

**MNT 503**  
**Nanoscale Synthesis and Characterization**  
**(2024-2025 Spring)**  
 Assignment 2

1- Choose the odd one out about epitaxy method.

- ☐ enables deposition and growth of crystalline layers
- ☐ there are three types of epitaxial methods: vapor phase, liquid phase and molecular beam epitaxy
- ☐ coated material may be same or different kind compared to substrate
- ☐ coatings single crystalline structures can be formed
- ☐ it is a very fast coating process

2- Choose the false statement about molecular beam epitaxy.

- ☐ widely used techniques in semiconductor devices, including transistors
- ☐ very slow process, around 1  $\mu\text{m}$  thick coatings can be obtained in one hour
- ☐ it operates under ultra high vacuum (around  $10^{-11}\text{Torr}$ ) technique
- ☐ RHEED (Reflection High Energy Electron Diffraction) for monitoring the residual gases
- ☐ thin film method used for deposition of single crystal layers

3- Which one of the followings is not related to chemical vapor deposition

- ☐ solid film on a substrate is formed by the reaction of vapor phase chemicals (reactants)
- ☐ the process can be carried out at room or elevated temperatures
- ☐ there may be two different type of reactions, namely, oxidation and compound formation
- ☐ it necessitates ultra high vacuum
- ☐ it can be used to deposit oxides, nitrides and carbides as well as for production of graphene and carbon nanotubes.

4- Choose the correct statement about Atomic Layer Deposition (ALD) technique

- ☐ it is a CVD technique
- ☐ precursor materials feed into the environment separately, not at the same time
- ☐ atomic scale deposition is possible
- ☐ can be used to deposit a variety of oxides ( $\text{ZnO}$ ,  $\text{TiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Cu}_2\text{O}$ ,  $\text{MgO}$ ) at relatively low temperatures
- ☐ all of them

5- Defect free graphene can be produced with CVD process by use of hydrocarbon gases and copper or nickel substrates in foil form.....T F

6- Molecular beam epitaxy is used in the growth of semiconducting compounds (i.e., silicon, germanium, II-VI, IV-VI), dielectrics, epitaxial metallic films, as well as superconducting materials. ....T F