

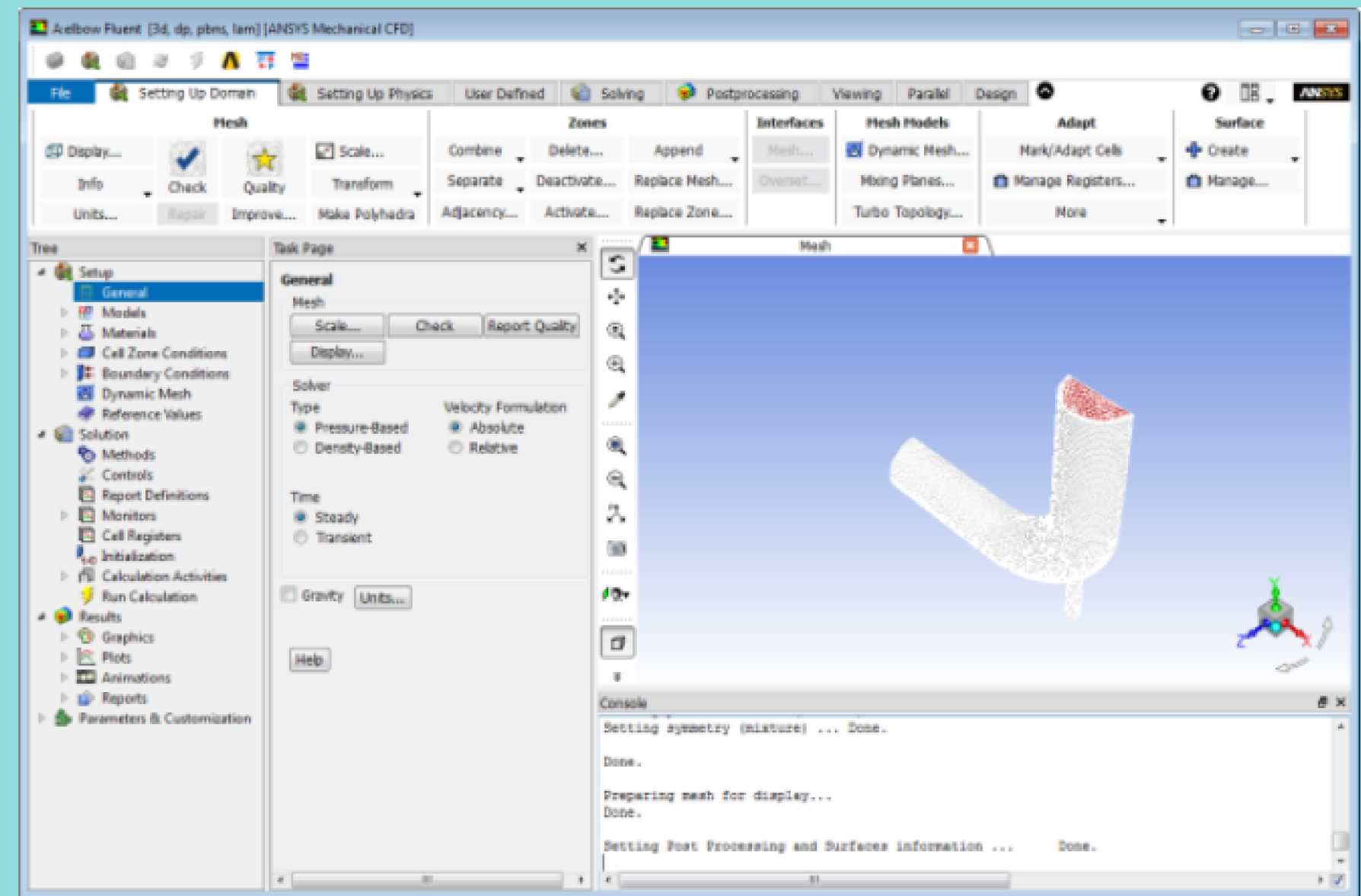
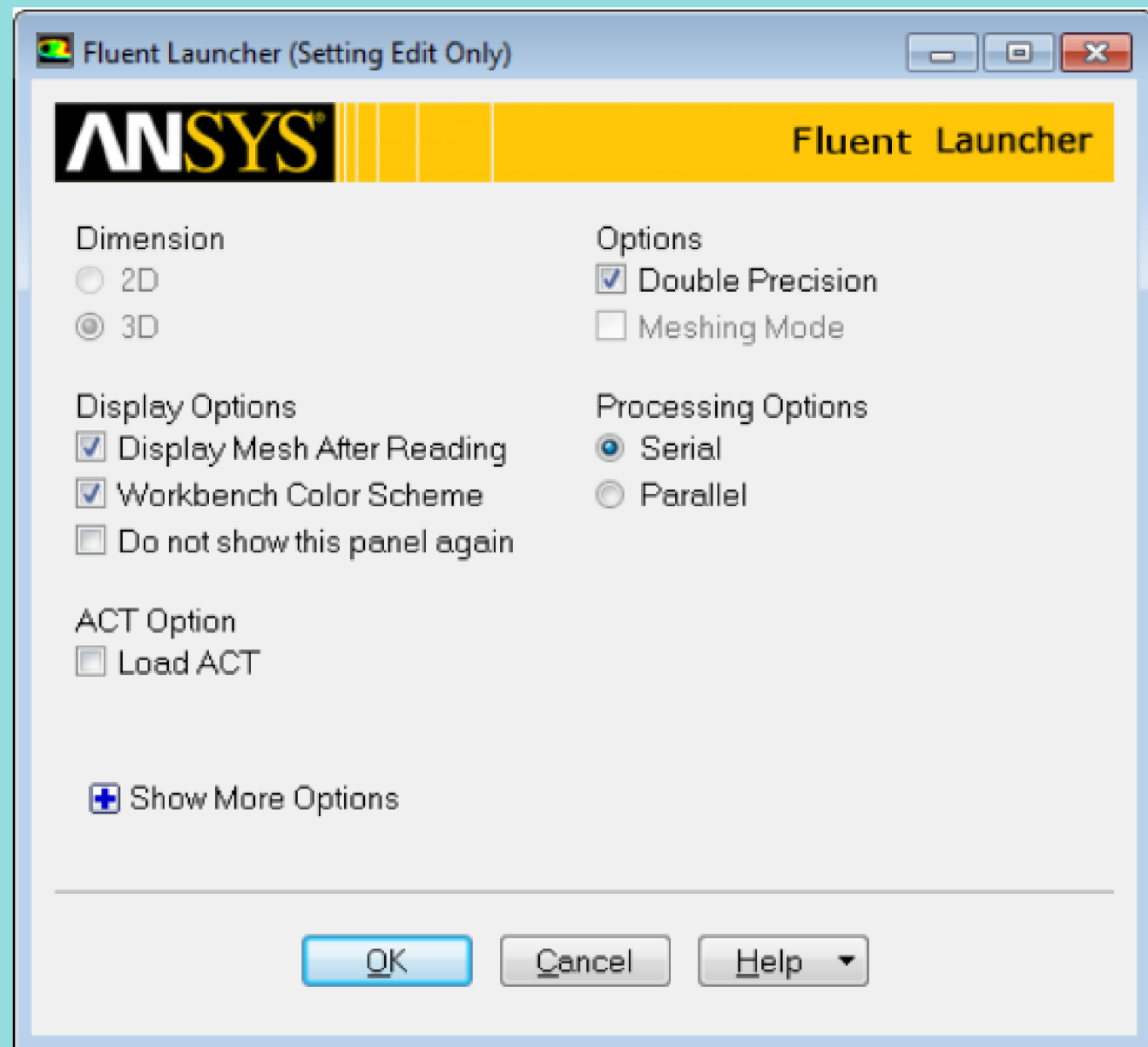
A stylized illustration of a desk setup. In the center is an open laptop with a teal screen and a dark keyboard. To the left of the laptop is a stack of three books in teal, orange, and teal. Below the books is a potted plant with long, pointed leaves in teal and orange, sitting in an orange pot. To the right of the laptop is a teal pen holder with a pink base, containing three pens in orange, teal, and orange. Above the laptop is a teal folder or book with a white border and a pattern of small white crosses. In the bottom right corner, there is a stylized illustration of a computer monitor with a pink screen and teal window frames.

