Corrected

+3.5

QUIZ 1, APRIL 26, 2004
CELL PHYSIOLOGY

NAME [redacted] STUDENT NUMBER 012-28-1979

Single Choice:

WRITE THE CORRECT ANSWER ON THE ANSWER SHEET PROVIDED & TURN THE ANSWER SHEET IN. (Keep the question sheet)

1. Integral (intrinsic) membrane proteins:

   a. are membrane-spanning proteins exposed to both cytoplasm and extracellular fluid.
   b. are channels specific for one type of ion.
   c. are only present on either the cytoplasmic surface of the cell membrane or on the extracellular surface of the cell membrane.
   d. are only present on the cytoplasmic surface of the cell membrane or on the extracellular surface of the cell membrane, but they rapidly switch from one surface to the other.

2. The phospholipid bilayer of the cell membrane

   a. is mechanically strong. cell membranes are weak.
   b. is an electrical insulator.
   c. easily dissolves hydrophilic solutes and ions.
   d. is rigid and does not allow any integral membrane proteins to move within it.

3. The diffusion of a nonelectrolyte in a porous membrane is being studied in a laboratory device. In the first experiment, the flux is measured to be 8×10^{-6} mols cm^{-2} sec^{-1}. Then for the second experiment, the thickness of the porous membrane is doubled, but all concentrations and other conditions are the same. The flux in the second experiment should be about:

   $2 = \frac{10}{5}$

   $J = D \frac{\Delta C}{\Delta X}$

   $1 = \frac{10}{10}$

   a. 8×10^{-6} mols cm^{-2} sec^{-1}.
   b. 16×10^{-6} mols cm^{-2} sec^{-1}.
   c. 4×10^{-6} mols cm^{-2} sec^{-1}.
   d. 11×10^{-6} mols cm^{-2} sec^{-1}.

4. The chloride-bicarbonate exchanger in red blood cells is a counter-transporter that transports 1 Cl^- ion in exchange for 1 HCO_3^- ion. Which is a true statement about this system? 2° active transport

   a. This transport process is electrogenic.
   b. HCO_3^- transport by this system requires the presence of Cl^-.
   c. ATP is hydrolyzed by this transporter to provide the energy for the process.
   d. This transporter can only move HCO_3^- out of the cell; it's direction cannot be reversed.

5. The cell membrane is an electrical capacitor. Because of this, changing the voltage across the membrane (membrane potential)

a. is impossible.
b. will change the amount of electrical charge stored on the capacitor.
c. will have no effect on the amount of charge stored on the capacitor.
d. will remove all the charge stored on the capacitor.

Na/K pump 3Na out & K in

6. When a healthy nerve cell is at its resting membrane potential

rest = Na in, K out

a. Na^+ is constantly leaving the cell through Na^+ channels.
b. Na^+ is constantly being pumped out of the cell by the Na^+ pump.
c. K^+ is constantly entering the cell through K^+ channels.
d. There is no movement of ions into or out of the cell because a true equilibrium has been attained.

7. During the rising phase (upstroke) of the nerve action potential, as the membrane potential approaches its peak level, which is true?

a. E_K changes from about -90 mV to about +40 mV.
b. E_{Na} changes from about +60 mV to about -90 mV.
c. $T_{Na} < T_K$
d. $T_{Na} > T_K$

8. Which of the following nerves should have the highest conduction velocity, all other things being equal?

a. diameter = 1 micron, unmyelinated
b. diameter = 10 microns, unmyelinated
c. diameter = 1 micron, myelinated
d. diameter = 10 microns, myelinated

Conduction velocity proportional to $\frac{\lambda}{\tau}$ (long / time)