Finding a Missing Ion Count in a Mixture

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

A teaching model combines two ionic solids. Each solid contains the negative ion X^-. Solid P contains M^{2+} and X^-, and solid Q contains N^+ and X^-. The solids are electrically neutral. The model reports the ions that came from both solids together.

Ion	Count
M^{2+}	12
N^+	8
X^-	Hidden

1 How many X^- ions must appear in the combined record?

(1) 20

(2) 24

(3) 32

(4) 40

2 How many X^- ions in the combined record came from P? Explain using the formula of P. [1]

Answer and work

The model makes a second neutral mixture. It replaces four M^{2+} ions with four N^+ ions by changing the amounts of the two solids. The same total number of positive ions remains.

3 Predict the X^- count in the second mixture. Show your reasoning. [1]

Answer and work

4 Explain why counting the total number of positive ions cannot by itself predict the negative-ion count in both mixtures. [1]

Answer and work