4 НЕДЕЛЯ

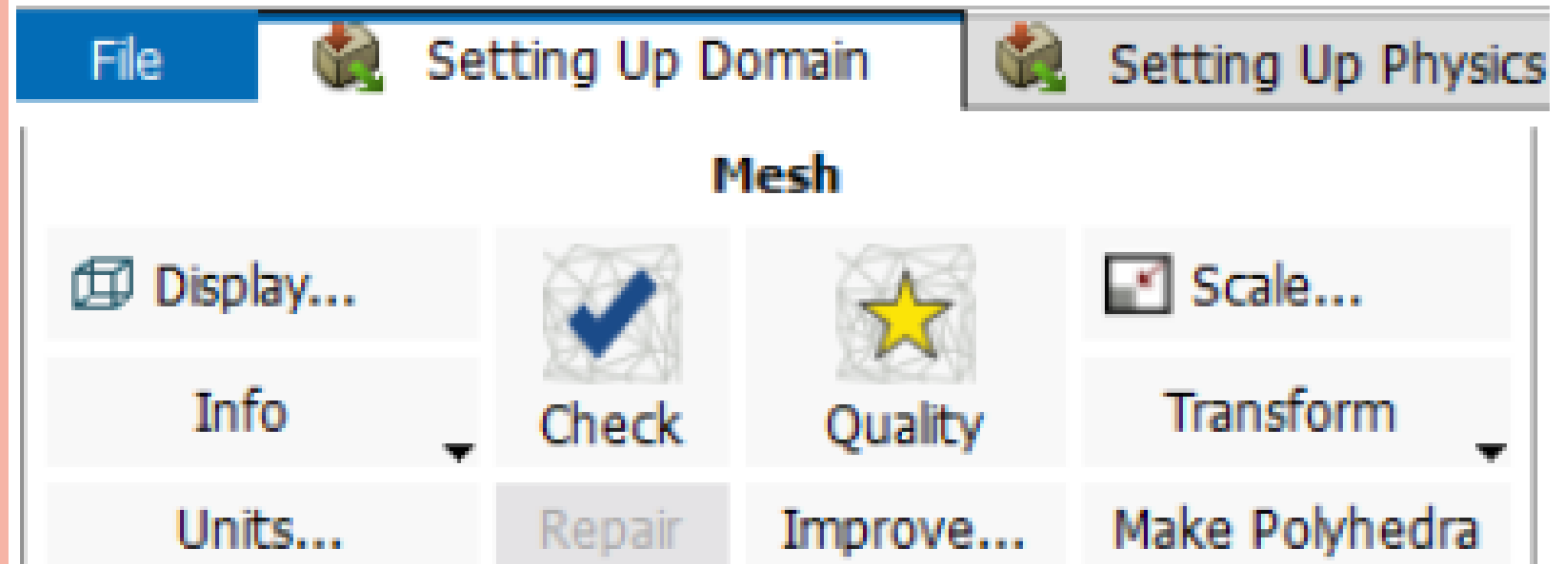
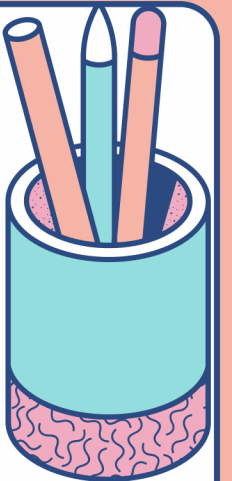
Поток жидкости и теплообмен в смесительном колоне

