Separating Two Solids Without Breaking Bonds

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A display compares a molecular solid and a covalent network solid. They have the same overall X-to-Y atom ratio of 1:2. The first setting disrupts attractions between separate molecules while leaving every X–Y bond intact. The second setting can break X–Y bonds.

Sample	**Observed after the first setting**
P	Six separate particles, each with one X bonded to two Y
Q	One connected piece with six X and 12 Y atoms

1 Which observation supports a molecular structure for the original sample?

(1) P separates into intact XY_2 units.

(2) Q has 12 Y atoms.

(3) Both samples have a 1:2 ratio.

(4) Both samples contain X atoms.

2 Find the total atom count in P after separation. Compare it with the atom count in Q's connected piece. [1]

Answer and work

3 Identify the network solid. Use the observation from the first setting to explain your identification. [1]

Answer and work

A third setting restores attractions between separate molecules but cannot form any X–Y bonds. A technician tests this setting on the separate units recovered from P in the first setting. The technician also tests it on pieces cut from Q by breaking X–Y bonds in the second setting.

4 Which sample can the third setting restore to its original type of solid? Explain using the changes to the bonds or attractions in both samples. [1]

Answer and work