1. For molecular flow, Knudsen number ($K_n$) is
   a. $K_n = 0$
   b. $K_n > 1$
   c. $1 > K_n > 0.001$
   d. $K_n < 0.001$

2. Following steps in the CVD growth are dependent on the flow conditions
   a. Adsorption and diffusion of species on surface
   b. Surface reaction leading to film growth
   c. Desorption of volatile by-products away from the reaction zone
   d. None of the above

3. Gas flow inside an APCVD reactor is
   a. Molecular
   b. Viscous
   c. Turbulent
   d. None of the above

4. In a horizontal CVD reactor, thin film thickness ($d$) changes with axial distance ($x$) from gas inlet as
   a. $d \propto 1/x$
   b. $d \propto 1/x^2$
   c. $d \propto e^{-x}$
   d. $d \propto x$

5. Low Pressure CVD (LPCVD) is better compared to atmospheric pressure CVD (APCVD) because,
   a. Better step coverage
   b. Better film thickness uniformity
   c. Higher deposition rates
   d. All of the above

6. Gas phase diffusivity ($D$) of gaseous species across boundary layer is related to gas pressure ($P$) as
   a. $D \propto P$
   b. $D \propto 1/P$
   c. $D \propto e^{-P}$
   d. $D \propto P^{1.5}$

   - Questions 7 to 9 are based on following:
     The disproportionation reaction
     \[
     \text{Si} + \text{SiCl}_4 \leftrightarrow 2\text{SiCl}_2 \quad (\Delta G^\circ = 83000 + 3.64 \, T \log T - 89.4 \, T \, \text{cal/mol})
     \]
     is carried out in a closed tubular atmospheric pressure reactor whose diameter is 15 cm. Deposition of Si occurs on a substrate maintained at 650 °C and located 25 cm away from the source, which is heated to 800 °C. Assume, thermodynamic equilibrium
prevails at source and substrate and viscosity of the gas in chamber is 0.08 cP (1 cP = 9.87x10^{-6} atm-sec, R= 1.987 cal/mol-K = 82.05 cm^3-atm/mol-K).

7. What is the partial pressure of SiCl\textsubscript{2} at the source?
   a. 1 atm.
   b. \textbf{0.4 atm.}
   c. 0.5 atm.
   d. 0.04 atm.

8. What is the partial pressure of SiCl\textsubscript{2} at the substrate?
   a. 0.6 atm.
   b. 0.5 atm.
   c. \textbf{0.05 atm.}
   d. 0.03 atm.

9. What is the flux of SiCl\textsubscript{2} at substrate transported from source to substrate by bulk flow?
   a. \(1 \times 10^4\) moles/cm\textsuperscript{2}-sec
   b. 9.1 moles/cm\textsuperscript{2}-sec
   c. \(9.1 \times 10^2\) moles/cm\textsuperscript{2}-sec
   d. \textbf{9.1x10\textsuperscript{-2} moles/cm\textsuperscript{2}-sec}

10. In lattice mismatched epitaxial layer, beyond critical thickness, strain is relieved by
    a. Formation of voids
    b. \textbf{Formation of misfit dislocations}
    c. Intermixing of substrate and thin film material
    d. Misfit strain is present and film is under stress