

3D Scientific Visualization with Blender



OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

- **3D creation suite**
 - Modeling
 - Rigging
 - Animation
 - Simulation
 - Rendering
 - Compositing and motion tracking
 - Video editing
- **API for Python scripting**

CONTENTS

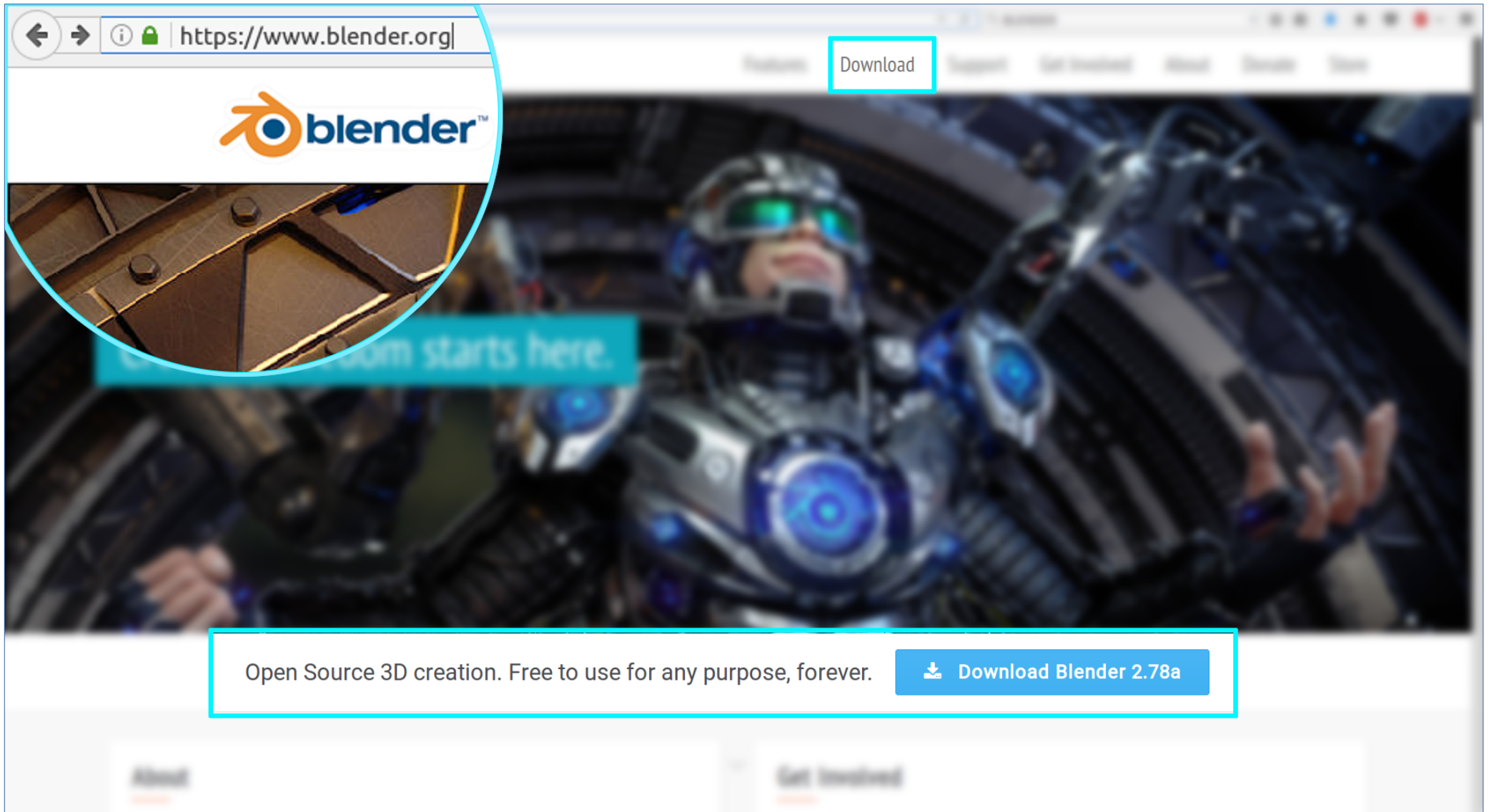


Blender installation



Creating a 3D model of a molecule SF₆ in Blender.







INSTALLATION

Blender is [Free & Open Source Software](#). Free to use for any purpose, forever.

Read about the new features and fixes in the [Blender 2.78a Features](#) page.

Blender 2.78a for Windows		
	64bit	32bit
Compatible with Windows 10 8 7 Vista		
Installer (.msi)	USA DE NL 1 NL 2 RU	USA DE NL 1 NL 2 RU
.ZIP	USA DE NL 1 NL 2 RU	USA DE NL 1 NL 2 RU

Blender 2.78a for Mac OSX	
	64bit
Requires Mac OS X 10.6+	
.ZIP	USA DE NL 1 NL 2 RU

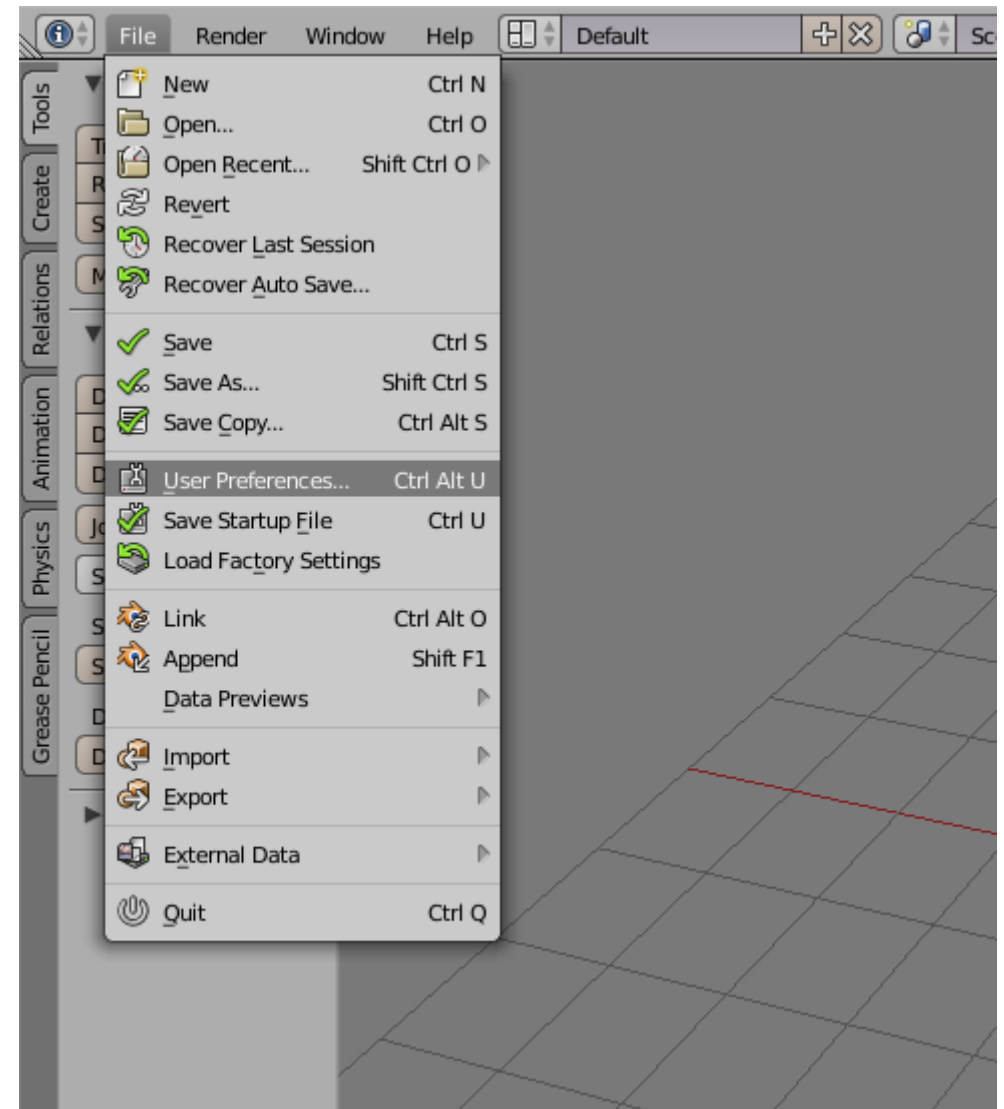
Blender 2.78a for GNU/Linux		
	64bit	32bit
Requires glibc 2.11. Suits most recent GNU/Linux distributions		
Tarball .bz2	USA DE NL 1 NL 2 RU	USA DE NL 1 NL 2 RU



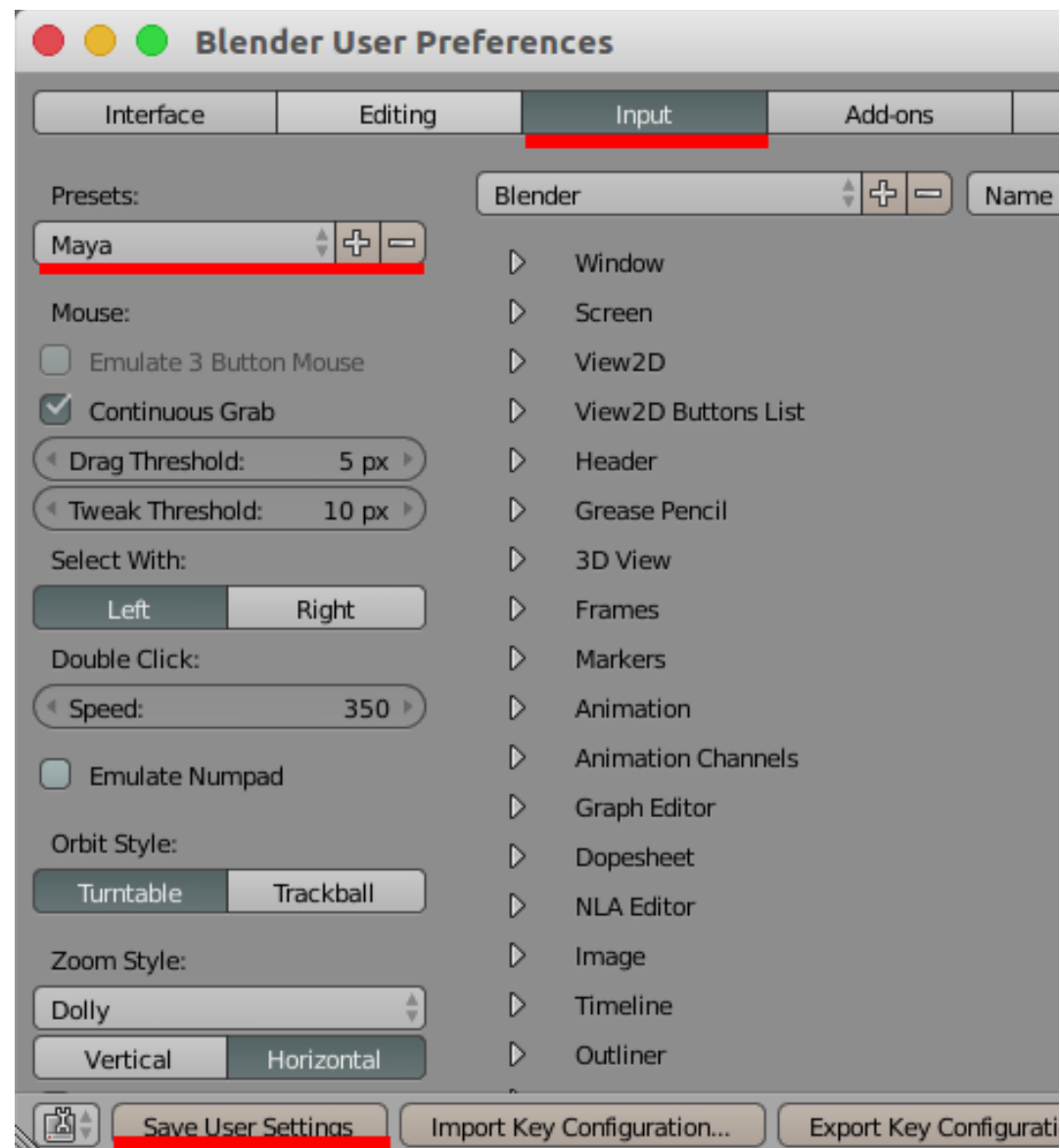
OIST

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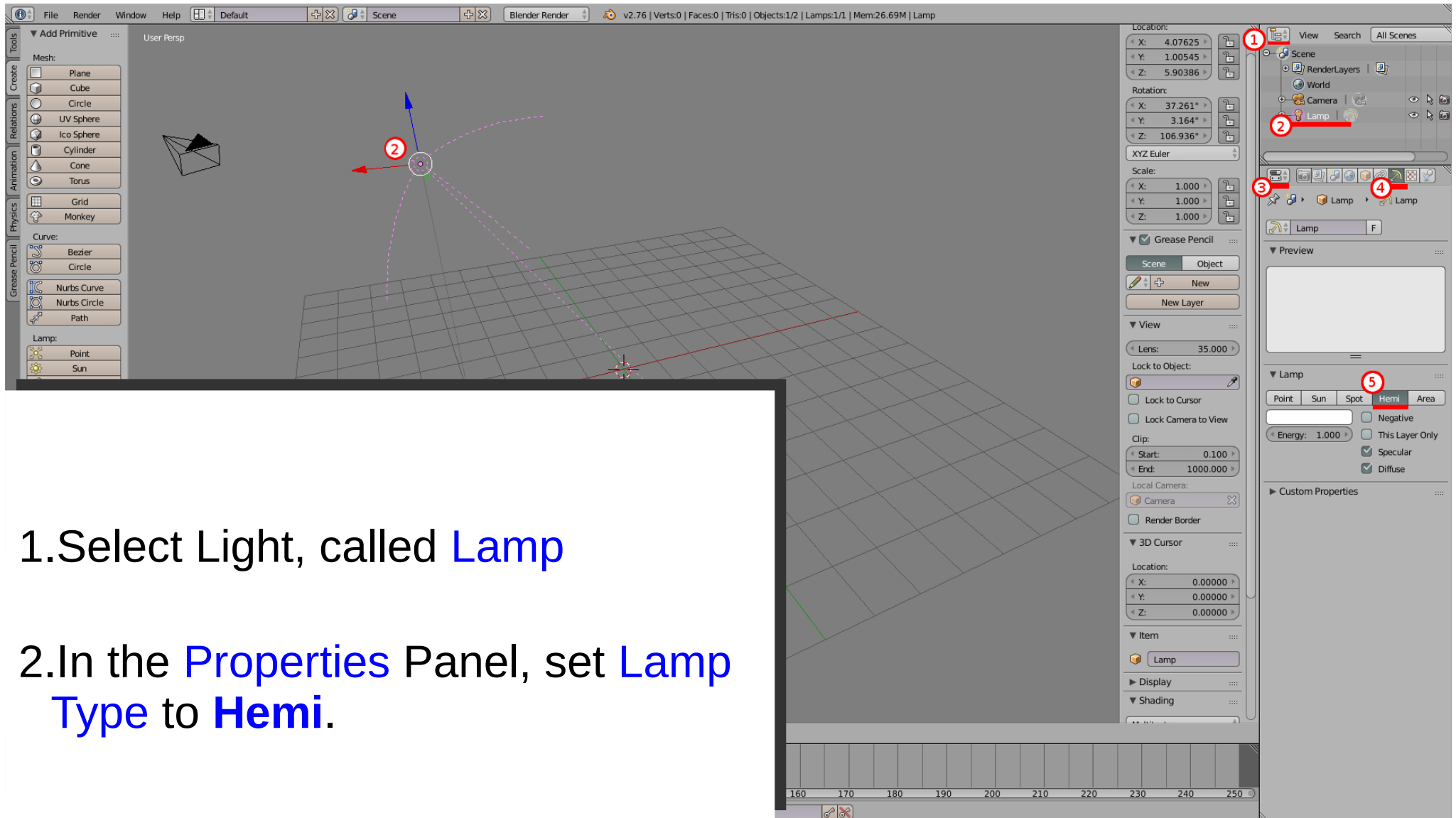
Open User Preferences:
File > User Preferences...



