

#### Quiz 4 (Lecture 06 QBIO482)

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What is the natural distribution that evolves during diffusion, and what distribution is observed at equilibrium? [0.1 pt]

The natural distribution that evolves during diffusion follows a Gaussian (normal) distribution over time. At equilibrium, the distribution becomes uniform across the domain. This means the quantity has spread evenly and no net diffusion occurs.

List two reasons why using the Laplacian is useful in a simulation. [0.1 pt]

1. Captures spatial variation

The Laplacian operator quantifies how a value at a point differs from its neighbors, which is essential for modeling how diffusion smooths out concentration differences.

2. Enables compact and general formulation

It provides a concise way to express diffusion in any number of dimensions and coordinate systems.

Give one biological application of diffusion on a spherical surface. [0.1 pt]

One biological application of diffusion on a spherical surface is signaling on a cell membrane. Many biological signaling molecules diffuse along the spherical surface of a cell membrane, affecting receptor activation and intracellular response.