Quiz 8: Bounds on Information Processing

Question 1. Which of the following states has the largest value of $I(A:B)$?

(a) $\rho_{AB} = |0_A\rangle\langle 0_A| \otimes |1_B\rangle\langle 1_B|$.

(b) The maximally mixed state.

(c) The maximally correlated state.

(d) The maximally entangled state.

Question 2. Which of the following states has the largest value of $H(A|B)$?

(a) $\rho_{AB} = |0_A\rangle\langle 0_A| \otimes |1_B\rangle\langle 1_B|$.

(b) The maximally mixed state.

(c) The maximally correlated state.

(d) The maximally entangled state.

Question 3. For which of the following classes of states does monotonicity, $H(AB) \geq H(A)$, hold?

(a) Classical states.

(b) Product states.

(c) Pure states.

Question 4. Suppose Alice and Bob share a state between systems A and B. Which of the following are true?

(a) Alice cannot increase $I(A:B)$ by performing operations on her system.

(b) Alice cannot increase $I(A:B)$ by sending Bob classical information.

Question 5. Suppose Alice and Bob share a maximally entangled state of dimension d. They perform some operations individually on their systems without communicating. Which of the following states can they produce?

(a) A maximally entangled state of dimension $d+1$.

(b) A maximally mixed state of dimension $d+1$.

(c) A maximally correlated state of dimension d.