Covalent Bonding - Properties of Simple Molecules

1. Look at the properties of each simple molecule in the data table below:

Simple Molecule	State of Matter at Room Temperature	Melting Point (°C)	Boiling Point (°C)	Can Conduct Electricity?
fluorine	gas	-219.67	-188.11	no
bromine	liquid	-7.20	-58.80	no
iodine	solid	113.70	184.40	no
water				no
carbon dioxide	gas	-56.60	-78.50 (sublimes)	no
methane	gas	-182.50	-161.50	no

a. Complete the missing data for water.

b. Which state of matter is the most common for simple molecules? _____

c. State the range of melting points. _____ to _____

d. What do you notice about the melting points?

_____

_____

e. What do you notice about the boiling points?

_____

_____

f. Which simple molecule doesn't fit the pattern? _____

g. Look at the location of this anomaly on the periodic table. Can you suggest why this doesn't fit the pattern?

_____

_____

h. Why do you think **none** of these simple molecules can conduct electricity? (Clue: Think back to ionic compounds dissolving in water.)

_____

_____

Answers

1. Look at the properties of each simple molecule in the data table below:

Simple Molecule	State of Matter at Room Temperature	Melting Point (°C)	Boiling Point (°C)	Can Conduct Electricity?
fluorine	gas	-219.67	-188.11	no
bromine	liquid	-7.20	-58.80	no
iodine	solid	113.70	184.40	no
water	**liquid**	**0**	**100**	no
carbon dioxide	gas	-56.60	-78.50 (sublimes)	no
methane	gas	-182.50	-161.50	no

a. Complete the missing data for water.

b. Which state of matter is the most common for simple molecules? **Gas, then liquid.**

c. State the range of melting points. **-219.67°C** to **113.70°C.**

d. What do you notice about the melting points?

Most are very low/minus numbers. For example, fluorine has a melting point of -219.67°C.

e. What do you notice about the boiling points?

Again, most are very low/minus numbers. For example, fluorine has a boiling point of -188.11°C.

f. Which simple molecule doesn't fit the pattern? **iodine**

g. Look at the location of this anomaly on the periodic table. Can you suggest why this doesn't fit the pattern?

Iodine is part of group 7 (the halogens). In the period, fluorine and bromine are above iodine. They are smaller molecules and therefore have weaker intermolecular forces between the molecules. Therefore less energy is needed to overcome these forces and change into a liquid or gas. On the other hand, iodine is larger and so more energy is needed to overcome the stronger intermolecular forces between the I_2 molecules. Therefore, iodine has a higher melting and boiling point.

h. Why do you think **none** of these simple molecules can conduct electricity? (Clue: Think back to ionic compounds dissolving in water.)

The molecules are not charged due to no electrons being transferred, like ionic bonding. There are no free electrons or ions to carry the electrical charge.