1. Select *Input* Tab
2. Under *Presets* select “Maya”
3. Save User Settings



1. Select Cube and delete it (press *Delete* or *X*, or in *3D View Panel*>*Object*>*Delete...X*). Confirm the dialog.
2. To Select object left-click it
3. To deselect, in *3D View Panel*>*Select*>(De)Select All *A*

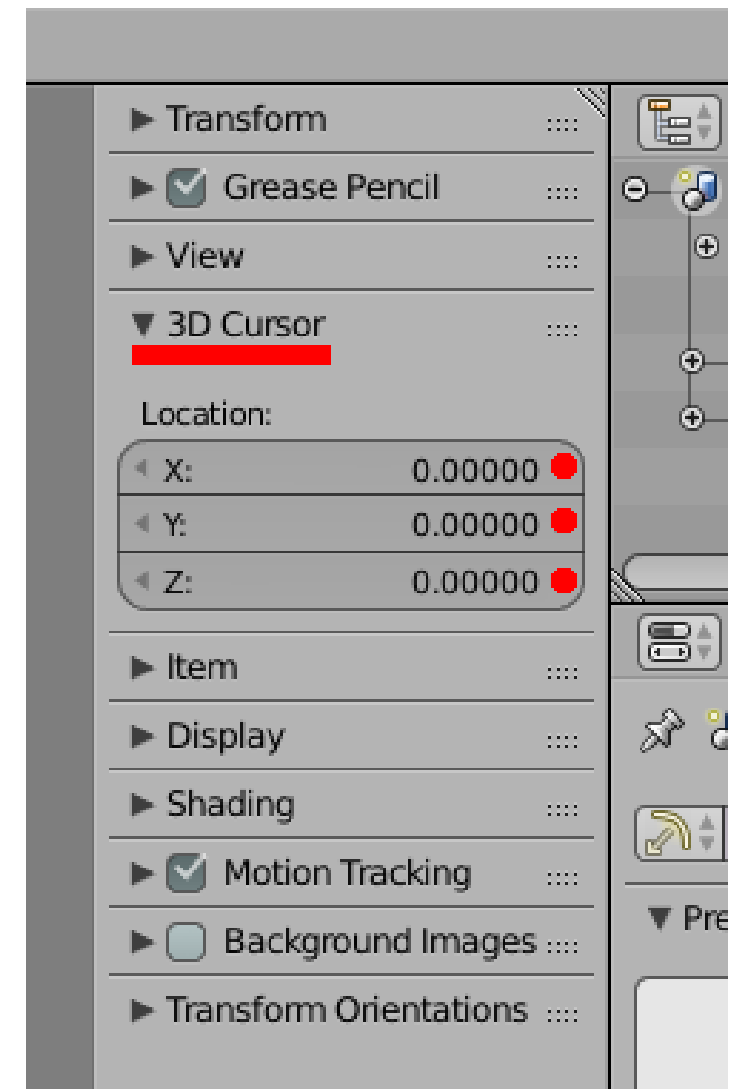
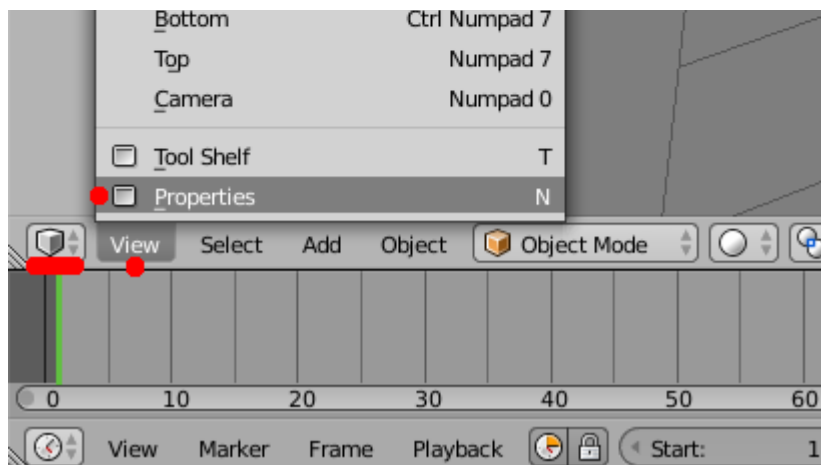


1. Select Light, called **Lamp**

2. In the **Properties** Panel, set **Lamp Type** to **Hemi**.



1. Place *3D cursor* to the 0,0,0
2. Open the Properties Panel By pressing N, or in *3D View Panel>View>Properties*
3. Find the block which is called *3D Cursor*, and set location to 0,0,0.



Creating a Camera Target

1. Create *Empty*.

2. Type: *Plain Axes*

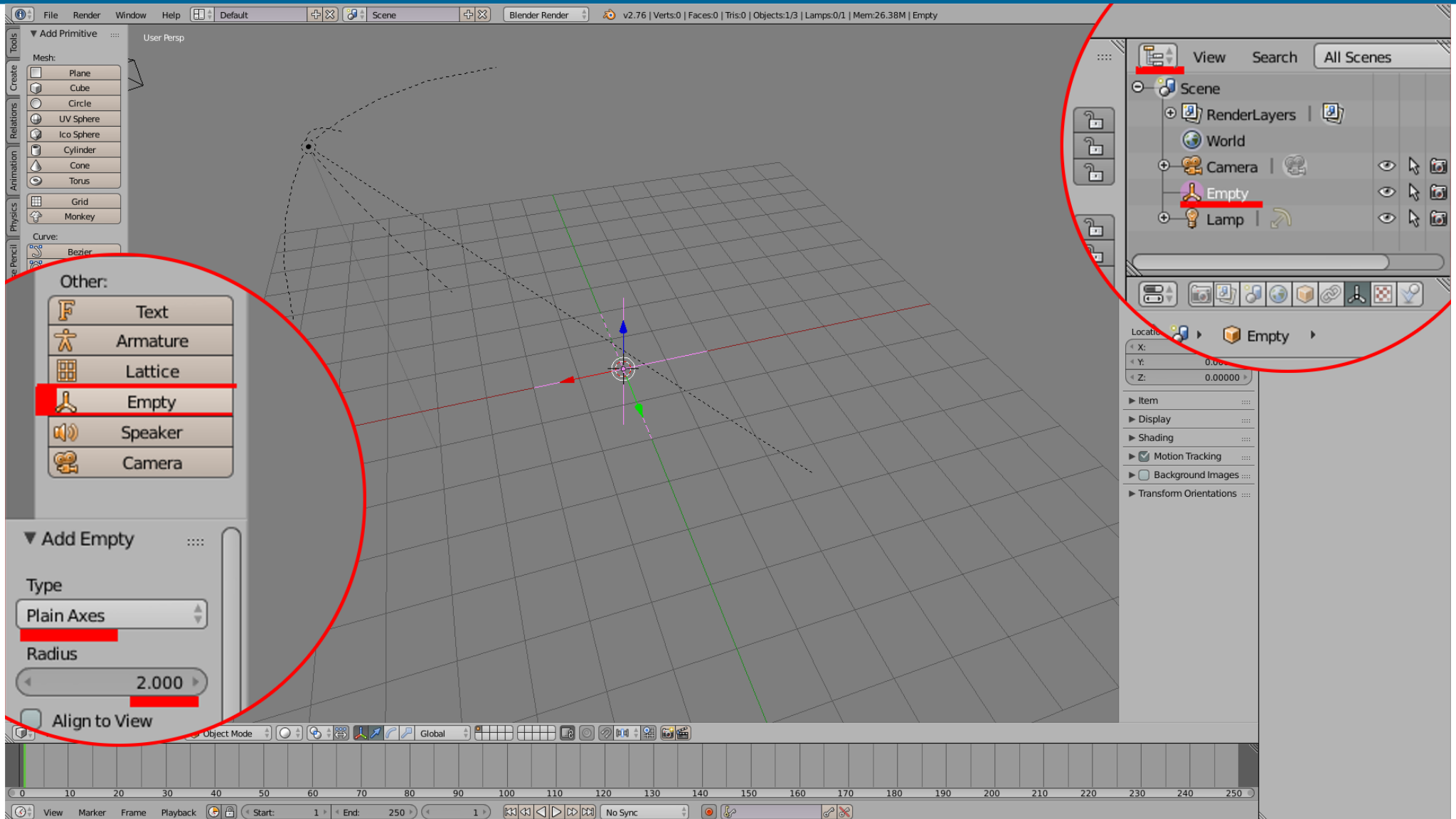
3. Radius *2.000*

4. Location (*0, 0, 0*)

5. In the *Outliner*  Panel, right click on the “Empty” object and Click Rename in the appeared menu.

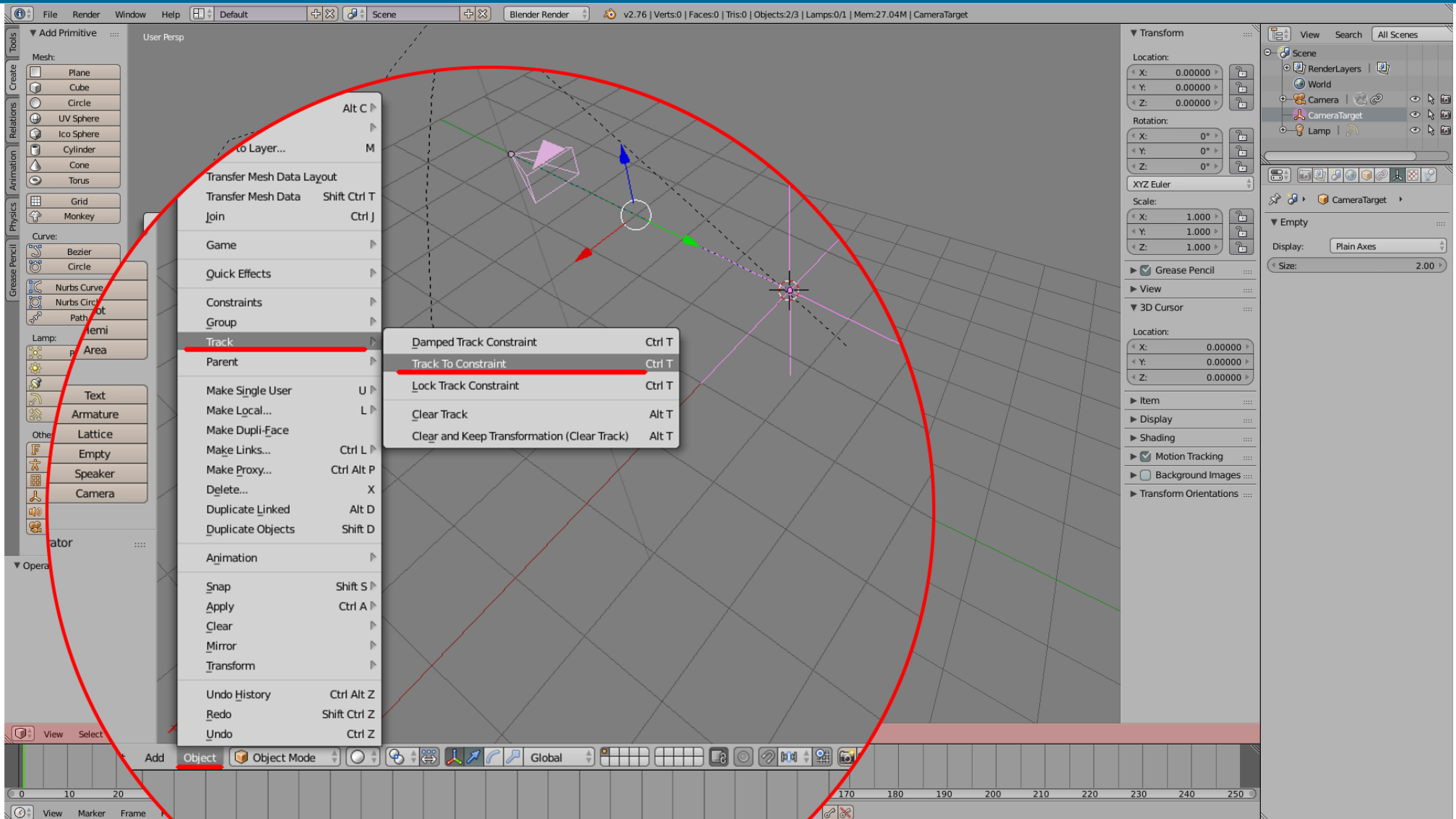
6. *Rename* it to *CameraTarget*:

Creating a Camera Target



1. Relocate and rotate the camera so it should “look” right at the CameraTarget:
Location (0,-6,0), Rotation(90,0,0)
2. Select the Camera first then holding “*Shift*”, select the CameraTarget object.
3. Create relation – so that the camera always looks at the CameraTarget object. *Object>Track>Track to Constraint*
4. Save as startup. Now this scene will always open with a Camera, a CameraTarget and a light source

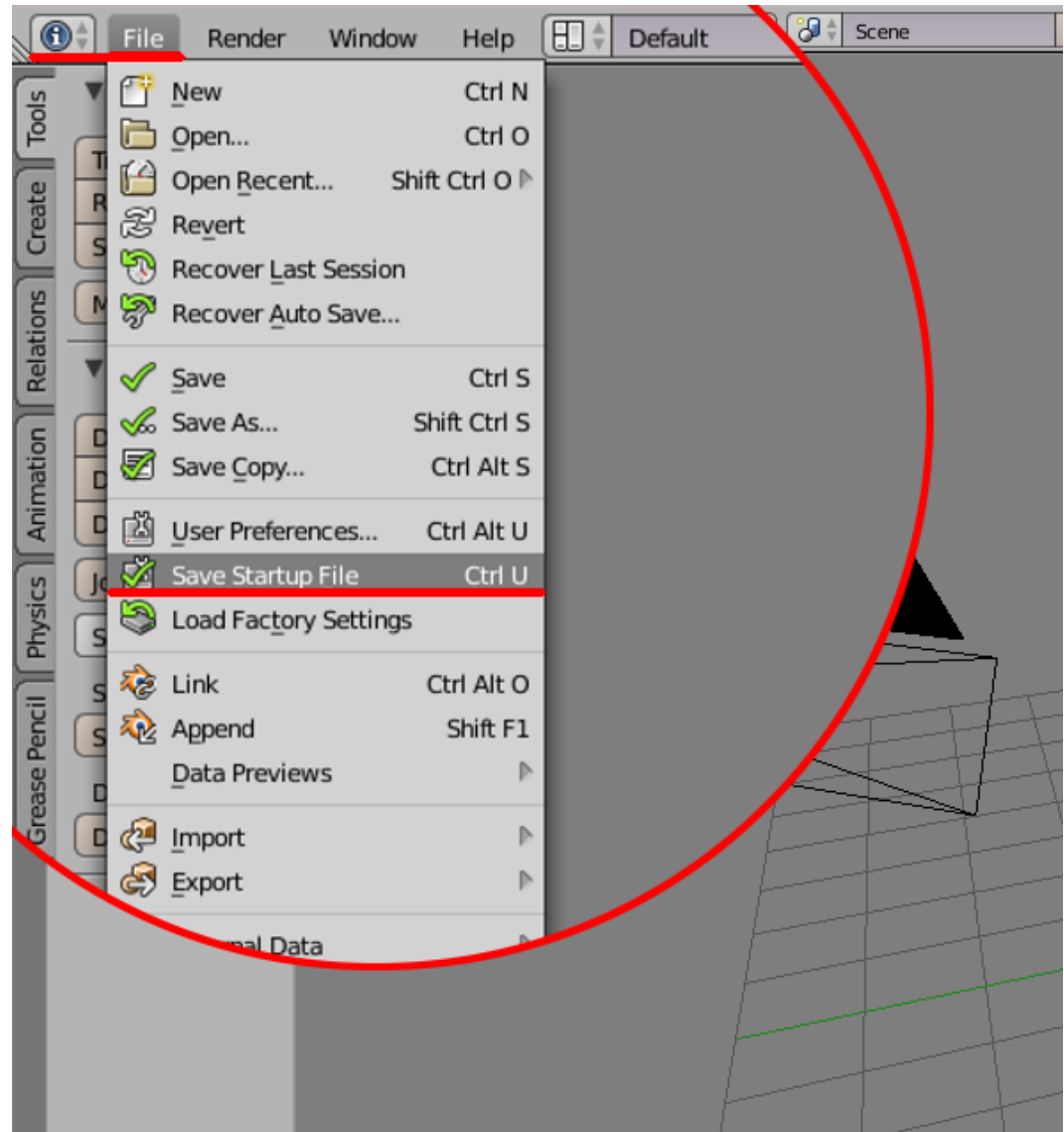
Linking the Camera with the Camera Target



