Checking Charge After a Crystal Substitution

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

A ceramic model begins with six metal ions M^{2+} and six oxide ions O^{2-}. The display replaces two of the M^{2+} ions with two Li^{+} ions in their sites. The model then adjusts the ion counts to restore zero total charge.

State	**M^{2+} ions**	**Li^{+} ions**	**O^{2-} ions**
Start	6	0	6
After replacement only	4	2	6

1 What total charge does the model have just after replacement?

(1) −4

(2) −2

(3) 0

(4) +2

2 Find the number of oxide ions that could remain if removing oxide is the only way to restore zero charge. [1]

Answer and work

A second compensation model leaves all six oxide ions in place and adds one M^{2+} ion at a new site. Both models can restore zero total charge.

3 A structural reading shows five oxide ions. Use the models to identify which change it supports. [1]

Answer and work

4 State the final M^{2+} and oxide counts in each neutral model. Explain why the same net charge does not distinguish the models. [1]

Answer and work