

ConceptTests Distinguishing Ionic from Covalent Bonds

This is a series of questions that has to do with distinguishing between ionic and covalent bonds. Before asking this series of questions, the instructor should have gone over how to tell whether an element is a metal or nonmetal, and how to tell whether a compound is ionic or molecular, whether it has ionic or covalent bond.

Which of the following are metals?

1. Cl
2. K
3. H
4. P

Correct Answer: 2. K

Comment to Instructor: Students should already have been introduced to the distinction of metal vs. nonmetal by looking at the periodic table. This ConceptTest is to bring their attention to the distinction. Choice #3 means students are calling H a metal since it appears on the left side of the periodic table. Choice #4 may mean that students are thinking of P for Potassium, which is a metal, but this is unlikely as they would have looked up P in the table and it is on the right side of the table. After reminding them of the rule, go on to the next question.

Which of the following have primarily ionic bonds?

1. SCl_2
2. MnCl_2
3. Cl_2
4. Na

Correct Answer: 2. MnCl_2

Comment to Instructor: Choice #1 indicates students have no idea how to tell whether ionic bonds or there or not, or they think S is sodium and they remember vaguely that sodium chloride is table salt which is ionic. Choice #3 is selected because students may be thinking of chloride and remembers that chloride is an ion. The same goes for Choice #4, they think Na means sodium ions.

Review the rule that generally metals and nonmetals combine to form ionic compounds, with ionic bonds. Go on to the next question.

Which of the following bonds are ionic?

1. Cl_2O
2. SO_3
3. SnO
4. P_4S_{10}

Correct Answer: **3. SnO**

Comment to Instructor: Students shouldn't have a problem with this after you have reviewed the rule with them after the previous ConcepTest, unless they still don't know what how to tell which is a metal and which is a nonmetal.

Consider the subscript in SCl_2 . Which statement is correct?

1. S has a charge of 2+.
2. S has a charge of 2-.
3. None of these statements is correct.
4. Cl has a charge of 1-.

Correct Answer. **3. None of these statements is correct.**

Remind students that neither S nor Cl is a metal, so there are no ions here. None of them are charged. SCl_2 is a molecule with one S and two chlorine atoms.

Consider the subscripts in the solid compound MgCl_2 . Which statement best describes it?

1. A molecule of MgCl_2 contains one Mg atom and two chlorine atoms.
2. A molecule of MgCl_2 contains one Mg^{2+} ion and two Cl^- ions.
3. The MgCl_2 consists of one Mg^{2+} joined to two Cl^- ions.
4. MgCl_2 consists of Mg^{2+} and Cl^- ions in a ratio of 1:2.

Correct Answer: **4. MgCl_2 consists of Mg^{2+} and Cl^- ions in a ratio of 1:2.**

Comment to Instructor: Go over each statement to show why only Choice #4 is correct. Go on to the next question. Introduce the term "formula unit" to apply to ionic compounds when "molecule" is no longer appropriate. Explain that one formula unit of MgCl_2 has one Mg^{2+} and two Cl^- .
