Comparing Charge Carriers in Two Salt Solutions

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

A class compares equal volumes of two salt solutions in a classroom conduction model. Positive and negative ions move in opposite directions and both contribute to current. In this simplified comparison each ion type contributes its amount multiplied by the size of its charge. The model treats the other factors affecting current as equal.

Solution	**Positive ions (mmol)**	**Negative ions (mmol)**
P	30 Na^{+}	30 Cl^{-}
Q	20 Ca^{2+}	40 Cl^{-}

1 Which statement describes the total amounts of ions in the two solution samples?

(1) P has 60 mmol ions, and Q has 40 mmol.

(2) P has 30 mmol ions, and Q has 20 mmol.

(3) Both have 60 mmol ions.

(4) Q has more ions because calcium has a +2 charge.

2 Calculate the sum of the two current contributions for each solution in model units. [1]

Answer and work

3 Evaluate the claim that equal total amounts of ions guarantee equal current in this model. [1]

Answer and work

A new sample of Q has 15 mmol Ca^{2+} and 30 mmol Cl^{-} in the same volume used before. The model conditions are otherwise unchanged.

4 Use the new amounts to compare the new Q contribution with the original P contribution. [1]

Answer and work