For which kinds of specifications $P$ and $Q$ is the following a theorem:

(a) $\neg (P \cdot \neg Q) \iff P \cdot Q$

(b) $P \cdot Q \iff \neg (P \cdot \neg Q)$

(c) $P \cdot Q = \neg (P \cdot \neg Q)$

After trying the question, scroll down to the solution.
§ First, rewrite the two sides.
\[ \neg (P \cdot \neg Q) = \forall \sigma'' \cdot (\sigma' \cdot P) \sigma'' \Rightarrow (\sigma \cdot Q) \sigma'' \]
\[ P \cdot Q = \exists \sigma'' \cdot (\sigma' \cdot P) \sigma'' \land (\sigma \cdot Q) \sigma'' \]

(a) \[ \neg (P \cdot \neg Q) \iff P \cdot Q \]
§ If, for all prestates, \( P \) is deterministic, then (a) is a theorem. (That's sufficient, but not necessary.)

(b) \[ P \cdot Q \iff \neg (P \cdot \neg Q) \]
§ If, for all prestates, \( P \) is satisfiable (\( P \) is implementable), then (b) is a theorem.

(c) \[ P \cdot Q = \neg (P \cdot \neg Q) \]
§ If, for all prestates, \( P \) is satisfiable and deterministic, then (c) is a theorem.