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**MEMS Applications Overview Assessment**

**Instructor Guide**

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|  | 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. |

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|  | **What of the following BEST describes MEMS?** |
|  | 1. A microdevice such as a pump or laser used to simulate a similar macro device 2. A microdevice or groups of devices that integrate both mechanical and electrical components 3. A series of small devices that work together to accomplish the required task 4. Micro size devices that measure pressure and acceleration. |

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|  | *Answer: b.* |
|  | *A microdevice or groups of devices that integrate both mechanical and electrical components. A MEMS is a MicroElectroMechanical System.* |

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|  | **List five commercial fields in which MEMS have already proven to be beneficial.**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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

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|  | **What type of MEMS device is used as the deployment sensor in automotive airbag systems?**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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|  | *Answer:* |
|  | *An inertial sensor / accelerometer* |

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

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|  | *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.* |

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|  | **What type of MEMS device is used in medical infusion pumps to identify blockage in the flow tubes?**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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|  | *Answer:* |
|  | *Pressure Sensor* |

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|  | **What are two types of inertial sensors?**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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|  | *Answer:* |
|  | *Accelerometers and gyroscopes* |

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

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|  | *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.* |

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|  | **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* |

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|  | **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.**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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|  | *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* |

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|  | **What type of MEMS device is illustrated in the figure?** |
|  | 1. GLV1_5_17Inertial Sensor 2. Pressure sensor 3. Grating Light Valve 4. Digital Mirror Display |

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|  | *Answer: c.* |
|  | *Grating Light Valve* |

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