Saving the scene as a startup file

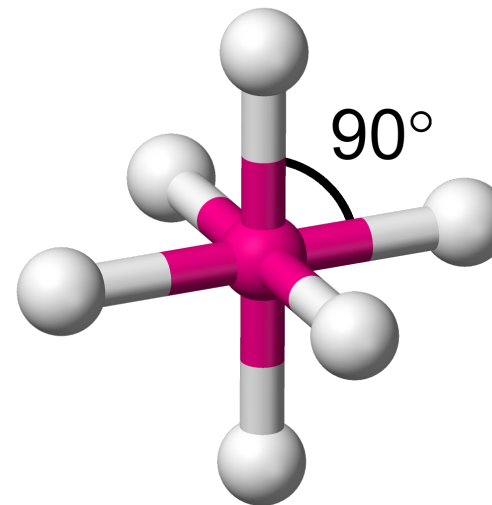
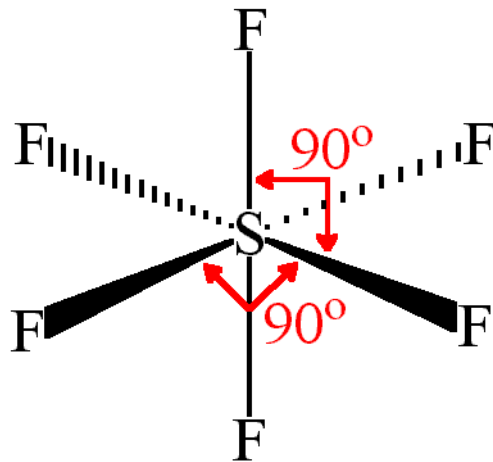
Save the out scene as a
Startup File:

File > Save Startup File



Prepare drafts and references

1. Draw 3D model on the paper
2. Search for the similar images on the internet
3. Divide it into the primitive objects: cube, sphere etc
4. Find identical parts of the object
5. Be creative, develop your own strategy



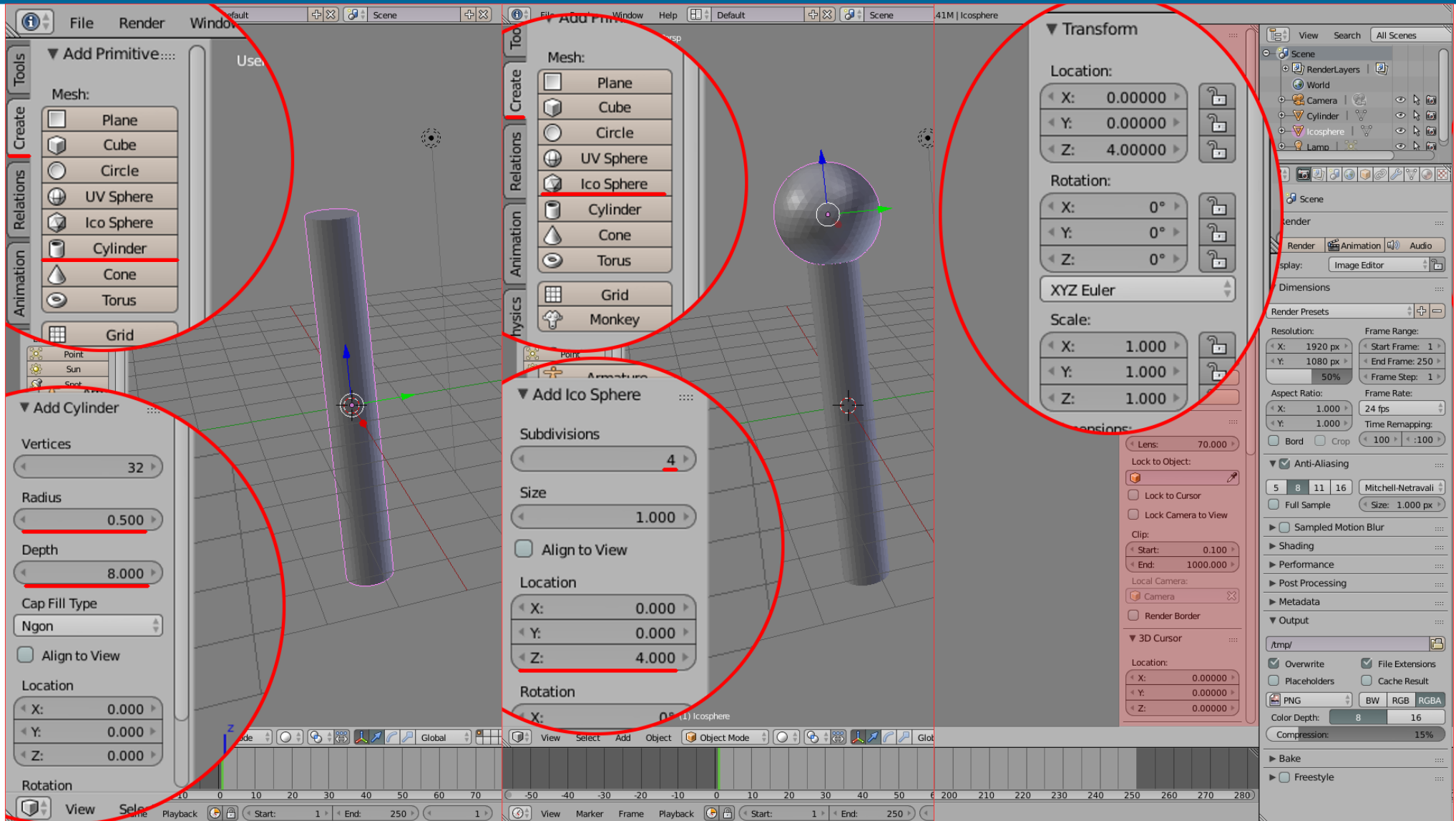
Creating the first 3D model

1. Create *Cylinder*
2. Set *Radius to 0.5*
3. Set *Depth to 8*

**you won't be able to change those values in that menu after the object is created and deselected. Don't worry, there is another way of changing the shape*

4. Create *Ico Sphere*
5. Set property: *Subdivisions 4*
6. Set property: *Size 1.0*
7. Translate it to (0, 0, 4)

Creating the first 3D model



Duplicating the sphere object

1. In Tools tab, click *Duplicate*

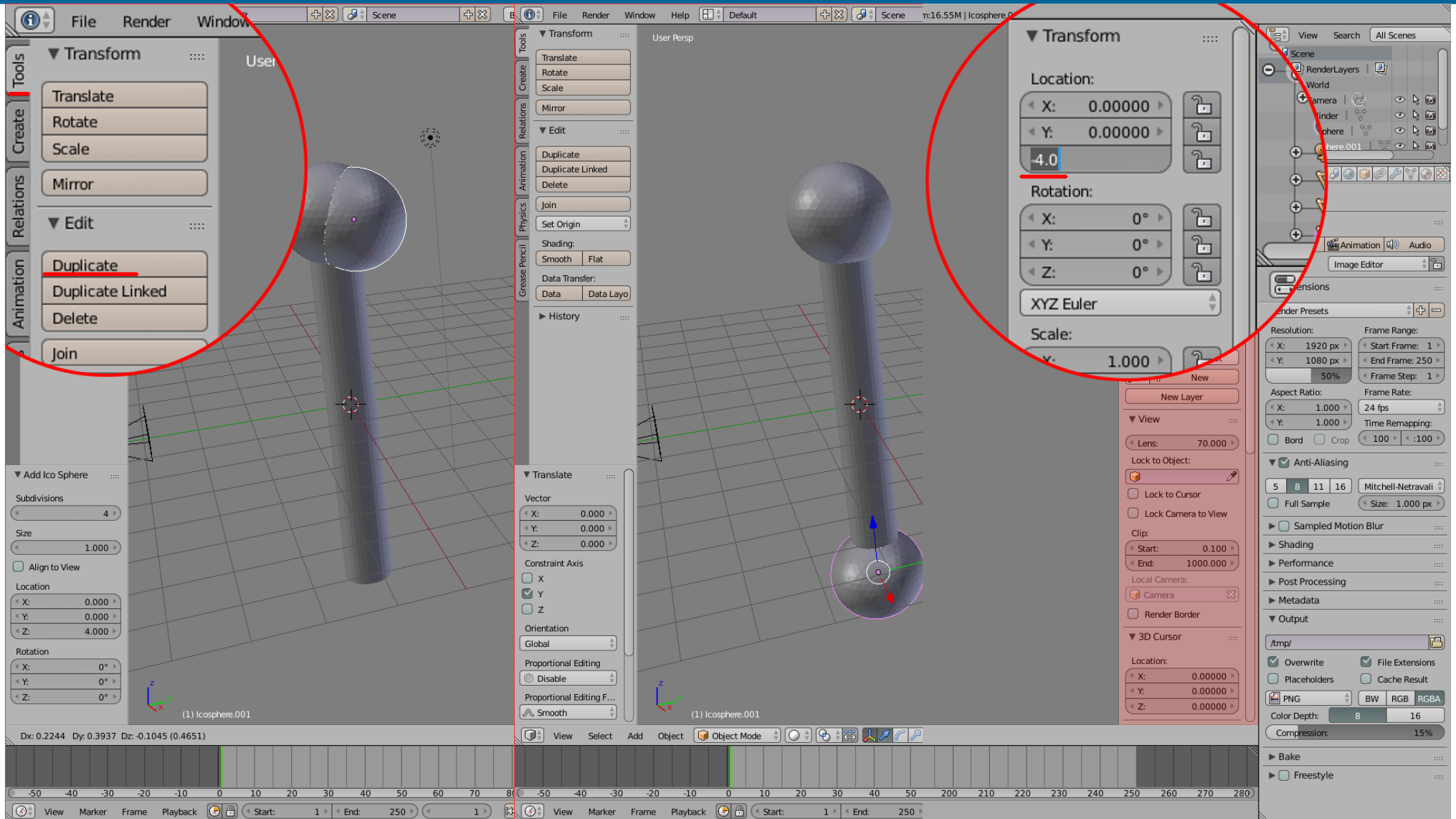
2. Right click to drop duplicated sphere

** The duplicated object is dropped to the same location as the original.*

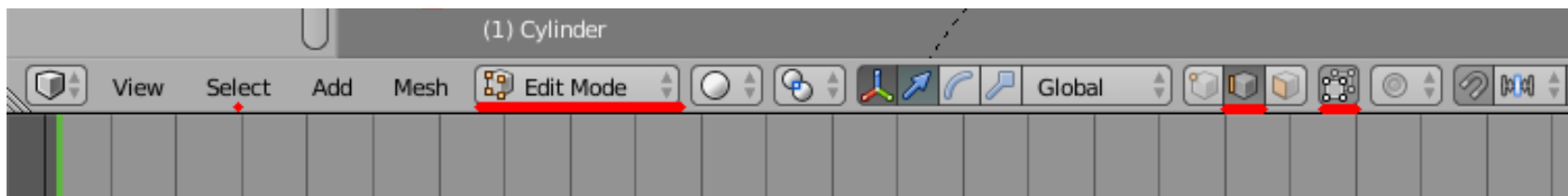
3. In Properties panel, find *Transform > Location > Z*

4. Set *Z* value to -4

Duplicating the sphere object

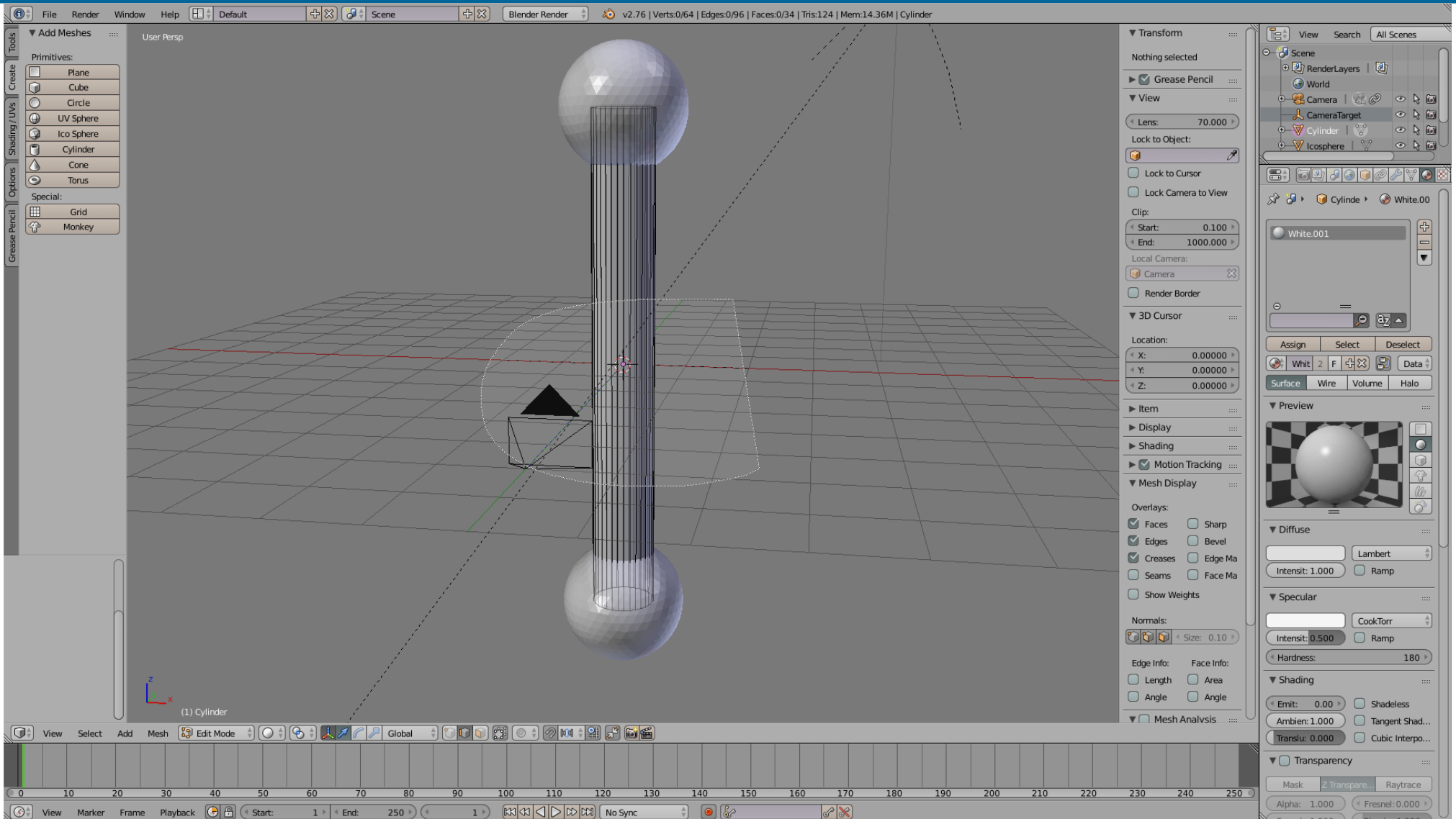


1. Select the *Cylinder* and open the [Edit mode] (press *Tab*)
2. Deselect all, by pressing '*A*'; or Via Menu: *Select > (De)select All A*
3. Make sure that your selection will not be limited to visible
4. Choose [Edge Select] Mode

