Couette Flow: Slip Flow Regime. Velocity profile in nondimensional form. Volumetric flow rate per

|  |  |
| --- | --- |
| 16 channel width |  |
| 17 Couette Flow: Transition and Free-Molecular Flow Regimes. |  |
| 18 The shear stress for Couette flows in the continuum and free-molecular flow regimes. |  |
| 19 Shear-Driven Flows. Free-Molecular Regime. |  |
| 20 Shear-Driven Flows. Transition Flow Regime. |  |
| 21 Pressure-Driven Flows. Slip Flow Regime. Isothermal Compressible Flows. |  |
| 22 Pressure-Driven Flows. Slip Flow Regime. Adiabatic Compressible Flows. |  |
| 23 Pressure-Driven Flows. Slip Flow Regime. Validation of Slip Models. |  |
| 24 Pressure-Driven Flows. Transition and Free-Molecular Regimes. Burnett Equations. |  |
| 25 Thermal Effects in Microscales. Thermal Creep (Transpiration) |  |
| 26 Heat Transfer in Couette Microflows. |  |
| 27 Heat Transfer in Poiseuille Microflows. |  |

Couette Flow: Slip Flow Regime. Velocity profile in nondimensional form. Volumetric flow rate per

|  |  |
| --- | --- |
| 1 Nanophenomenas. Super Hydrophobicity. Self-Cleaning. |  |
| 2 Validation of continuum hypothesis for microflows |  |
| 3 The Continuum Hypothesis. Mixed Flow Regimes |  |
| 4 The Continuum Hypothesis. Molecular Magnitudes |  |
| 5 New Flow Regimes in Microsystems. Reasons. |  |
| 6 Knudsen number. Flow regimes for different Knudsem number. |  |
| 7 Validity of continuum models in microflow. Governing equations and slip models. |  |
| 8 Nano Phenomena. Collective Surface Area |  |
| 9 Nano-Phenomenon. Strongest Materials, C-C bonds. Young’s modulus of carbon nanotubes |  |
| Nondimentionless number of nanoflows. Prandtl number Pr, Reynolds number Re, and  10 Knudsennumber Kn. |  |
| 11 Why does Rarefaction effect take place in gas microflows. Describe. |  |
| 12 Viscous heating and thermal creep effects in gas microflows |  |
| 13 Slip and adsorption phenomena in water nanoflows |  |
| 14 Slip and wetting phenomenas in water nanoflows |  |
| 15 Nano-Phenomenon. Strongest Materials. Young’s modulus of carbon nanotubes |  |

1. channel width
2. The shear stress for Couette flows in the continuum and free-molecular flow regimes.
3. Couette Flow: Transition and Free-Molecular Flow Regimes.

Characterization of nanomaterials. Scanning Electron Microscopy (SEM). Describe the principles of

31 SEM working

Characterization of nanomaterials. Transmission Electron Microscopy (TEM). Describe the

32 principles of TEM working

Characterization of nanomaterials. Raman Spectroscopy. Describe the principles of Raman

1. Spectroscopy working
2. Characterization of nanomaterials. X-ray Diffraction (XRD). Describe the principles of XRD working Characterization of nanomaterials. X-ray photoelectron spectroscopy (XPS). Describe the principles
3. of XPS working

Characterization of nanomaterials. ATOMIC FORCE MICROSCOPY (AFM). Describe the principles of 36 AFM working

Characterization of nanomaterials. SCANNING TUNNELING MICROSCOPE (STM). Describe the

37 principles of STM working

|  |  |
| --- | --- |
| 38 Computational methodologies for fluid flow simulations. Molecular Dynamics (MD) for microflows. |  |
| 39 Computational methodologies for fluid flow simulations. Direct Simulation Monte Carlo (DSMC) |  |
| 40 Computational methodologies for fluid flow simulations. Computational Fluid Dynamics (CFD) |  |
| 41 Implementation of uniform and non-uniform cells in DSMC |  |
| What are the Weighting factor, Number of simulated molecules and Number of real molecules in  42 2D axisymmetric case in DSMC |  |
| 43 Purposes of Subroutines WEIGHT and AIFR in 2D axisymmetric case in DSMC |  |
| 44 Implementation of Surfaces in calculation domain and boundary conditions in DSMC. |  |
| 45 Purposes of Subroutines AIFR and REFLECT in DSMC code |  |