark]