

Identifying Solids

You will design and carry out an investigation using the physical properties of several substances to identify the type of solid.

Helpful info: Electrical resistivity is an intrinsic property that quantifies how strongly a given material opposes the flow of electric current. A low resistivity indicates a material that readily allows the movement of electric charge.

How to use multimeter to measure resistance:

- Switch on your multimeter, and set the dial to resistance mode.
 - Resistance is measured in ohms, indicated by the Ω symbol.
- Most multimeters are not autoranging, meaning you will need to set the correct range for the resistance you expect to measure. If you're not sure, start with the highest setting.
- Place one probe at each end of the circuit or component you want to test.
 - It doesn't matter which probe goes where; resistance is non-directional.
- If your multimeter reads close to zero, the range is set too high for a good measurement. Turn the dial to a lower setting.
- If you set the range too low, the multimeter simply reads 1 or OL, indicating that it is overloaded or out of range. This won't hurt the multimeter, but we need to set the dial to a higher range.
 - The other possibility is that the circuit or component you are testing doesn't have [continuity](#)—that is, it has infinite resistance. A non continuous circuit will always read 1 or OL on a resistance test.

Purpose: To determine the types of solids (ionic, metallic, or molecular covalent) of six unidentified substances

Equipment & Materials:

- Safety glasses
- 6 unknown solids
- List all other equipment you will require for this lab.

Procedure:

1. Write out a set of steps to collect data that will help you to identify the types of solids for six unidentified substances. Be sure to number your steps. Steps should be short but easy to follow. Describe any safety precautions you will take. Be sure to look at Table 1 to see what you will need to test.

2. Once your teacher has approved your design, carry out your procedure.

NOTE: The Materials and Procedure section of this lab will be worth 15 marks for this lab. Unlike future labs, you cannot just reference materials and procedure.

Observations and Data:

Be sure to record **detailed** observations **in addition** to completing the table:

Table 1: (copy into your lab report)

Unknown	Appearance at room temperature	Hardness	Solubility in water	Conductivity of aqueous solution	Conductivity of solid	Melting point (high or low)	(analysis) Type of Bond
A							
B							
C							
D							
E							
F							

Analysis:

Initial Paragraph: For each unknown, explain how you determined the type of bond (on a chemical level, be detailed. *Ex. Ionic bonds dissolve in water because the dipoles of the water are able to pull the ions out of their crystalline lattice, Since ___ dissolved in water that lead us to believe it was bonded ionically).*

Questions

1. List the physical properties that indicate ionic bonding exists in a compound (in general).
2. List the physical properties that indicate covalent bonding exists in a compound (in general).
3. List the physical properties that indicate metallic bonding exists in a compound (in general).
4. Which compounds melted most easily? Using their determined bond types explain why some substances melt easily and the others do not melt at all.
5. Is there any one property that best indicates whether a compound is molecular, ionic or metallic? Explain.
6. Why can metallic compounds conduct electricity, ionic compounds can conduct electricity when aqueous and covalent compounds cannot conduct electricity?
7. Sodium nitrate has several covalent bonds, yet the substance has primarily ionic character. How can this be possible? (Hint: think about the specific ions that make up the compound.)

Lab Report Rubric

	A (100%-80%)	B (80%-60%)	C (60%-50%)	D (50% or less)
Purpose /2	Purpose describes the reason for doing the experiment	Purpose describes part of the reason for the experiment	Purpose doesn't describe the reason for doing the experiment	no purpose
Hypothesis /3	Hypothesis is educated, gives expectations and relates to purpose	Hypothesis appears to be uneducated or unrelated to the purpose	Hypothesis appears to be uneducated and unrelated to the purpose	No hypothesis
Materials and Procedure /15	The procedure is easy to follow and includes all details needed to successfully meet the purpose. All materials and equipment required are listed.	The procedure is easy to follow and includes some details needed to successfully meet the purpose. Almost all materials and equipment required are listed.	The procedure is difficult to follow and/or does not include all details needed to successfully meet the purpose. Not all materials and equipment required are listed.	No procedure or materials
Data and Observations /15	Observations are detailed and include information of before during and after the experiment	Observations are not detailed or don't include information from before, during and after the reaction	Observations are not detailed and don't include information from before, during, or after reaction	Observations do not exist
Analysis & Questions /15	Analysis explains observations (ie. what was happening on a chemical level) in a separate paragraph. Analysis questions are also answered correctly.	Analysis answers questions but doesn't completely explain observations	Analysis does not explain observations and questions are answered incorrectly	Analysis contains very little analytical information or does not exist
Conclusion /5	Answers purpose, relates to hypothesis and is correct.	Answers purpose or relates to hypothesis and is correct	Doesn't answer purpose/ hypothesis, or is incorrect	Doesn't exist
Sources of Error /3	Has more than 2 correct sources of error	Has 2 correct sources of error	Has less than 2 correct sources of error	Has no sources of error
Format /5	Neat, headings, ruler used, name and partner (s) included.	Neat, but may not be formatted properly	A little messy but proper formatting	Messy and not properly formatted.