Reading the Bonds in a Phosphate Model

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

A display models a solid made from Ca^{2+} ions and PO_4^{3-} ions. Inside each phosphate ion, phosphorus and oxygen atoms share electrons. The full solid has no net charge. A display card lists proposed counts of each kind of ion.

Model	**Ca^{2+} ions counted**	**PO_4^{3-} ions counted**
J	2	2
K	3	2
L	3	1

1 Which set of counts gives a total charge of zero?

(1) J only

(2) K only

(3) L only

(4) J and K

2 Explain how the solid can contain both covalent bonds and ionic attractions. Identify the particles involved in each. [1]

Answer and work

A student writes the formula Ca_3PO_8 for the display card because the chosen count includes eight oxygen atoms. The card needs to preserve the count of intact phosphate ions.

3 Write the formula that preserves both intact phosphate ions, and explain what the subscript outside the parentheses means. [1]

Answer and work

4 In the counting model, what net charge remains if one calcium ion is removed from K and no other ion leaves? Explain. [1]

Answer and work