Компьютерная графика в вычислениях

Запускаем ANSYS Fluent



Настройка домена



 **Setting Up Domain → Mesh → Check**

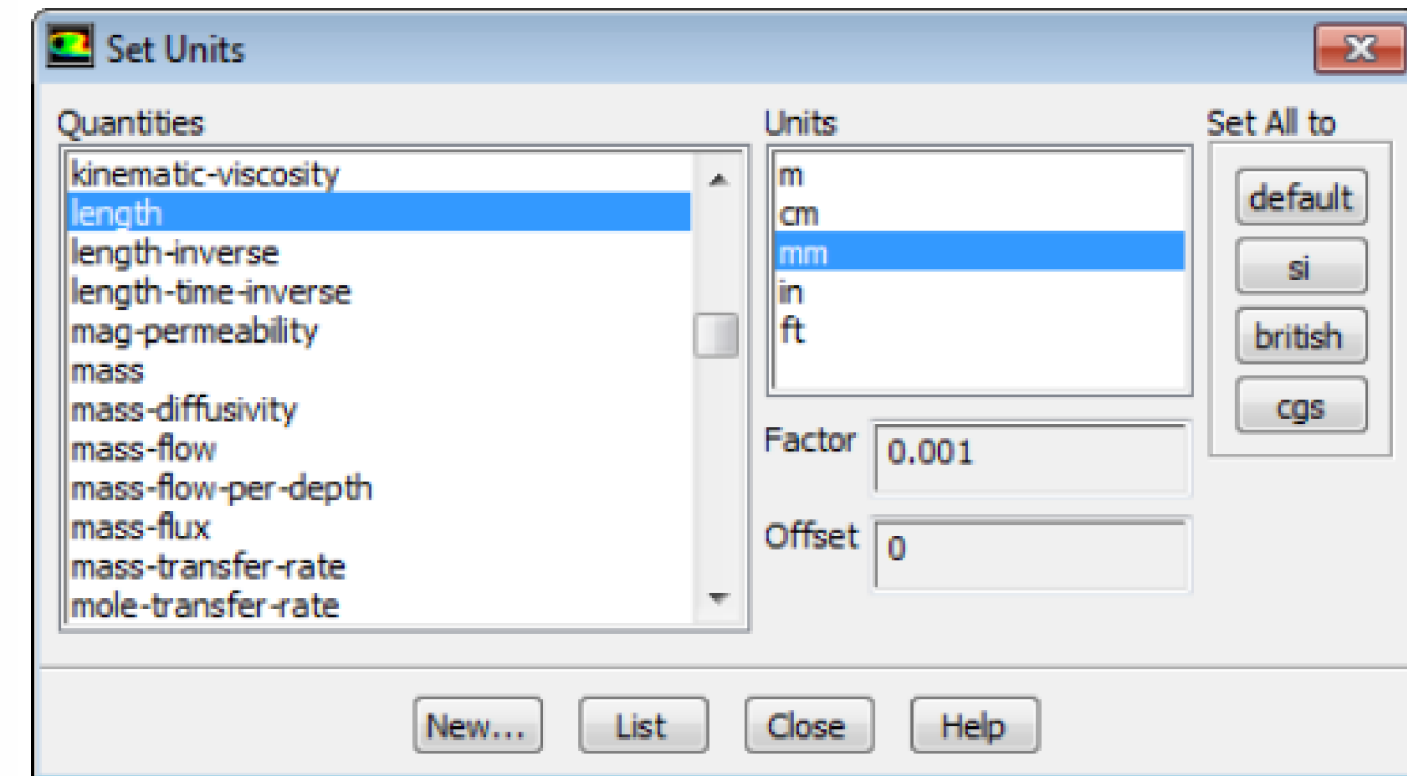
Note

ANSYS Fluent will report the results of the mesh check in the console.

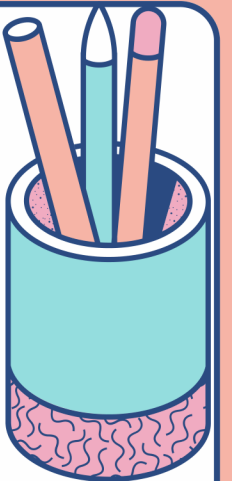
```
Domain Extents:
  x-coordinate: min (m) = -2.000000e-01, max (m) = 2.000000e-01
  y-coordinate: min (m) = -2.250000e-01, max (m) = 2.000000e-01
  z-coordinate: min (m) = 0.000000e+00, max (m) = 5.000000e-02
Volume statistics:
  minimum volume (m3): 1.144763e-10
  maximum volume (m3): 5.871098e-08
  total volume (m3): 2.511309e-03
Face area statistics:
  minimum face area (m2): 2.051494e-07
  maximum face area (m2): 3.429518e-05
Checking mesh.....
Done.
```

 **Setting Up Domain → Mesh → Units...**

This displays the **Set Units** dialog box.



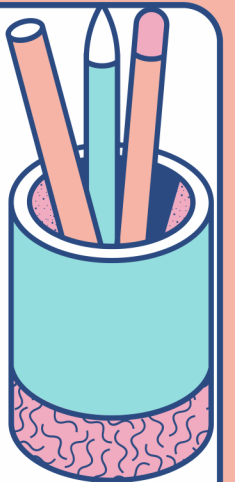
Настройка домена



 **Setting Up Physics → Solver**

File		 Setting Up Domain		 Setting Up Physics		User Defined			
Solver									
Time		Type		Velocity Formulation		Operating Conditions...			
☒ Steady		☒ Pressure-Based		☒ Absolute		Reference Values...			
☐ Transient		☐ Density-Based		☐ Relative					
Models									
☒ Energy		 Radiation...		 Multiphase...		 Solidify/Melt...			
		 Heat Exchanger...		 Species...		 Acoustics...			
		 Viscous...		 Discrete Phase...		 More			

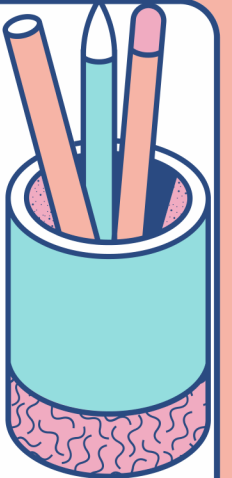
Настройка физики



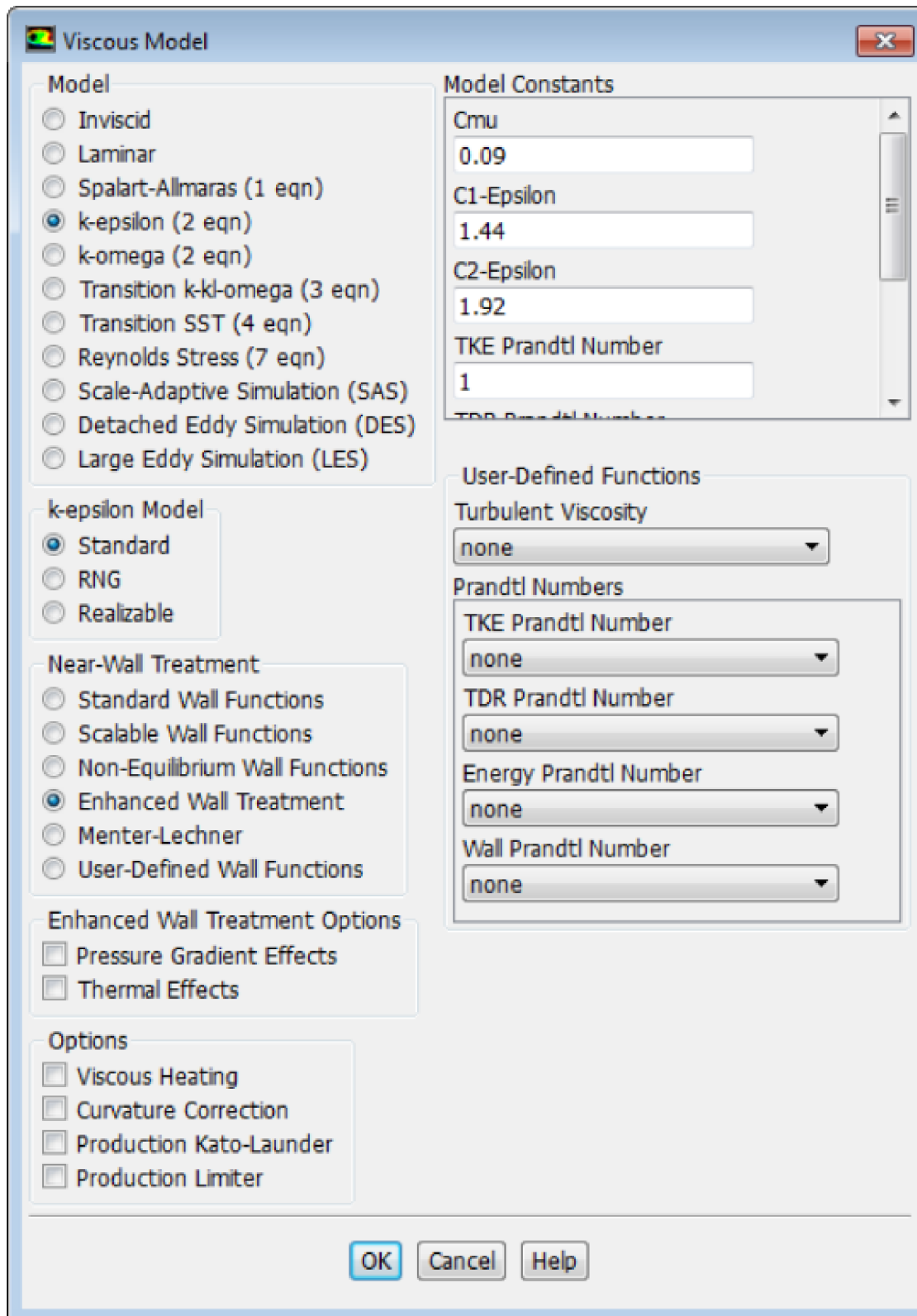
 **Setting Up Physics → Solver**

File		 Setting Up Domain		 Setting Up Physics		User Defined	
Solver							
Time		Type		Velocity Formulation		Operating Conditions...	
☒ Steady		☒ Pressure-Based		☒ Absolute			
☐ Transient		☐ Density-Based		☐ Relative		 Reference Values...	
Models							
☒ Energy		 Radiation...		 Multiphase...		 Solidify/Melt...	
		 Heat Exchanger...		 Species...		 Acoustics...	
		 Viscous...		 Discrete Phase...		 More	

Настройка физики



Setting Up Physics → Models → Viscous...



- a. In the **Setting Up Physics** ribbon tab, click **Create/Edit...** (Materials group).

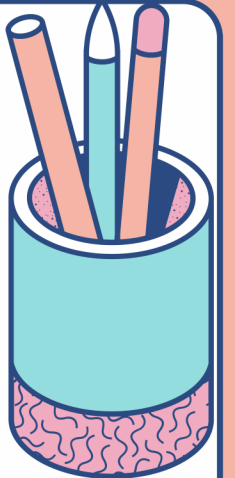
Setting Up Physics → Materials → Create/Edit...

- b. In the **Create/Edit Materials** dialog box, type `water` for **Name**.