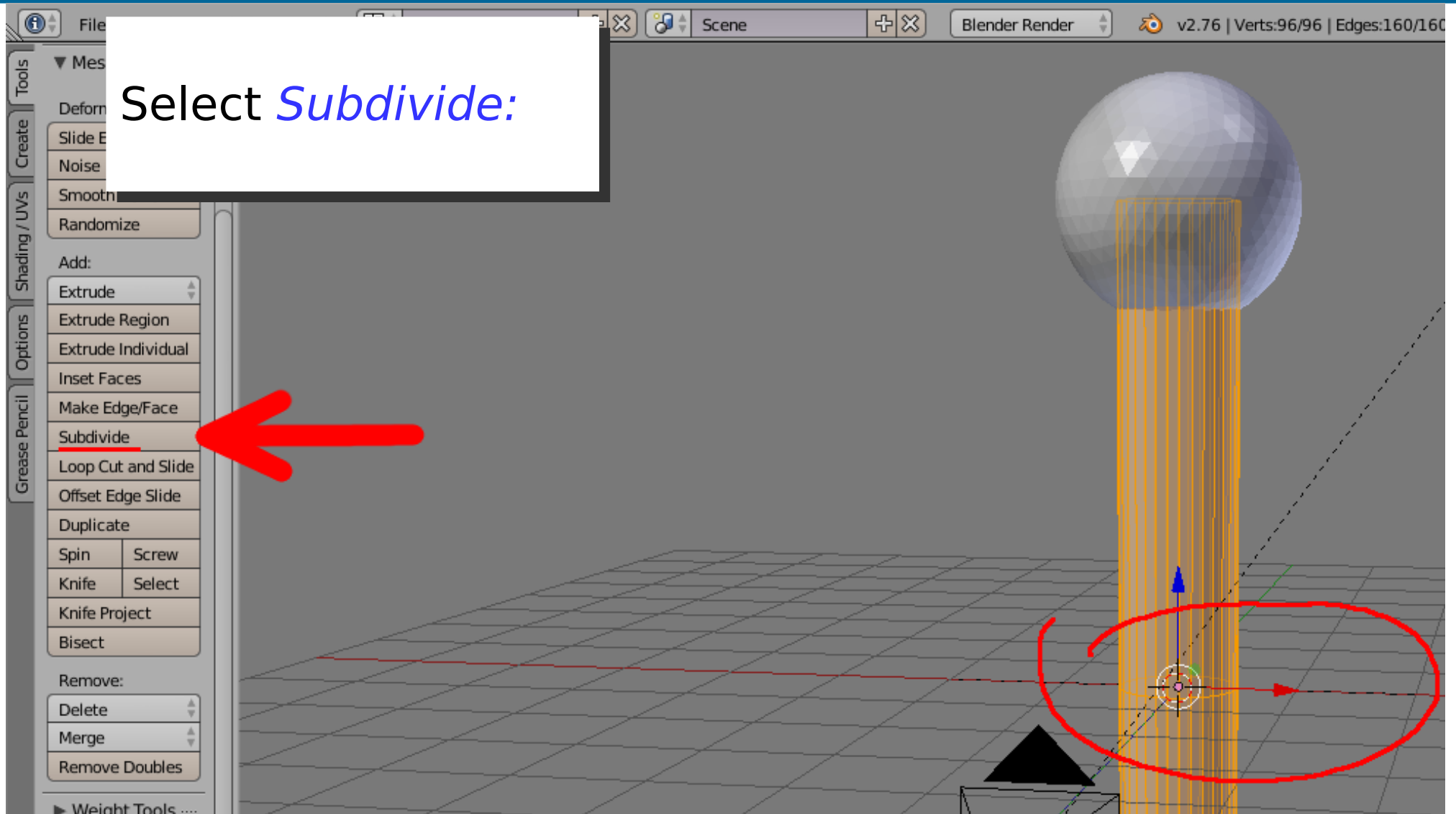


5. Select vertical Edges: Press *Ctrl + RightClick & Drag* around the edges. (*Select only vertical edges*)

Duplicating the sphere object



Editing mesh: subdividing edges



1. Deselect all, by pressing 'A'; or Via Menu: *Select > (De)select All A*

2. Perform the same actions with the top & bottom vertical edges:

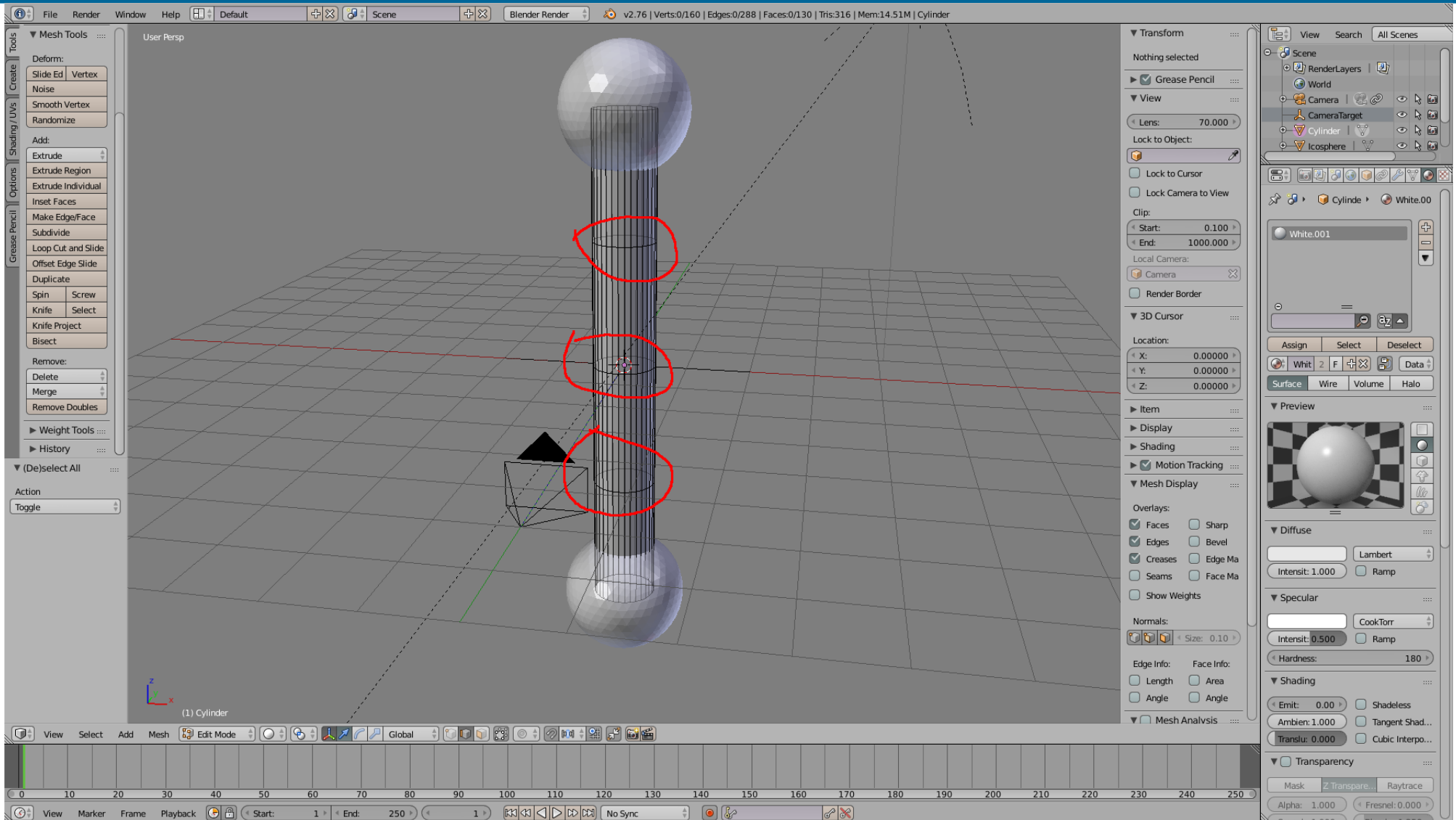
2.1. Select them

2.2. Then *Subdivide*.

*(Select only **vertical edges**)*

3. Deselect all

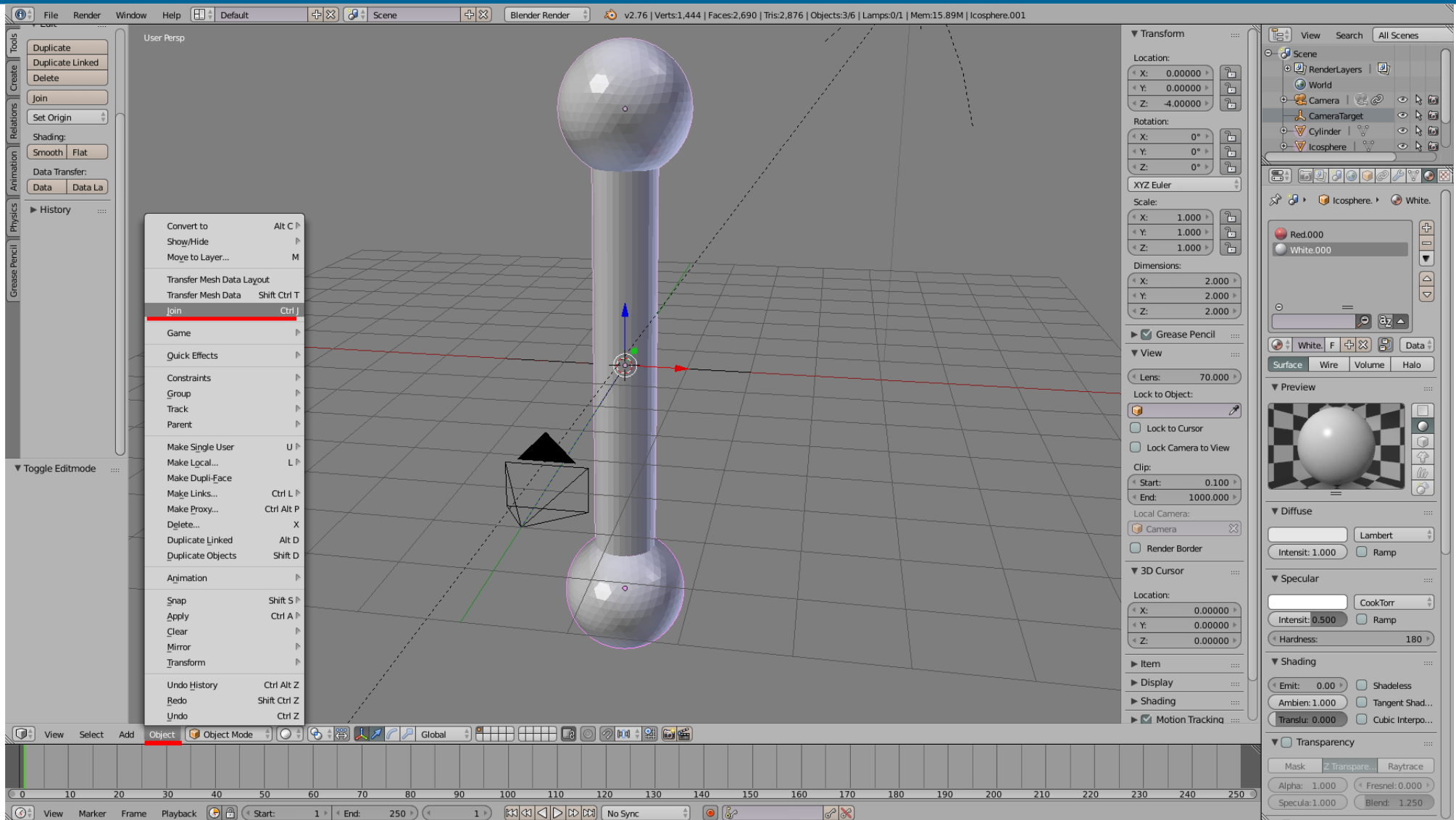
Editing mesh: subdividing edges



Joining objects in one mesh

1. Change to [*Object Mode*]
2. Select all three objects: cylinder and two spheres.
Select by holding *Shift* and *Left clicking* each object
3. *Join* objects into one mesh: *Object > Join*

Joining objects in one mesh

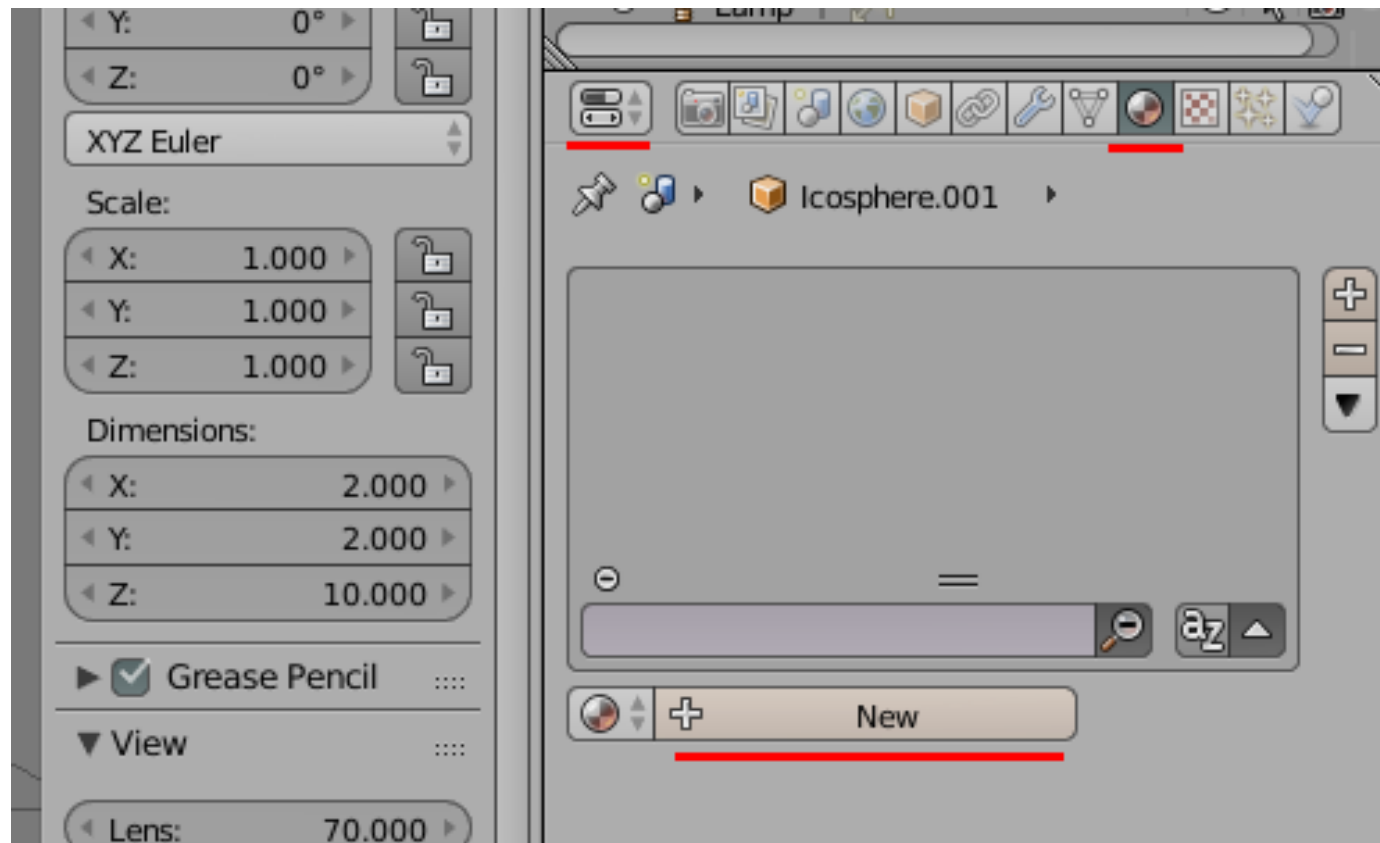


Joining objects in one mesh

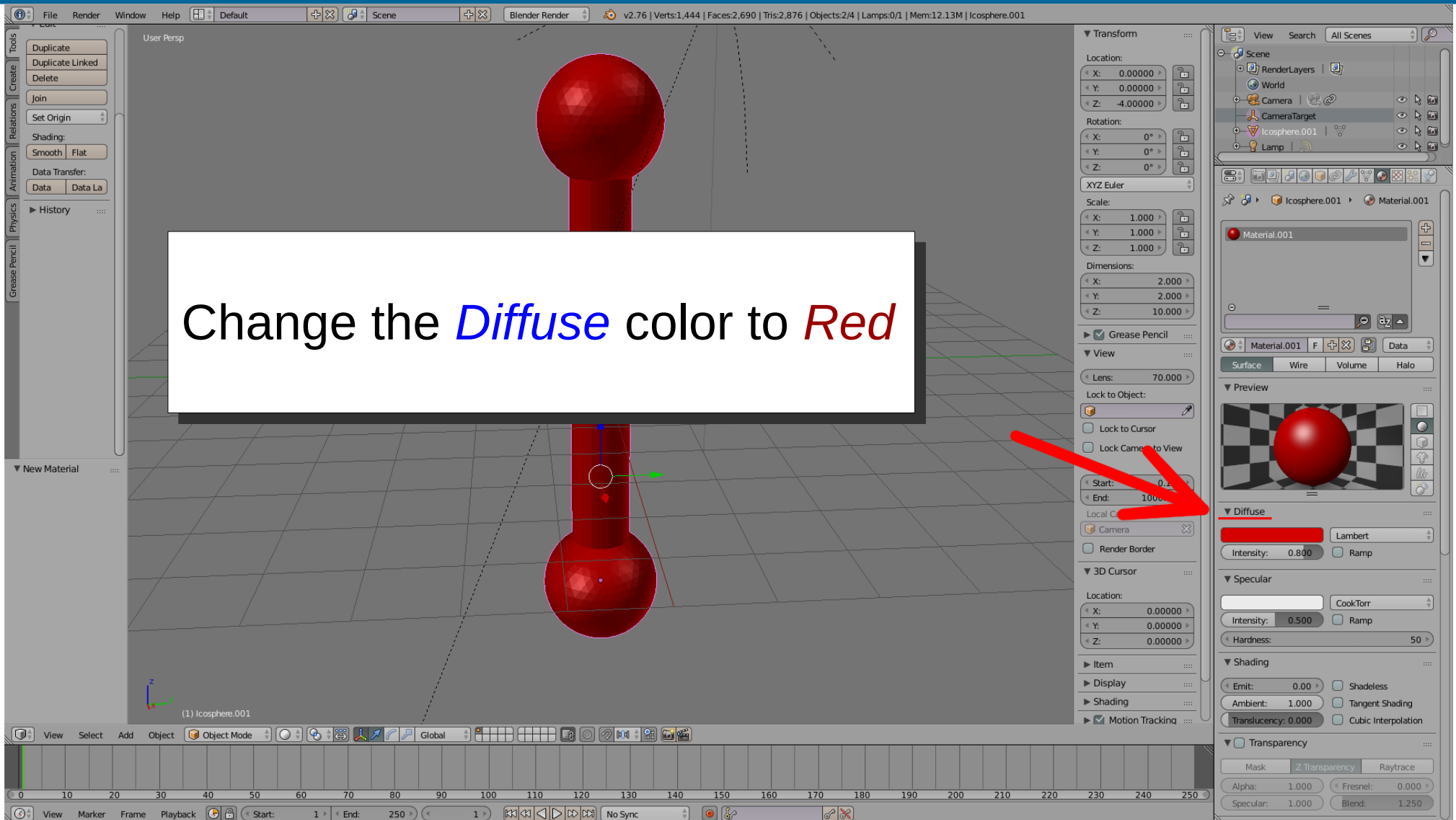
1. Change to [*Object Mode*]
2. Select all three objects: cylinder and two spheres.
Select by holding *Shift* and *Left clicking* each object
3. *Join* objects into one mesh: *Object > Join*

