MEMS Applications Overview Assessment
Instructor Guide

Note to Instructor

The objective of this MEMS Applications Overview Assessment is to assess the participant's knowledge and understanding of the information covered in the MEMS Applications Overview Learning Module.

The MEMS Applications Overview Learning Module:
- MEMS Applications Overview Primary Knowledge
- MEMS Applications Overview Research Activity
- **MEMS Applications Overview Assessment**

There are ten (10) assessment questions. Below are the questions with answers.

1. **What of the following BEST describes MEMS?**
    a. A microdevice such as a pump or laser used to simulate a similar macro device
    b. A microdevice or groups of devices that integrate both mechanical and electrical components
    c. A series of small devices that work together to accomplish the required task
    d. Micro size devices that measure pressure and acceleration.

    Answer: b.

    A microdevice or groups of devices that integrate both mechanical and electrical components. A MEMS is a MicroElectroMechanical System.

2. **List five commercial fields in which MEMS have already proven to be beneficial.**

   _____   _____

   _____   _____

   _____

   Answer:
   Consumer Products
   Aerospace
   Automotive
   Biomedical
   Chemical
   Wireless and optical communications
   Optical displays
   Fluidics
   And others

3. **What type of MEMS device is used as the deployment sensor in automotive airbag systems?**

   _____

   Answer:
   An inertial sensor / accelerometer

4. **Describe the basic operation of a MEMS Pressure Sensor.**

   Answer:
   A MEMS pressure sensor consists of a flexible diaphragm with one side sealed to a fixed reference pressure and the other side exposed to the elements. The diaphragm moves with a change in the external pressure. The MEMS electronics sense the change and provides an output pressure reading.

5. **What type of MEMS device is used in medical infusion pumps to identify blockage in the flow tubes?**

   _____

   Answer:
   Pressure Sensor

6.　　　　**What are two types of inertial sensors?**

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　　　　Answer:
　　　　Accelerometers and gyroscopes

7.　　　　**Describe the basic operation of an accelerometer.**

　　　　Answer:
　　　　The simplest MEMS accelerometer consists of a suspended inertial mass. This mass is affected by forces as a result in an acceleration or change in velocity. This change causes the mass to deflect from its nominal position. This deflection of mass is converted to an electrical signal as the sensor's output.

8.　　　　**State three applications of MEMS in the medical field. Identify at least one type of sensor that could be used in each application.**

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　　　　Answer:
　　　　Dispensing of small amounts of liquids
　　　　Glucose monitors and pumps
　　　　Tweezers and mini robots that move, rotate, cut and place molecules, sort cells and proteins and manipulate organelles and DNA inside a living cell.
　　　　Miniature surgical tools with sensors and measuring devices
　　　　Diagnostics
　　　　Sensors that measure biologically relevant information (cells, antibodies, DNA, RNA enzymes)
　　　　GeneChips to test for genetic diseases, medicine interaction and other biological markers
　　　　DNA duplication devices
　　　　And others

9. **State three applications of MEMS in the optical or wireless communications field.   Identify at least one type of sensor that could be used in each application.**

_____
_____
_____
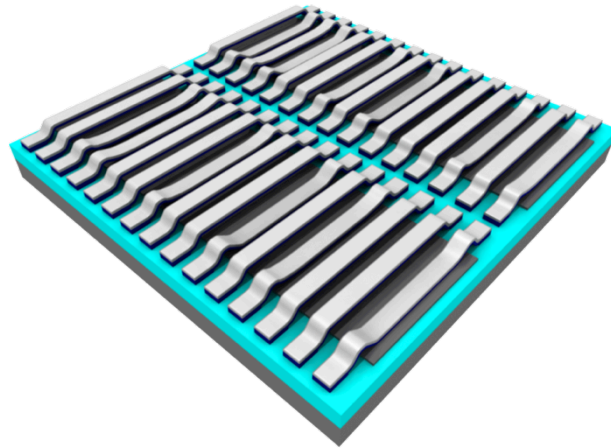
Answer:
Projection displays
Digital flat-panel displays
Tunable lasers and filters
Spatial Light Modulators
Display screens on cell phones and PDAs
Variable optical attenuators
Optical spectrometers
Grating Light Valves
Bar Code Readers
Maskless lithography
And others

10. **What type of MEMS device is illustrated in the figure?**

    a. Inertial Sensor
    b. Pressure sensor
    c. Grating Light Valve
    d. Digital Mirror Display

Answer: c.
Grating Light Valve