Worksheet 02: Elements Compounds Formulae and Symbols

Trimester school assessment - IB-style practice with SL and HL questions | Time: 50 minutes | Total: 40 marks

Name:	Class:	Date:	Total: 40 marks

Focus: Chemical symbols, formulae, fixed composition of compounds and how symbolic representation supports international communication.

Instructions: Answer all questions. Show working where relevant. HL questions are marked with [HL]. For extended responses, use clear scientific language and link particle-level explanations to observable properties.

Section A - Multiple choice (8 marks)

Choose the best answer, A, B, C or D. Each question is worth 1 mark.

1. Which symbol represents potassium?
A. P
B. Po
C. K
D. Pt

2. Which formula represents a compound containing three different elements?
A. O2
B. NaCl
C. Mg(OH)2
D. Cl2

3. Which sample has a fixed ratio of atoms?
A. air
B. seawater
C. bronze
D. water

4. Why is correct capitalization important in chemical symbols?
A. It changes only pronunciation.
B. It can change the substance represented.
C. It changes the state symbol only.
D. It is needed only for compounds.

5. Which statement about sodium chloride is correct?
A. It has the same properties as sodium and chlorine.
B. It is a mixture of sodium metal and chlorine gas.
C. It is a compound with properties different from its elements.
D. It can be separated into sodium and chlorine by filtration.

6. Which particle is the smallest part of an element that shows the characteristic properties of that element?
A. molecule
B. atom
C. compound
D. mixture

7. How many hydrogen atoms are represented in 2NH3?
A. 2
B. 3
C. 5
D. 6

8. [HL] A formula is a limited model because it does not directly show
A. which elements are present
B. the ratio of atoms
C. the three-dimensional arrangement or bonding details
D. the identity of atoms in the compound

Section B - Short answer (12 marks)

9. Explain the difference between the symbols C, Co and CO. (3)

10. For the formula CuSO4, state the elements present and the number of atoms of each element in one formula unit. (4)

11. Magnesium burns in oxygen to form magnesium oxide. Write a word equation and a balanced symbol equation with state symbols. (3)

[HL] 12. Suggest why an international system of symbols is important for chemistry as a collaborative science. (2)

Section C - Data response / case study (10 marks)

13. A museum label for four minerals gives the information below.

Mineral label	Main chemical information
A	pure sulfur, S
B	fluorite, CaF2
C	sapphire, mainly Al2O3 with trace impurities
D	granite, a mixture of several minerals

(a) Identify which label represents an element. (1)
(b) Identify which labels represent compounds as their main substance. (2)
(c) Explain why C may be described as impure even though Al2O3 is a compound. (2)
(d) Write the number ratio of aluminium atoms to oxygen atoms in Al2O3. (1)
(e) [HL] Explain why the physical properties of B cannot be predicted simply by averaging the properties of calcium and fluorine. (4)

Section D - Extended response (10 marks)

14. Sodium reacts with chlorine to form sodium chloride. Describe how the formula NaCl and the equation 2Na(s) + Cl2(g) -> 2NaCl(s) represent the reaction. Include fixed ratio, state symbols and the difference between elements and the compound. (10)

Answer Key and Marking Guidance - Worksheet 02

General marking guidance: Award marks for chemically correct answers expressed in equivalent wording. Do not award a mark twice for the same idea. For calculations, allow error carried forward if the method is correct. HL marking points may be used as extension credit where appropriate.

Section A: 1 C; 2 C; 3 D; 4 B; 5 C; 6 B; 7 D; 8 C

Section B: 9. C is carbon element (1); Co is cobalt element (1); CO is carbon monoxide, a compound containing carbon and oxygen (1). 10. Cu, S and O (1); Cu = 1 (1); S = 1 (1); O = 4 (1). 11. magnesium + oxygen -> magnesium oxide (1); 2Mg(s) + O2(g) -> 2MgO(s) (2, one for balancing and one for state symbols). 12. Shared symbols reduce ambiguity across languages (1) and allow scientists to communicate formulae, data and equations reliably (1).

Section C: 13(a) A (1). (b) B and C (2). (c) Al2O3 has fixed composition but the mineral sample can contain small amounts of other substances (2). (d) 2:3 (1). (e) Calcium and fluorine atoms become chemically bonded in a fixed structure (1); the compound has new properties not a simple average of the elements (1); bonding and arrangement influence melting point, solubility and reactivity (1); calcium metal and fluorine gas are not present as separate substances in CaF2 (1).

Section D: Award up to 10 marks. Include: reactants are elements Na and Cl2 (2); product is compound NaCl with fixed 1:1 ion ratio (2); coefficient 2 balances atom numbers (2); state symbols identify solid and gas states (2); properties of NaCl differ from sodium and chlorine because a new chemical substance forms (2).