Assigning a material to the object

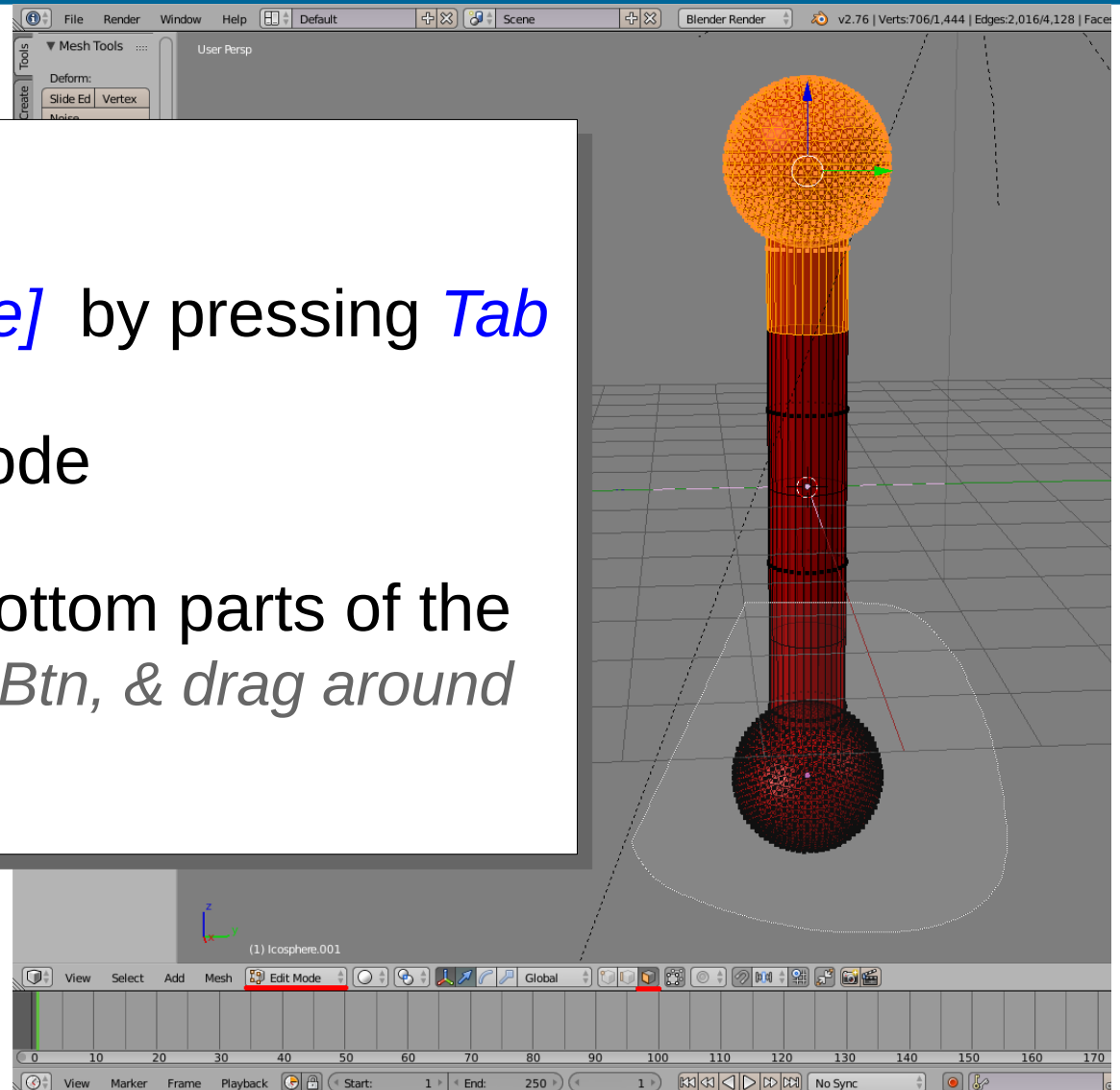
1. Open the *Material* tab.
2. Create new *Material*, by tapping *New*



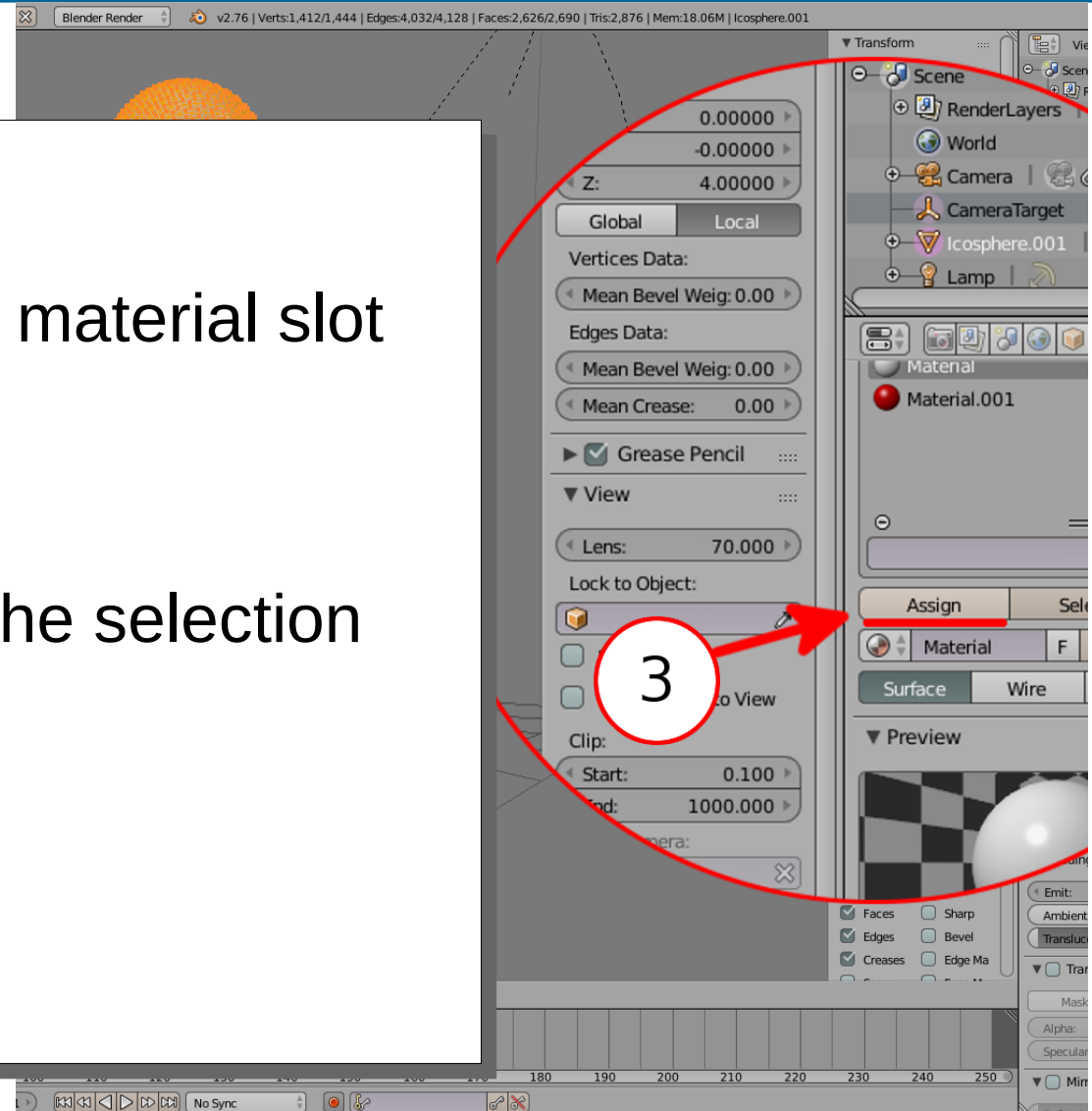
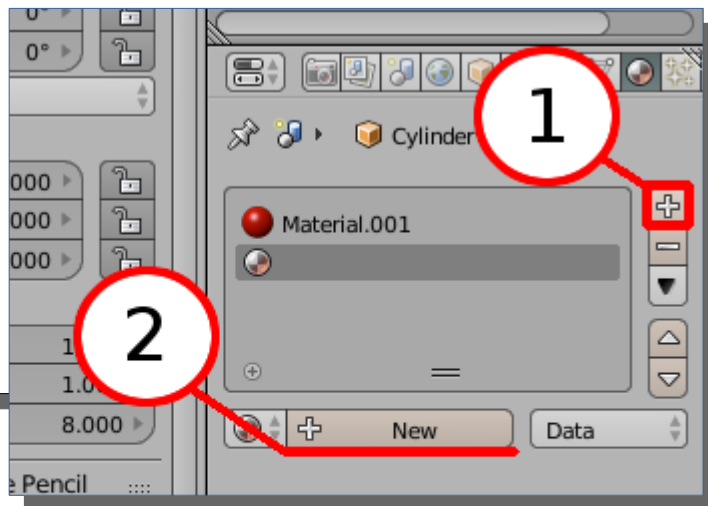
Assigning a material to the object



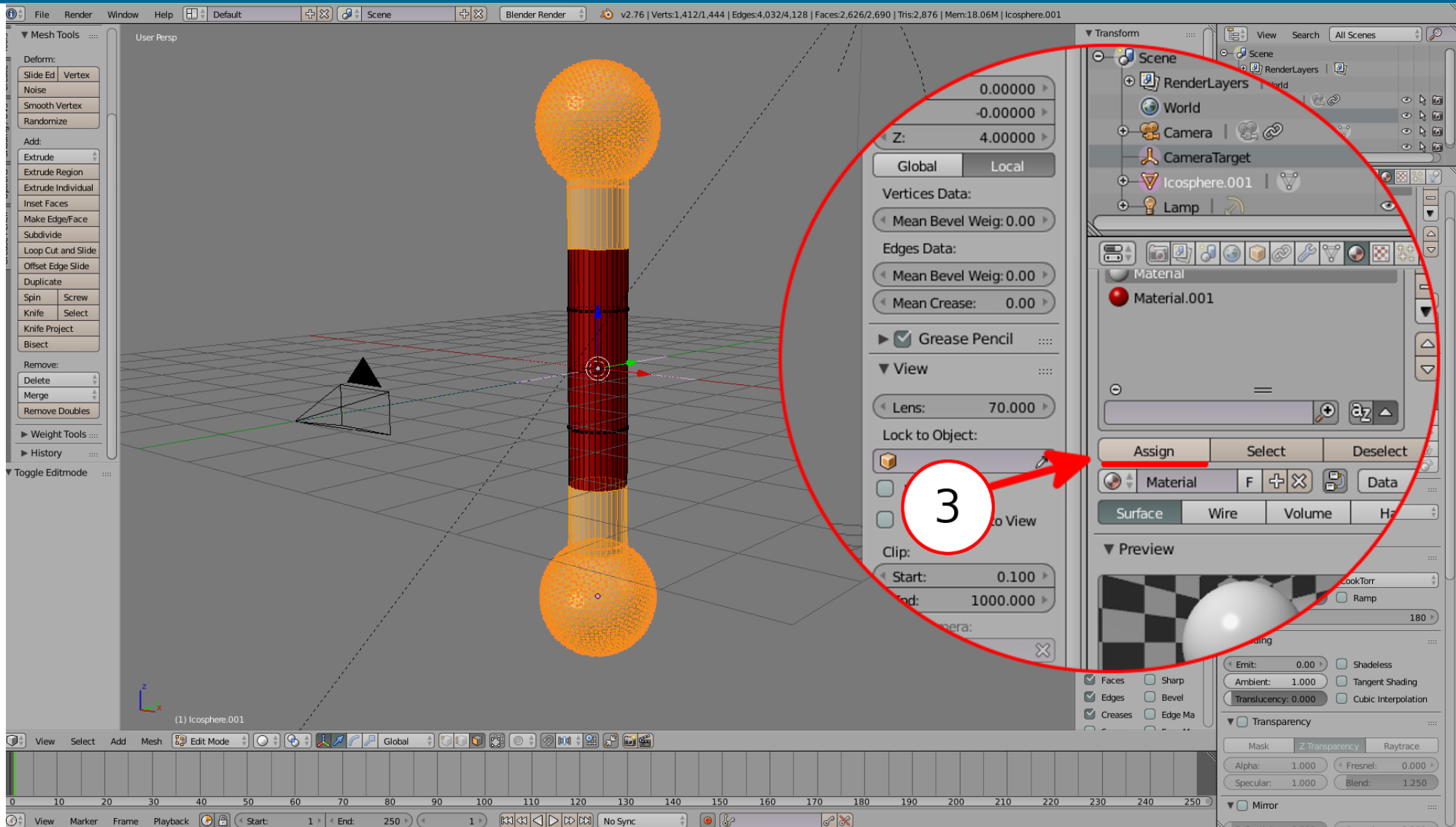
1. Change to the *[Edit Mode]* by pressing *Tab*
2. Choose *[Face Select]* mode
3. Select the Top and the Bottom parts of the object. *Ctrl + Right Mouse Btn*, & drag around



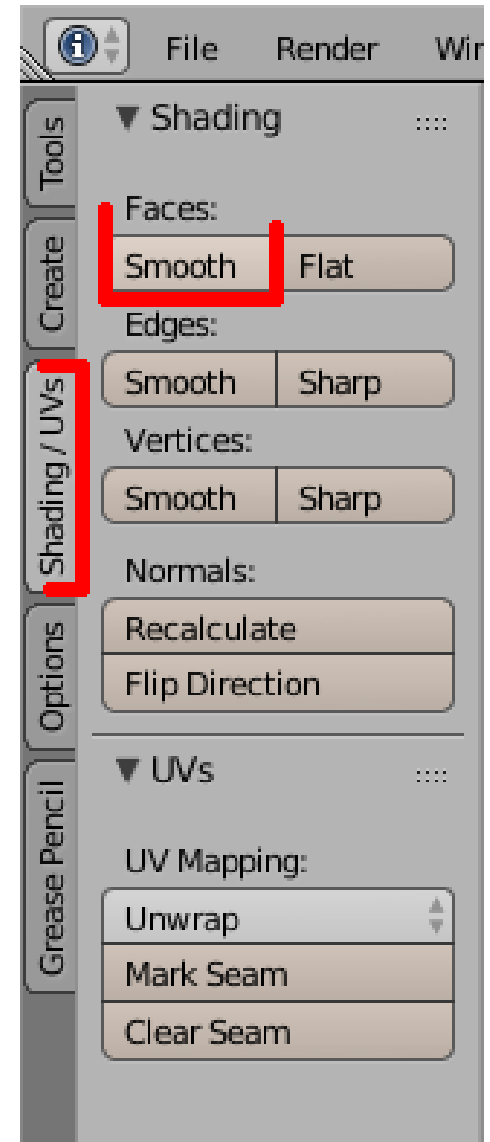
1. In the *Material* Tab, add new material slot
2. Create a new Material
3. *Assign* that new material to the selection