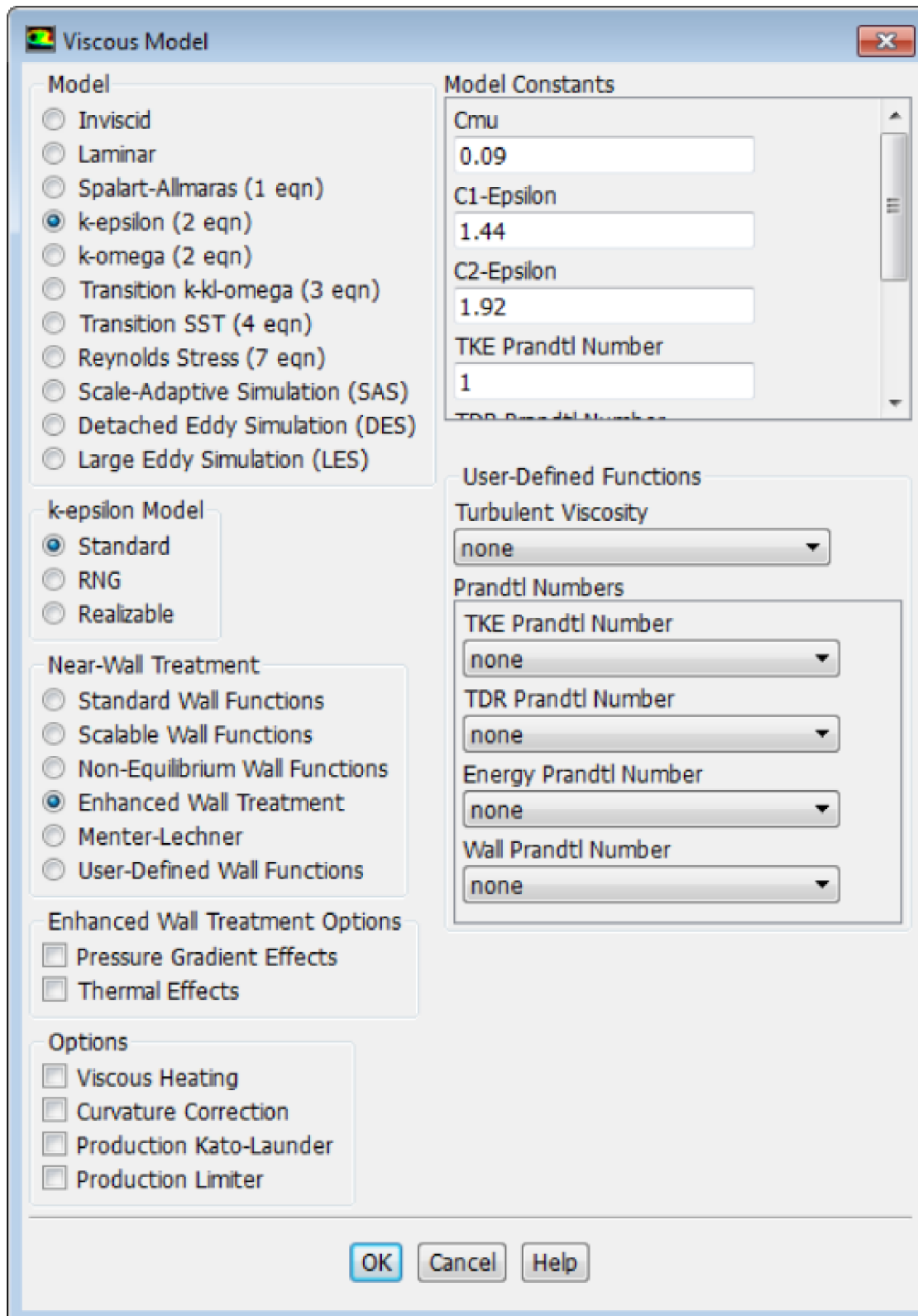
- c. In the **Properties** group, enter the following values:

Property	Value
Density	1000 [kg/m ³]
c_p (Specific Heat)	4216 [J/kg-K]
Thermal Conductivity	0.677 [W/m-K]

Настройка физики



Setting Up Physics → Models → Viscous...



- a. In the **Setting Up Physics** ribbon tab, click **Create/Edit...** (**Materials** group).

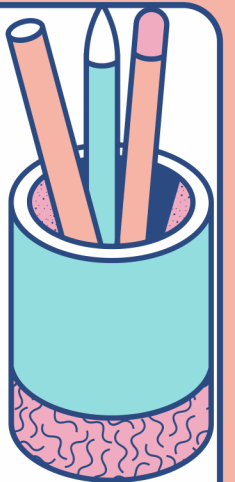
Setting Up Physics → Materials → Create/Edit...

- b. In the **Create/Edit Materials** dialog box, type `water` for **Name**.

- c. In the **Properties** group, enter the following values:

Property	Value
Density	1000 [kg/m ³]
c_p (Specific Heat)	4216 [J/kg-K]
Thermal Conductivity	0.677 [W/m-K]
Viscosity	8e-04 [kg/m-s]

Настройка физики



Create/Edit Materials

Name: water

Material Type: fluid

Chemical Formula:

Fluent Fluid Materials: water

Mixture: none

Order Materials by:
☒ Name
☐ Chemical Formula

Fluent Database...
User-Defined Database...

Properties

Density (kg/m ³)	constant	Edit...
	1000	
Cp (Specific Heat) (J/kg-K)	constant	Edit...
	4216	
Thermal Conductivity (W/m-K)	constant	Edit...
	0.677	
Viscosity (kg/m-s)	constant	Edit...
	0.0008	

Change/Create Delete Close Help

Zones

Cell Zones

Boundaries

Profiles...

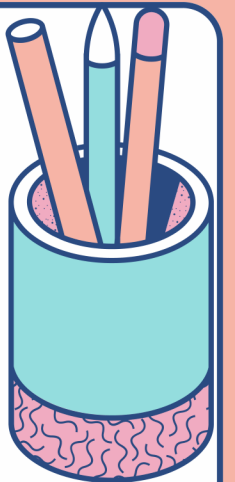
a. In the **Setting Up Physics** tab, click **Cell Zones**.



