Biomolecular Applications for bioMEMS - Assessment
Participant Guide

Description

This assessment should be completed after completing the *Biomolecular Applications for BioMEMS Learning Module*. There is a matching chart and ten questions.

Matching (with answers)

Indicate the BEST type of biomolecules to perform each of the bioMEMS functions listed below.

		BioMEMS Function		Type of biomolecule
	1	Recognizing the presence of a pathogen by a unique pathogen DNA sequence	A	Proteins
	2	Filtering large macromolecules from smaller molecules in a complex solution	B	Nucleic acids
	3	Forming a container for a water-soluble drug	C	Lipids
	4	Sensing the presence of an environmental pollutant		
	5	Moving a particle across the surface of a bioMEMS device		
	6	Detection of changes in blood sugar levels in diabetic patients		
	7	Detection of a disease state by changes in expression levels of key genes		
	8	Catalyzing a specific chemical reaction		

Table 1: BioMEMS Functions vs. Biomolecule

1.   **Which of the following has the smallest size?**
        a. distance across a lipid bilayer
        b. diameter of a microtubule
        c. diameter of a DNA double helix
        d. diameter across a liposome vesicle
        e. diameter of a bacterial flagellum

2.   **Which of the following has the largest size?**
        a. distance across a lipid bilayer
        b. diameter of a microtubule
        c. diameter of a DNA double helix
        d. diameter across a liposome vesicle
        e. diameter of a bacterial flagellum

3.   **Which type of protein has the largest channel diameter?**
        a. Bacterial membrane porins
        b. Bacterial S-layer proteins
        c. Microtubules
        d. Tobacco Mosaic virus

4.   **Which of the following best explains the reason that biomolecules have such specific recognition properties?**
        a. Nonpolar and hydrophobic interactions
        b. Polar and hydrophilic interactions
        c. Both nonpolar/hydrophobic and polar/hydrophilic interactions
        d. A specific covalent bond in a lock and key type of position

5.   **Which of the following properties of biological molecules is NOT an advantage in bioMEMS applications?**
        a. Ability to self-assemble, based on inherent chemical and surface interactions
        b. Ability to self-renew, providing a self-assembling and self-perpetuating property
        c. Precision in the structures that they form
        d. Their highly discriminating recognition properties
        e. Nanoscale size of their structures

6.   **Which of the following proteins would be best suited for moving particles to different positions on a bioMEMS surface?**
        a. Kinesin and microtubules
        b. Kinesin and actin microfilaments
        c. Flagellin motor proteins and flagellin proteins
        d. Myosin and flagellin proteins
        e. ATP synthase and flagellin proteins

7.   **Which of the following requires a lipid membrane in order to function?**
    a. A glucose oxidase enzyme that binds to glucose molecules and oxidize them
    b. A DNA microarray
    c. A protein microarray
    d. ATP synthase
    e. Microtubules

8.   **Which of the following could be used for transfer of small molecules into or out of lipid vesicles?**
    a. Bacterial porin and transmembrane channel proteins
    b. Bacterial porin proteins only
    c. Transmembrane channel proteins only
    d. Transmembrane receptor and cell surface receptor proteins
    e. Cell surface receptors only

9.   **Which of the following would be best suited for a protein microarray?**
    a. Single-stranded DNA molecules
    b. Cell surface receptors
    c. Antibodies
    d. Bacterial S-layer proteins

10.   **Which of the following stimuli could be used to provide power for synthesis of ATP by the enzyme ATP synthase?**
    a. Binding of a specific activator in the enzyme active site
    b. A sudden shift in pH
    c. Addition of a proton-carrier protein
    d. Coupling this enzyme with another enzyme that makes ADP available