



Jerusalem Science Contest 5785

Nanotechnology

Test 2

Form – A

Answer Key

1) **What is nanofabrication?**

- a) The process of creating large structures
- b) *The design and manufacture of devices with dimensions measured in nanometers***
- c) A method for building biological cells
- d) The production of macroscopic mechanical parts

2) **Which of the following techniques is commonly used in nanofabrication?**

- a) Injection molding
- b) *Photolithography***
- c) Blow molding
- d) Stereolithography

3) **What is the primary purpose of using a clean room in nanofabrication?**

- a) To reduce noise levels
- b) *To minimize contamination from air born particles and impurities***
- c) To provide ergonomic working conditions
- d) To enhance the aesthetic appearance of products

4) **What is dry etching in the context of nanofabrication?**

- a) A method using liquid chemicals to etch materials
- b) *A physical or chemical process to remove material using gases or plasmas***
- c) A technique for coating surfaces with a thin layer of material
- d) A method of joining materials using heat

5) **Which gas is commonly used in dry etching processes?**

- a) Oxygen
- b) Helium
- c) *Chlorine***
- d) Hydrogen

6) **What is wet etching?**

- a) A method using gas plasmas to etch materials
- b) A technique involving liquid chemicals to dissolve unwanted material**
- c) A method for depositing thin films
- d) A process for measuring thin films

7) **Which chemical is commonly used in wet etching for silicon?**

- a) Nitric acid
- b) Sulfuric acid
- c) Hydrofluoric acid**
- d) Acetic acid

8) **What is physical vapor deposition (PVD)?**

- a) A process of adding material to a substrate by chemical reactions
- b) A technique where material is vaporized and then condensed onto a substrate**
- c) A method of removing material from a substrate
- d) A process for measuring thin films

9) **Which of the following is a type of physical vapor deposition?**

- a) Chemical vapor deposition (CVD)
- b) Electroplating
- c) Sputtering**
- d) Anodizing

10) **What is the main advantage of using nanofabrication techniques in electronics?**

- a) Reducing production costs
- b) Creating smaller and more efficient devices**
- c) Enhancing the taste of products
- d) Simplifying manufacturing processes

11) **Which tool is commonly used to create patterns on a substrate in nanofabrication?**

- a) Scanning electron microscope (SEM)
- b) Atomic force microscope (AFM)
- c) Photomask aligner**
- d) Ultrasonic cleaner

12) **What is the purpose of using a photoresist in photolithography?**

- a) To etch materials
- b) To protect specific areas of the substrate from etching or deposition**
- c) To measure thin films
- d) To heat the substrate

- 13) What does “nanoimprint lithography” refer to?
- a) A method for cleaning nanoscale devices
 - b) A technique for creating nanoscale patterns by mechanically pressing a mold into a substrate**
 - c) A process for measuring nanoscale features
 - d) A method for growing nanoscale crystals
- 14) Which material is commonly used as a substrate in nanofabrication?
- a) Aluminum
 - b) Silicon**
 - c) Copper
 - d) Plastic
- 15) What is the role of a mask in the photolithography process?
- a) To clean the substrate
 - b) To deposit material onto the substrate
 - c) To transfer a pattern onto the photoresist**
 - d) To measure the thickness of the substrate
- 16) What does the Gemara (Eruvin 53a) mean when it compares the minds of the earlier generations to the entranceway of the Ulam of the Beit ha’Mikdash, the minds of the later generations to the entranceway of the Heichal of the Beit ha’Mikdash, and our minds to the eye of a sewing needle?
- a) The earlier the generation, the larger the neurocranium and brain.
 - b) The earlier the generation, the more holy the person.
 - c) The earlier the generation, the more superior they were in wisdom and in spiritual matters.**
 - d) The earlier the generation, the less superior they were in wisdom and in spiritual matters.
- 17) According to the Chafetz Chaim, historical progress in the science of telescoping indicates what?
- a) The people of the world have become so aware of Hashem’s presence, that Hashem gives them the wisdom to create the means to see far beyond the range of vision and the visual spectrum.
 - b) The people of the world have become so blind to Hashem’s presence, that Hashem gives them the wisdom to create the means to see far beyond the range of vision and the visual spectrum.**
 - c) Human intelligence is increasing.
 - d) Human intelligence is decreasing.

18) **According to the Michtav me'Eliyahu, what does Hashem do to counter the decline of spiritual values in the world?**

a) Hashem reveals to mankind more of His wisdom in Creation.

b) Hashem reveals to mankind less of His wisdom in Creation.

c) Hashem brings cataclysmic catastrophes upon the world.

d) Hashem momentarily alters the functioning of the laws of physics thereby creating a phenomenon we perceive as a miracle.

19) **What is the purpose of the events which the Zohar predicted would happen in the 600th year of the 6th millennium?**

a) No purpose for those events is mentioned.

b) To prepare the world for its ultimate perfection in the 7th millennium.

c) To enable the people of the world to be more giving and kind.

d) To bring knowledge of Torah to the entire world.

20) **Where will you find a nanoscale sensor closest to you?**

a) The local university

b) The nearest pharmaceutical laboratory

c) The nearest military research installment

d) On your face