92

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CHM. 121.004
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Lab Report – Experiment 14
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Experiment Objective

The objective of this experiment was to classify unknown substances into four different main categories and/or some combination categories. We will perform a series of test to determine if the substance is Ionic, Ionic with waters of hydration, Macromolecular, Metallic, Molecular, Molecular and Ionic, or Molecular and Ionic with waters of hydration. We will be testing the solubility, electrical conductivity, and melting point range of each unknown to identify it.

Conclusion

The lab itself was not very difficult, we performed our series of tests to each of the unknowns and collected all of our data. It was surprising to me that none of the solids were electrically conductive. At first I thought the 10-level conductivity tester was not working properly. I decided to test the device by putting the probes into some tap water. The device was in fact working properly which means that none of the solids were electrically conductive. On the classification and reason page, I had some trouble trying to figure out what to classify unknown C as. It did not perfectly match any one type of substance according to the given example chart. As a matter of fact, I found most of the worksheets to be very confusing and I didn't know what some of the questions were asking for. Because of this, I'm not sure if I did the lab worksheets correctly. In conclusion, we classified unknown A as a Macromolecular substance, unknown B as an Ionic with waters of hydration substance, unknown C as a Molecular substance, unknown D as a Molecular substance, and unknown E as an Ionic substance.

ADVANCE STUDY ASSIGNMENT

1) What would you expect to see, to distinguish among the following three classifications of substances:

a) a water soluble ionic substance

- Not Soluble in ethyl alcohol and cyclohexane.
- Only electrial Conductivity in water Solution
- melting range of 300°c - 1000°c

b) a water soluble ionic substance with waters of hydration

- will change color other than brown - black when heated
- Some Soluble in water
- electrical Conductivity in water Solution
- melting range of <200 °c

and c) a water soluble ionic-molecular combination substance?

- Soluble in water, ethyl alcohol, cyclohexane
- electrical Conductivity in water Solution and melt
- melting range 300°c - 1000°c or <300°c / decomposes

2) If substances are only classified as ionic, macromolecular, metallic, and molecular, in which, IF ANY, categories are ALL the members:

a) Soluble in water ~~Ionic, Molecular~~ -2

b) Electrical conductors when melted Ionic, metallic ✓

c) Insoluble in all common solvents Macromolecular, metallic ✓

d) Solids at room temperature Ionic, Macromolecular, ~~metallic~~

3) Classify each substance below into one of the following seven categories: ionic, ionic with waters of hydration, ionic-molecular, ionic-molecular with waters of hydration, metallic, macromolecular, or molecular.

a) A white solid melts at 250°C without decomposing. The liquid melt doesn't conduct electricity.

Molecular ✓

b) A white solid melts at 1000°C. The liquid melt doesn't conduct electricity.

Macromolecular ✓

c) A solid conducts electricity and undergoes a color change to brownish-black when being heated in a flame-dried test tube.

~~Ionic-molecular~~ -1

d) A solid doesn't conduct electricity and undergoes a color change to brownish-black when being heated in a flame-dried test tube.

Molecular ✓

e) A solid doesn't conduct electricity, but its melt does.

Ionic ✓

f) A solid dissolves in water, and the water solution conducts electricity. The solid also melts in a water bath.

Ionic ~~with waters of hydration~~ molecular -1

g) A solid reacts violently with water. The resulting water solution conducts electricity. When the solid melts, the melt also conducts electricity.

~~Ionic~~ -1

h) A solid dissolves in water and the water solution conducts electricity. The solid also changes color to white and gives of vapor when heated in a flame-dried tube.

Ionic with waters of hydration ✓

i) A gas dissolves in water. The resulting solution conducts electricity.

~~Ionic~~ -1

j) A solid dissolves in a polar organic solvent. The solid melts in a water bath. While melting in the water bath, the solid changes color from red to blue and gives off vapor.

Molecular and Ionic with waters of hydration ✓

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CLASSIFICATION OF CHEMICAL SUBSTANCES

UNK	SOLUBILITY			ELECTRICL CONDUCTIVITY		APPROXIMATE MELTING POINT RANGE
	Water	Polar Organic Solvent Ethyl Alcohol	Nonpolar Organic Solvent Cyclohexane	Water Solution	Solid	
A	NO	NO	NO	0	0	>650 °C
B	Yes	NO	NO	Yes 10	0	>650 °C
C	NO	Yes	NO	0	0	<100 °C
D	NO	NO	NO	0	0	100-650 °C
E	Yes	Yes	NO	Yes 8	0	<100 °C

B: Condensation

D: Changed brown and black

UNK	CLASSIFICATION AND REASON
A	This is a Macromolecular Substance because it is not soluble in any liquid, has no electrical conductivity in any form, and has a high melting point.
B	This is an Ionic Substance with waters of hydration because it had Condensation when being heated and melted the properties of an Ionic Substance. It had high electrical Conductivity in water and was Soluble in water.
C	This is a Molecular Substance because it is Soluble in ethyl alcohol and melted in the boiling water.
D	This is a Molecular Substance because it very cleanly decomposed when put under a flame. It also had no electrical Conductivity in water which is why it is not Molecular and Ionic.
E	This is a Ionic Substance because it has electrical Conductivity in water and Soluble in + H_2O hydration