What Is the Cell Membrane and How Does Transport Work?

Worksheet

The cell membrane is a phospholipid bilayer embedded with proteins that regulates the movement of substances via passive transport (diffusion, osmosis, facilitated diffusion) and active transport, which requires ATP.

Questions

1. Which transport type requires ATP?

A) Simple diffusion
B) Osmosis
C) Active transport
D) Facilitated diffusion

2. A cell placed in a hypertonic solution will:

A) Swell and burst
B) Shrink (crenate)
C) Stay the same size
D) Explode instantly

3. What is osmosis?

A) Movement of proteins across a membrane
B) Movement of water across a selectively permeable membrane
C) Active pumping of ions
D) Cell division

4. The sodium-potassium pump moves ions:

A) With their gradient using no energy
B) Against their gradient using ATP
C) Only sodium, never potassium
D) Randomly with no pattern

5. A red blood cell is placed in a hypotonic solution (0.1% salt) versus its normal isotonic plasma (0.9% salt). What happens?

6. The Na+/K+ pump moves 3 Na+ ions out and 2 K+ ions in for every 1 ATP hydrolyzed. How many ions cross per 5 ATP?

7. A cell in a solution with 0.5 M glucose outside and 0.2 M glucose inside relies on facilitated diffusion via GLUT carriers. Which direction does glucose move?

8. Define: What is the cell membrane made of?

9. Define: Difference between diffusion and osmosis?

10. Define: What powers active transport?

Answer Key

1. C) Active transport - Active transport moves substances against their gradient, which requires energy from ATP.

2. B) Shrink (crenate) - In a hypertonic solution, water leaves the cell, causing it to shrink.

3. B) Movement of water across a selectively permeable membrane - Osmosis is the diffusion of water specifically.

4. B) Against their gradient using ATP - It actively pumps 3 Na+ out and 2 K+ in per ATP, against their gradients.

5. Compare solute concentration inside vs outside the cell Outside solute (0.1%) is less than inside (~0.9%), so water moves INTO the cell by osmosis The cell swells and may burst (hemolysis)

6. Per ATP: 3 Na+ out + 2 K+ in = 5 ions moved For 5 ATP: 5 5 = 25 ions total 15 Na+ out and 10 K+ in

7. Compare the gradient: outside (0.5 M) is greater than inside (0.2 M) Facilitated diffusion follows the gradient, no ATP needed Glucose moves INTO the cell through GLUT channel proteins

8. A phospholipid bilayer with embedded proteins, cholesterol and carbohydrate chains (fluid mosaic model).

9. Diffusion moves any solute along its gradient; osmosis is specifically water moving across a selectively permeable membrane.

10. ATP - active transport moves substances against their concentration gradient.