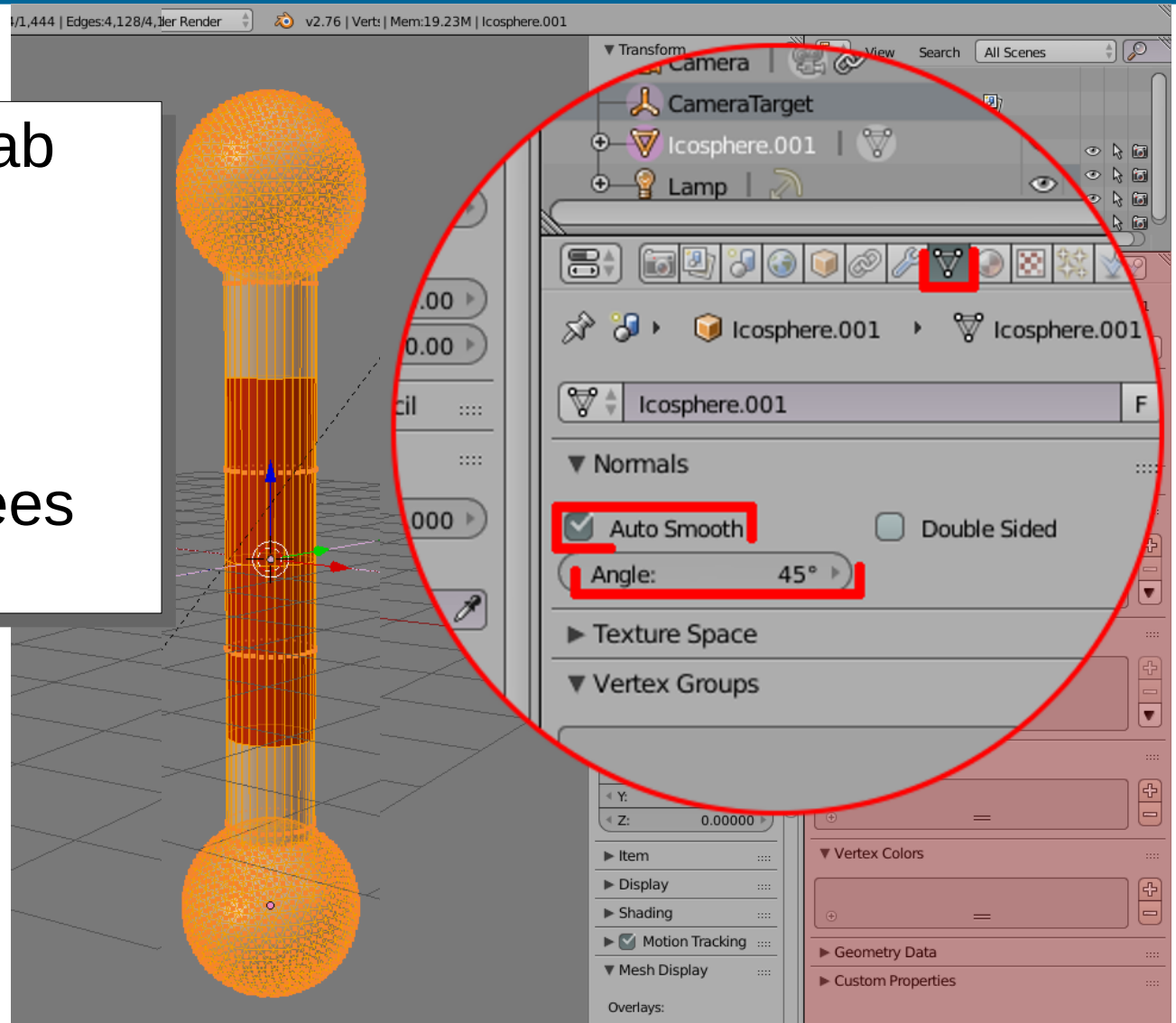
Assigning a material to polygons/faces



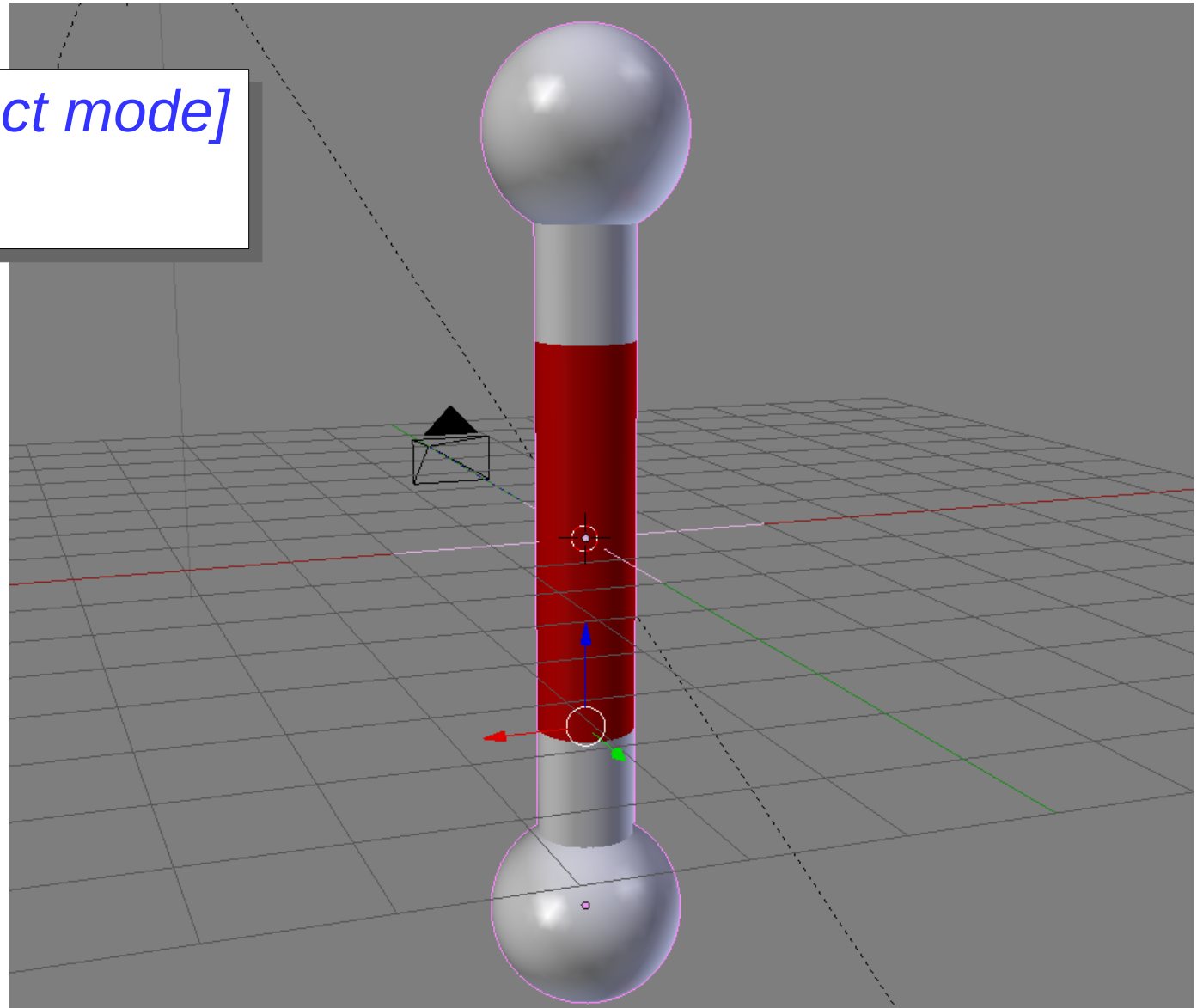
1. Deselect all selected by pressing 'A'
2. Select all faces of the mesh by pressing 'A'
3. On the left, open *Shading/UVs* tab
4. Under *Faces:* select *Smooth*



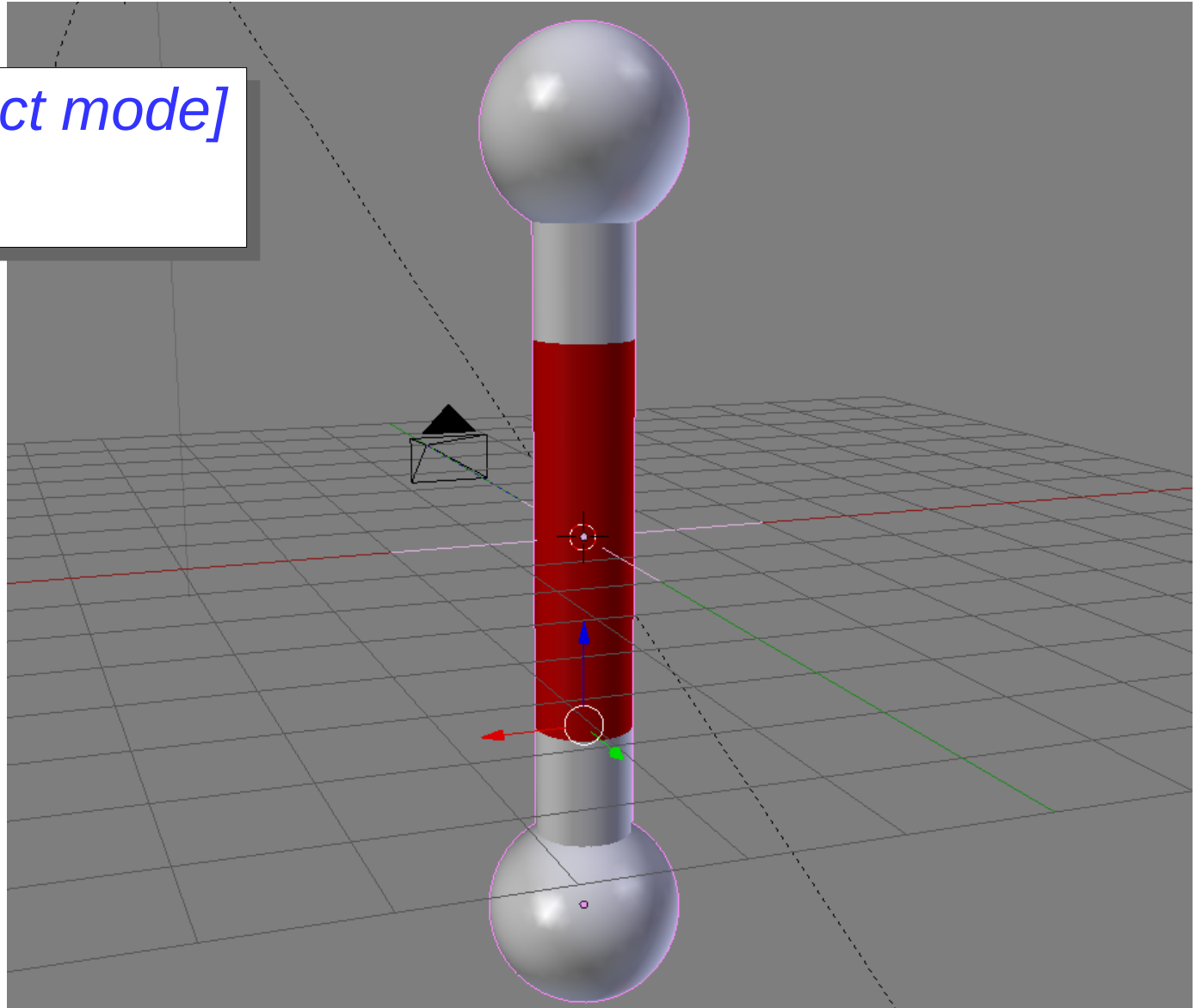
1. Open object's *Data* Tab
2. Check *Auto Smooth*
3. Set Angle to *45* degrees



Change back to *[Object mode]*
(press *Tab*)



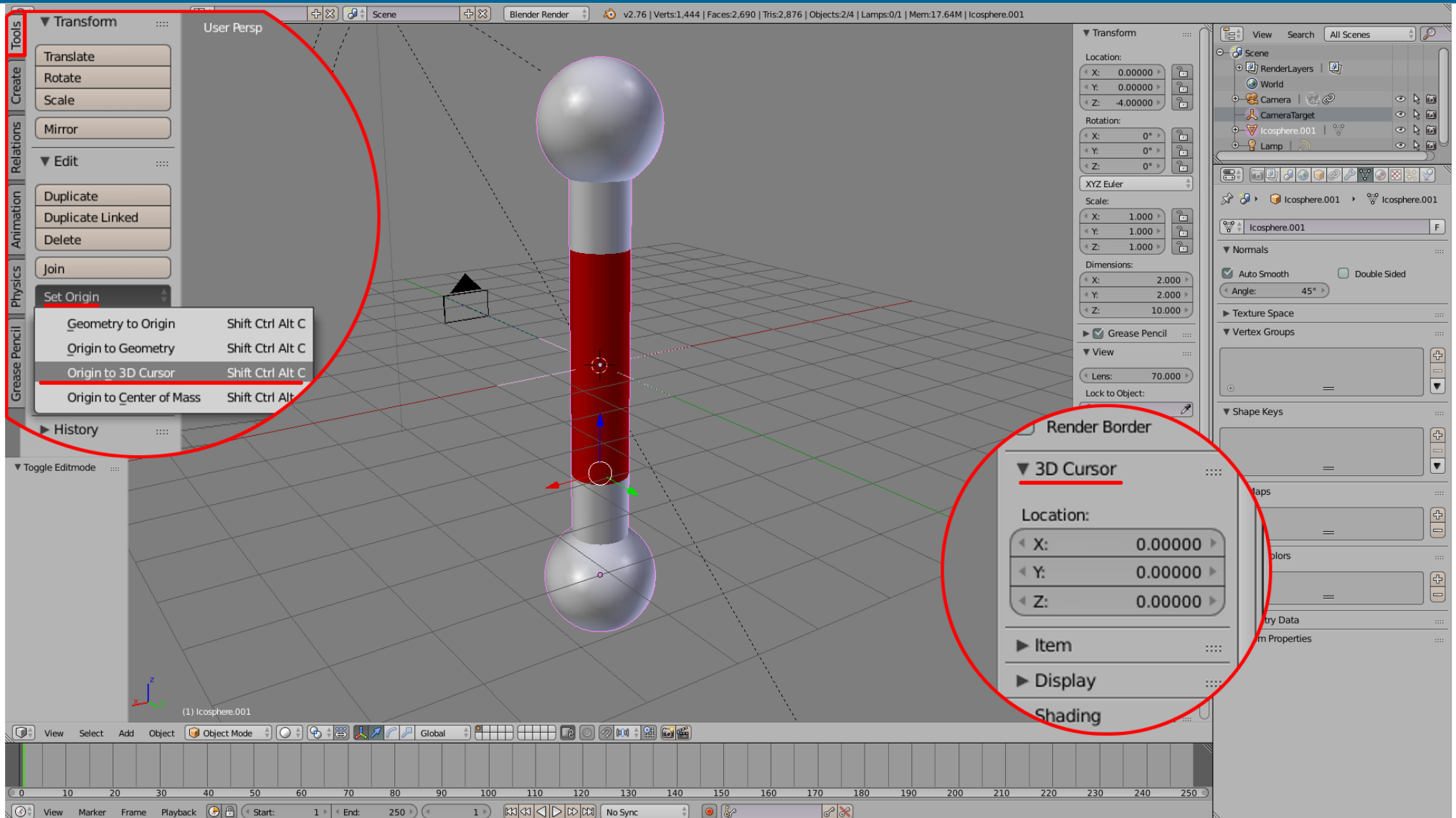
Change back to *[Object mode]*
(press *Tab*)



