

Assignment – 6  
**Fundamentals of Materials Processes**

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1. In a glow discharge plasma, most of the voltage drop occurs in
  - a. anode dark space
  - b. cathode dark space**
  - c. cathode glow
  - d. positive column
2. If a floating electrode is immersed in plasma, its potential with respect to plasma potential would be
  - a. positive
  - b. same
  - c. negative**
  - d. zero and independent of plasma potential
3. Which of the following discharges is used commonly in thin film deposition processes?
  - a. Townsend and dark self-sustained discharge
  - b. Corona discharge
  - c. Arc plasma
  - d. Normal glow discharge**
4. Kinetic energy of ions for sputtering process ranges in
  - a.  $10^{-4}$  to  $10^{-2}$  eV
  - b.  $10^{-2}$  to  $10^0$  eV
  - c.  $10^0$  to  $10^3$  eV**
  - d.  $10^3$  to  $10^5$  eV
5. You have a sputtering target with composition (atomic) Si:Ge = 2:1. If you sputter thin film from this target using Ar plasma with Ar ion energy of 0.5 keV, what will be the composition of first few monolayers deposited on your substrate? (Sputtering yields of Si and Ge for Ar ions with 0.5 keV energy is 0.5 and 1.1 respectively. Assume sticking coefficient for both Si and Ge is 1)
  - a. Si:Ge = 2:1
  - b. Si:Ge = 0.5:1.1
  - c. Si:Ge = 1:2
  - d. Si:Ge = 1:1.1**
6. For question number 5 (above) when steady state condition is reached, what will be the surface composition of sputtering target?
  - a. Si:Ge = 2:1
  - b. Si:Ge = 4.4:1**
  - c. Si:Ge = 1:2.2
  - d. Si:Ge = 1:4.4
7. What is the typical frequency of AC plasma used in thin film deposition processes?
  - a. 13.56 MHz**
  - b. 100 KHz
  - c. 2.45 GHz
  - d. 13.56 GHz
8. In a 'magnetron', electrons are confined in a race-track close to
  - a. substrate
  - b. half way between target and substrate
  - c. target**
  - d. anode
9. Glow in plasma discharge is due to

- a. ionization of gas atoms
  - b. excitation/de-excitation of ionic species**
  - c. acceleration of electrons
  - d. electron - gas atom collisions
10. For sputtering of insulating thin films using ceramic targets, it is beneficial to
- a. use DC Plasma
  - b. use AC Plasma**
  - c. increase target to substrate distance
  - d. decrease target to substrate distance