Setting Up Physics → **Zones** → **Cell Zones**

This opens the **Cell Zone Conditions** task page.

Настройка физики



Cell Zone Conditions

Zone

fluid

Phase Type ID

Edit... Copy... Profiles...

Parameters... Operating Conditions...

Display Mesh...

Porous Formulation

☒ Superficial Velocity

☐ Physical Velocity

Help

Fluid

Zone Name

Material Name Edit...

☐ Frame Motion ☐ 3D Fan Zone ☐ Source Terms

☐ Mesh Motion ☐ Laminar Zone ☐ Fixed Values

☐ Porous Zone

Reference Frame | Mesh Motion | Porous Zone | 3D Fan Zone | Embedded LES | Reaction | Source Terms | Fixed Values | Multiphase

Rotation-Axis Origin

X (mm) constant

Y (mm) constant

Z (mm) constant

Rotation-Axis Direction

X constant

Y constant

Z constant

OK Cancel Help

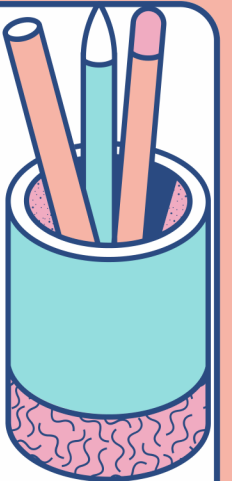
Zones

Cell Zones

Boundaries

Profiles...

Настройка физики



Boundary Conditions

Zone



- Inlet
 - velocity-inlet-large
 - velocity-inlet-small
- Internal
 - interior-fluid
- Outlet
 - pressure-outlet
- Symmetry
 - symmetry
- Wall
 - wall-fluid

Phase Type ID

☐ Highlight Zone

Velocity Inlet

Zone Name

Velocity Specification Method

Reference Frame

Velocity Magnitude (m/s)

Supersonic/Initial Gauge Pressure (pascal)

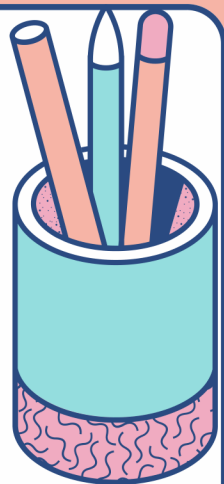
Turbulence

Specification Method

Turbulent Intensity (%)

Hydraulic Diameter (mm)

Настройка физики



Velocity Inlet

Zone Name

velocity-inlet-large

Momentum

Thermal

Radiation

Species

DPM

Multiphase

Potential

UDS

Temperature (k)

293.15

constant

OK

Cancel

Help

Setting	Value
Velocity Specification Method	Magnitude, Normal to Boundary
Velocity Magnitude	1 . 2 [m/s]
Specification Method	Intensity & Hydraulic Diameter
Turbulent Intensity	5%
Hydraulic Diameter	25 [mm]
Temperature	313 . 15[K]

Настройка физики



Velocity Inlet

Zone Name
velocity-inlet-large

Momentum Thermal Radiation Species DPM Multiphase Potential UDS

Temperature (k) 293.15 constant

OK Cancel Help

Pressure Outlet

Zone Name
pressure-outlet

Momentum Thermal Radiation Species DPM Multiphase Potential UDS

Backflow Reference Frame Absolute

Gauge Pressure (pascal) 0 constant

Backflow Direction Specification Method Normal to Boundary

Backflow Pressure Specification Total Pressure

☐ Radial Equilibrium Pressure Distribution

☐ Average Pressure Specification

☐ Target Mass Flow Rate

Turbulence

Specification Method Intensity and Hydraulic Diameter

Backflow Turbulent Intensity (%) 5

Backflow Hydraulic Diameter (mm) 100

OK Cancel Help

Setting	Value
Velocity Specification Method	Magnitude, Normal to Boundary
Velocity Magnitude	1.2 [m/s]
Specification Method	Intensity & Hydraulic Diameter
Turbulent Intensity	5%
Hydraulic Diameter	25 [mm]
Temperature	313.15[K]