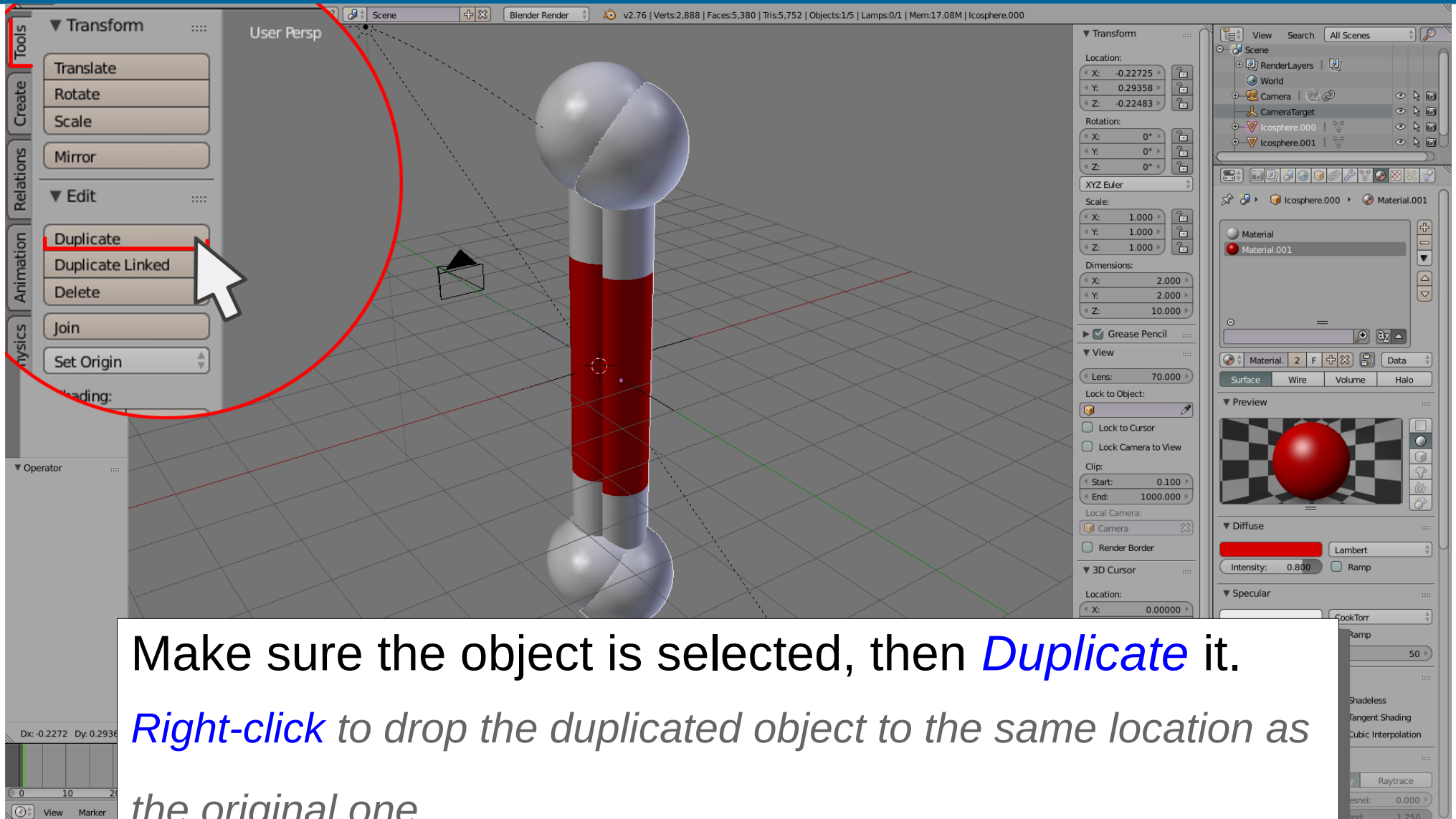
Update object's origin

1. Set 3D cursor to 0,0,0
2. Select our model, and open Tool tab in the left panel
3. Select *Set Origin* then
4. Origin to *3D Cursor*

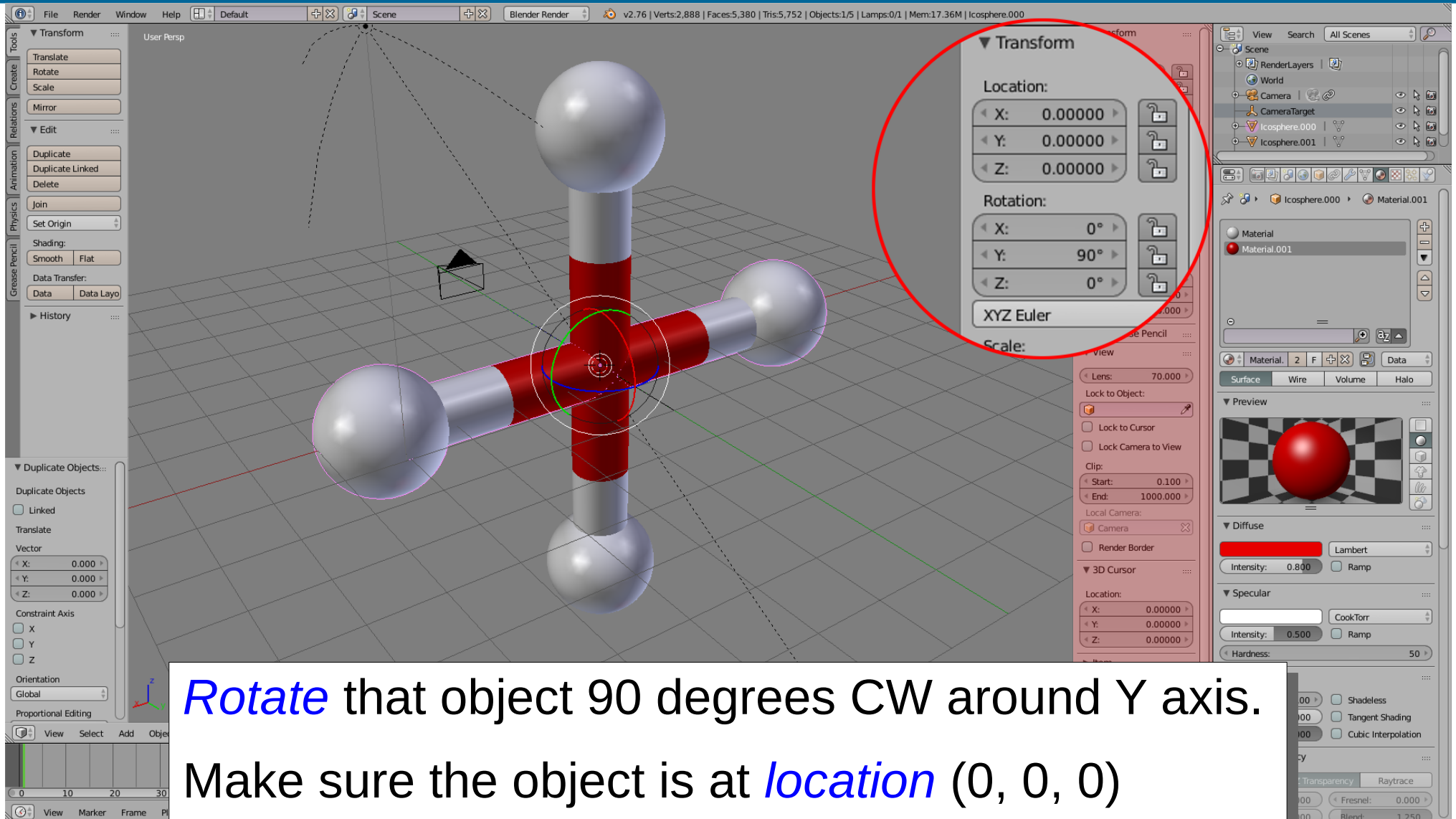
Update object's origin



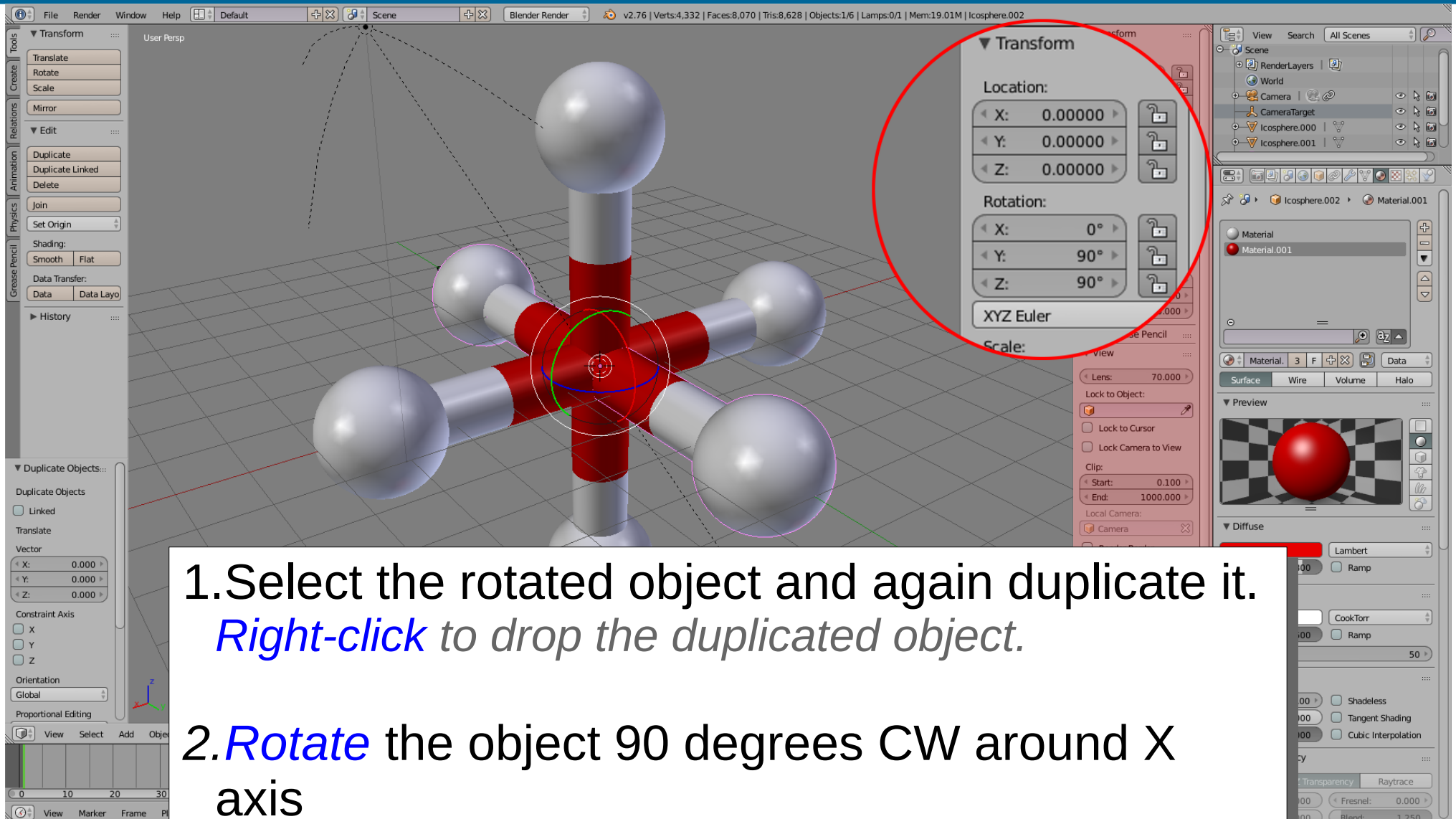
Duplicating the object



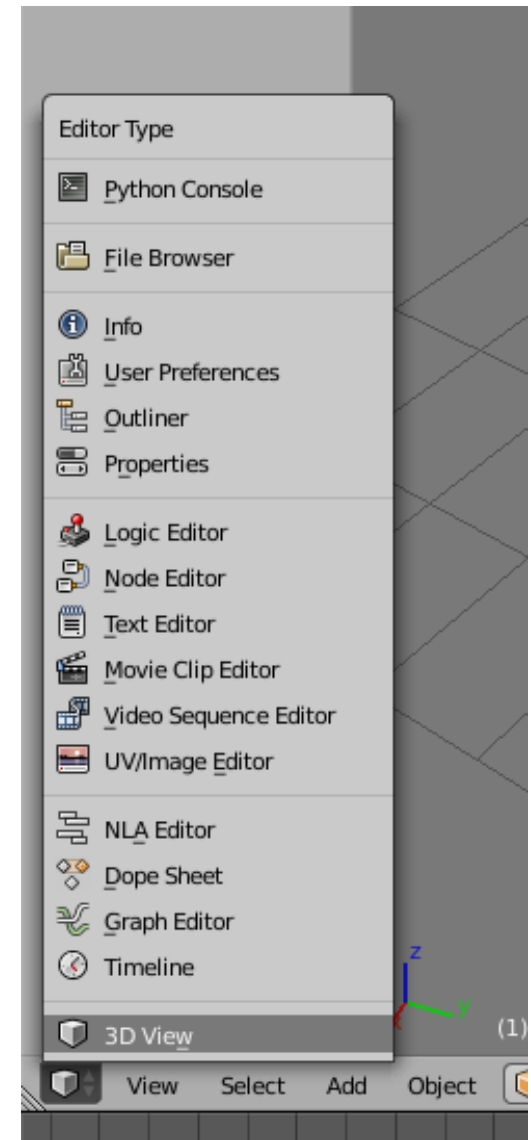
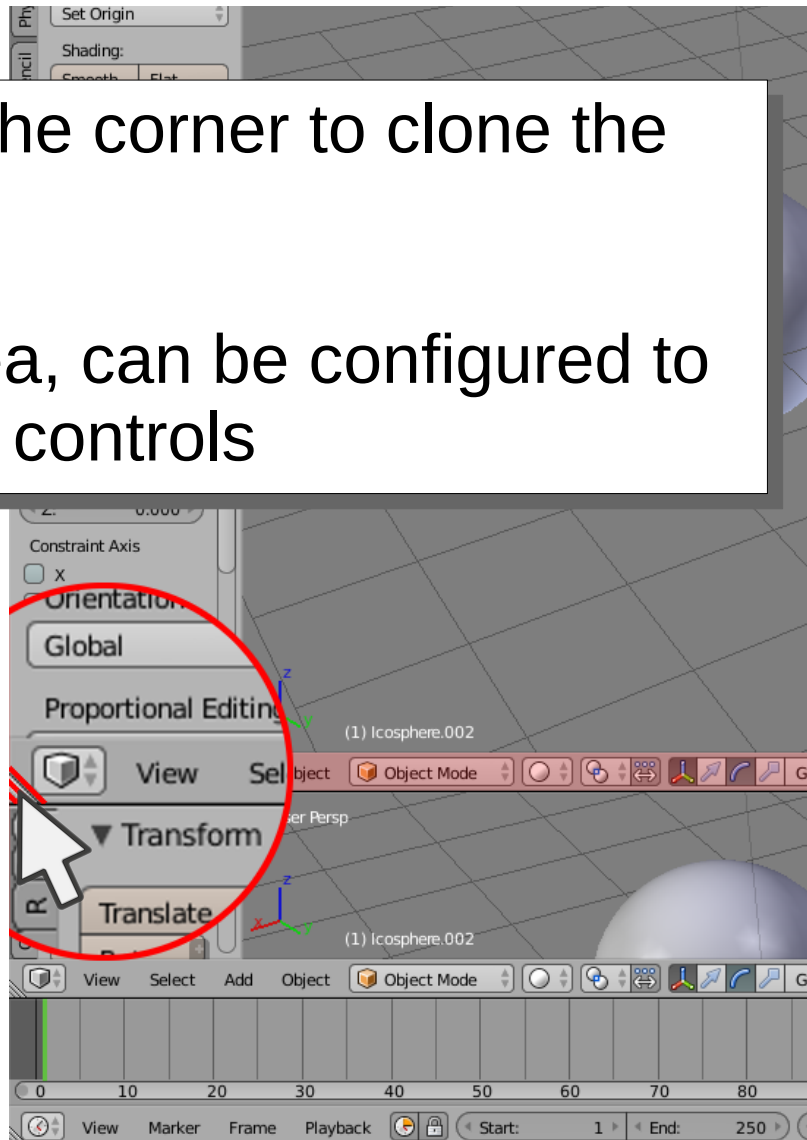
Duplicating the object



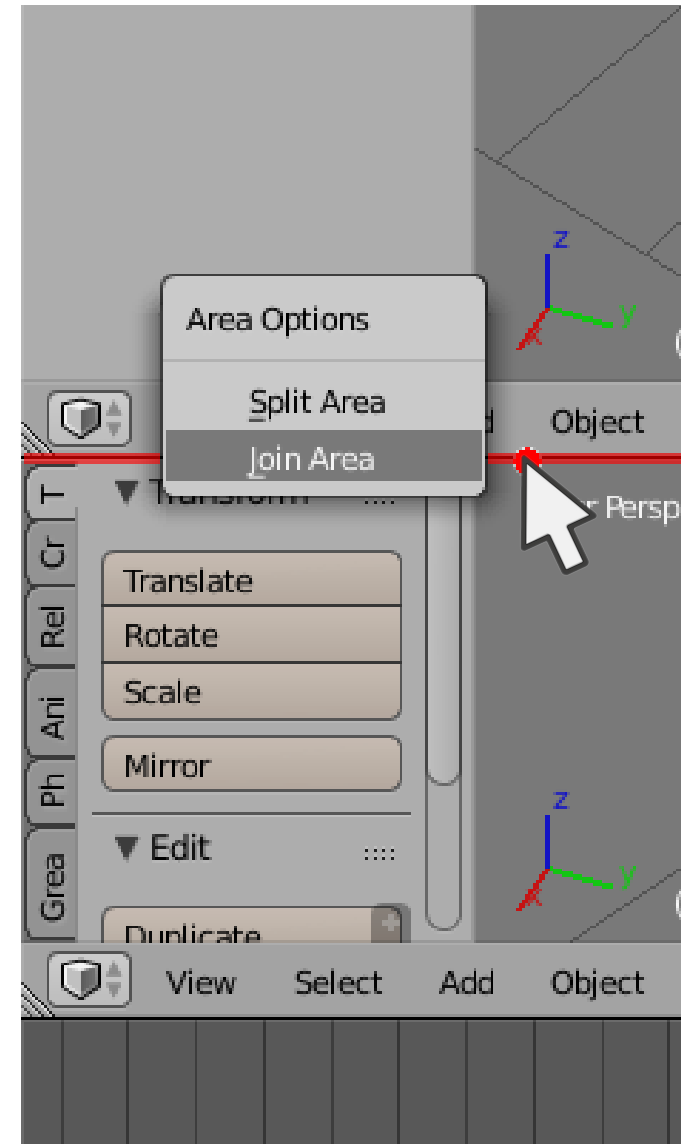
Duplicating the object



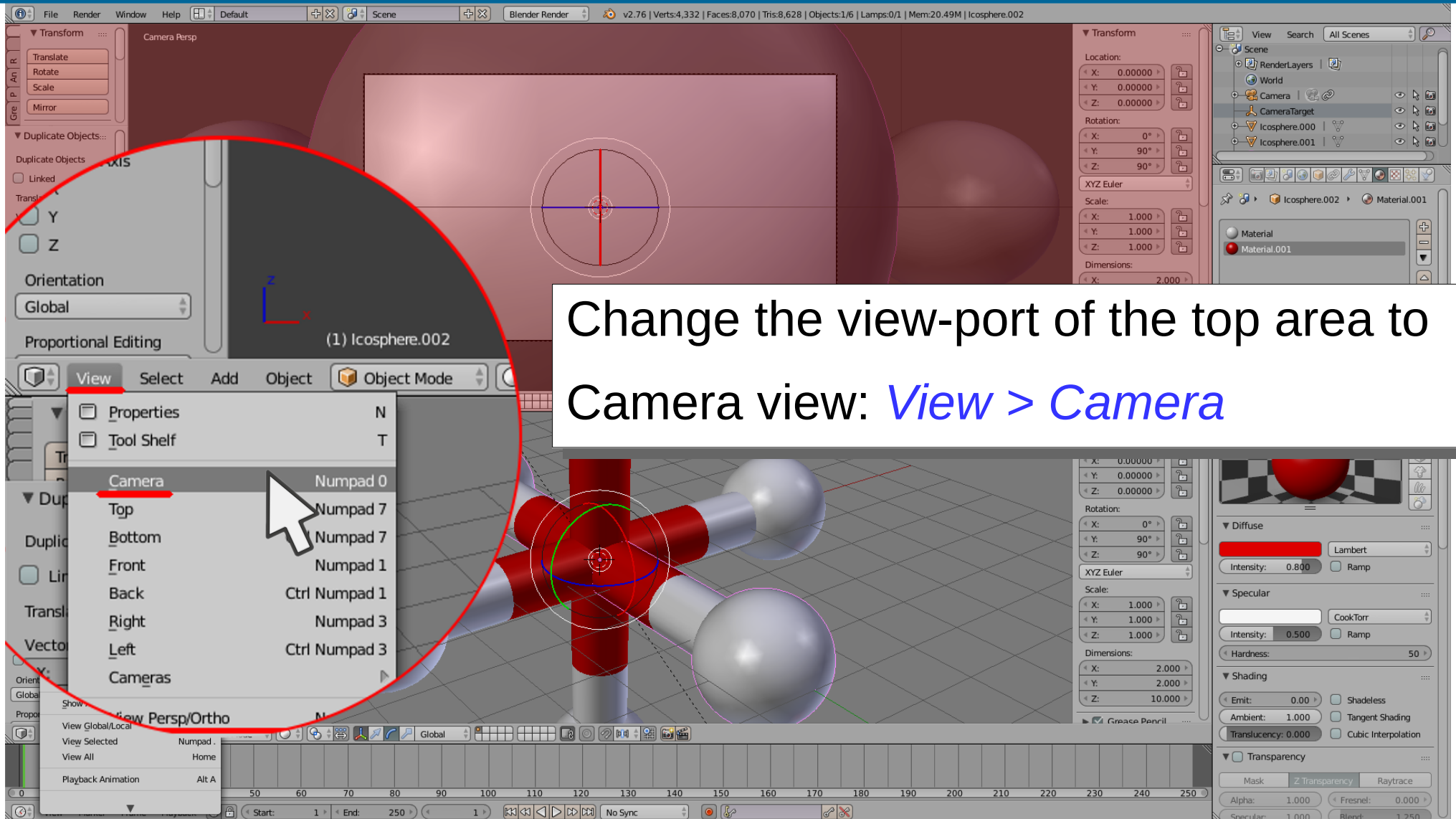
1. Hold and drag the corner to clone the Editor Area
2. Each Editor Area, can be configured to display different controls



1. To *Close* the Area, move the pointer to the *edge* then *right-click* to see the menu
2. Select *Join Area*
3. Select the Area to be joined (closed)

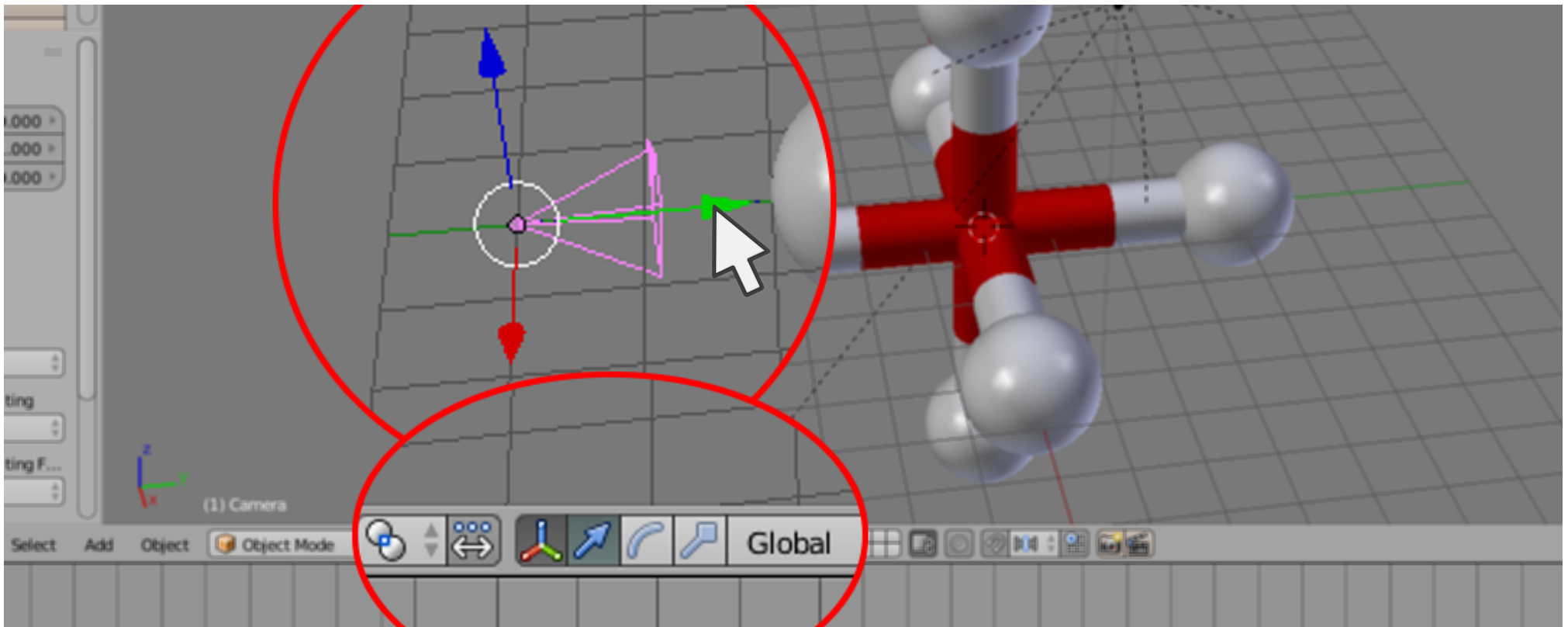


Setting up the Virtual Camera



Setting up the Virtual Camera

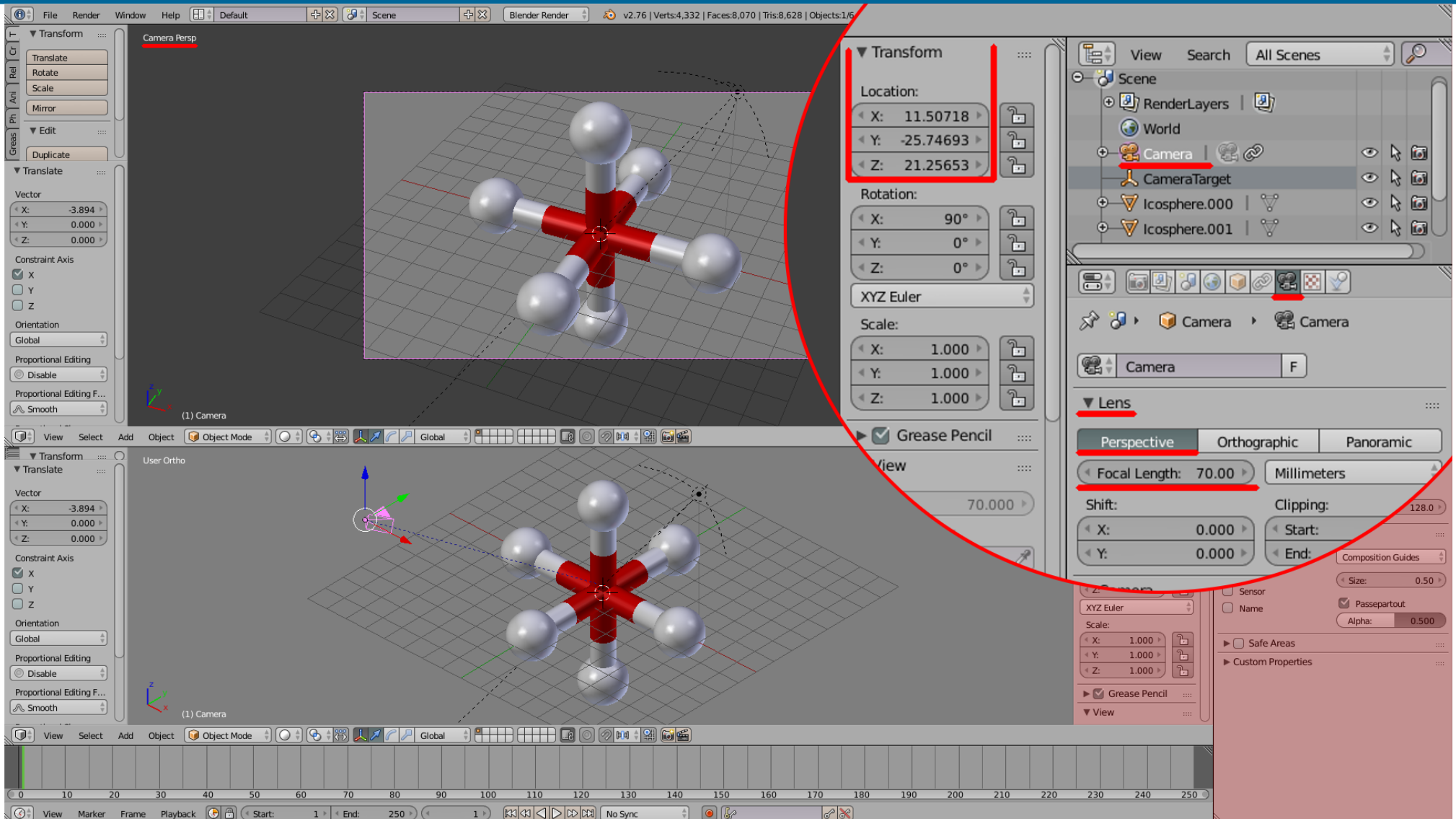
1. Drag the camera along the Axes XYZ.
2. Holding Left Ctrl while dragging snaps camera's location to the grid



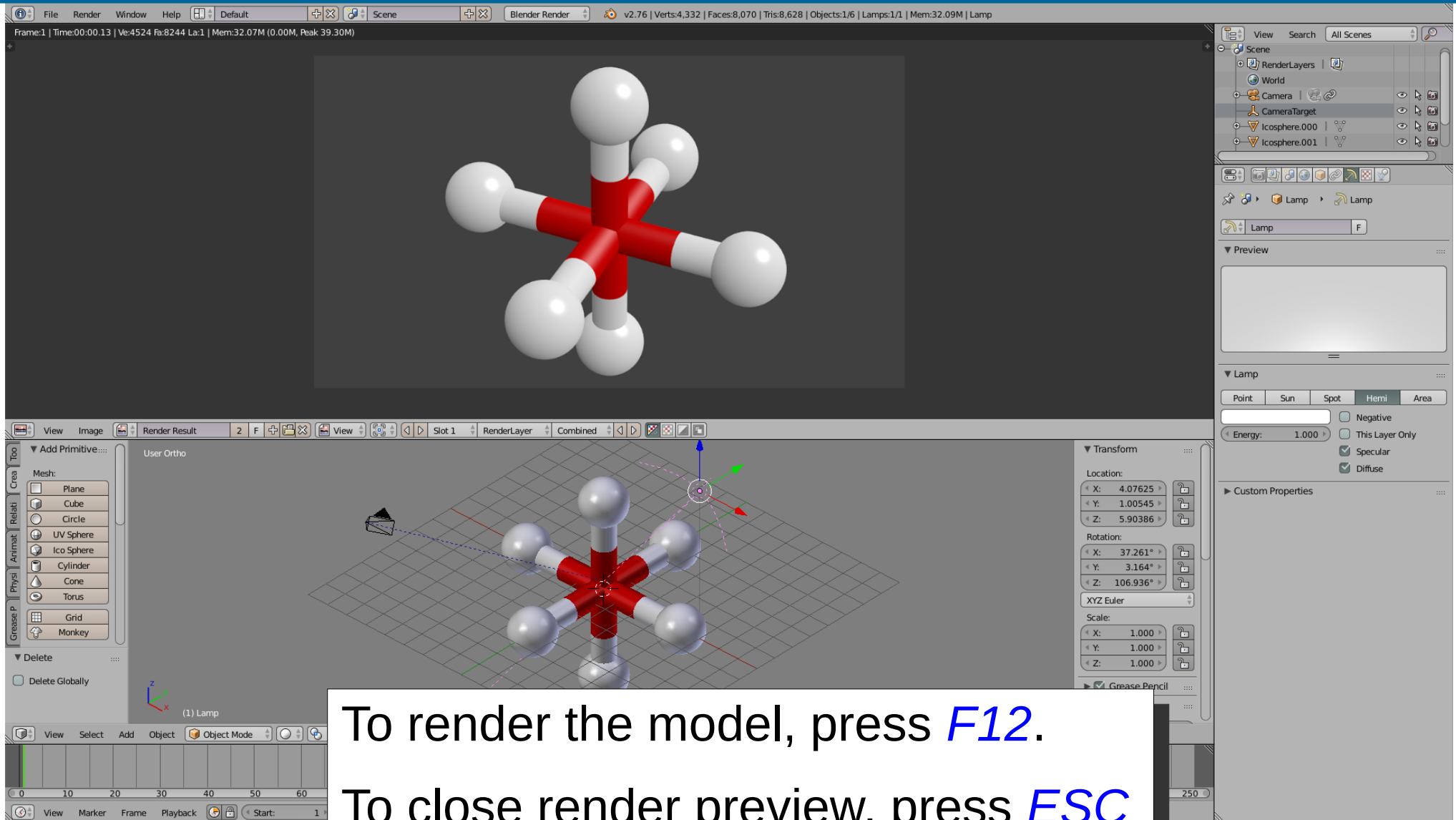
Setting up the Virtual Camera

1. Move the Camera around the scene until the object appear inside 2/3 of the camera view.
2. Use *Translate* tab to enter the exact *location* you want your camera to be placed at.
3. The Camera has its own properties and one of them is a *Focal Lens*
4. Relocate the camera and adjust the Focal Lens property

Setting up the Virtual Camera

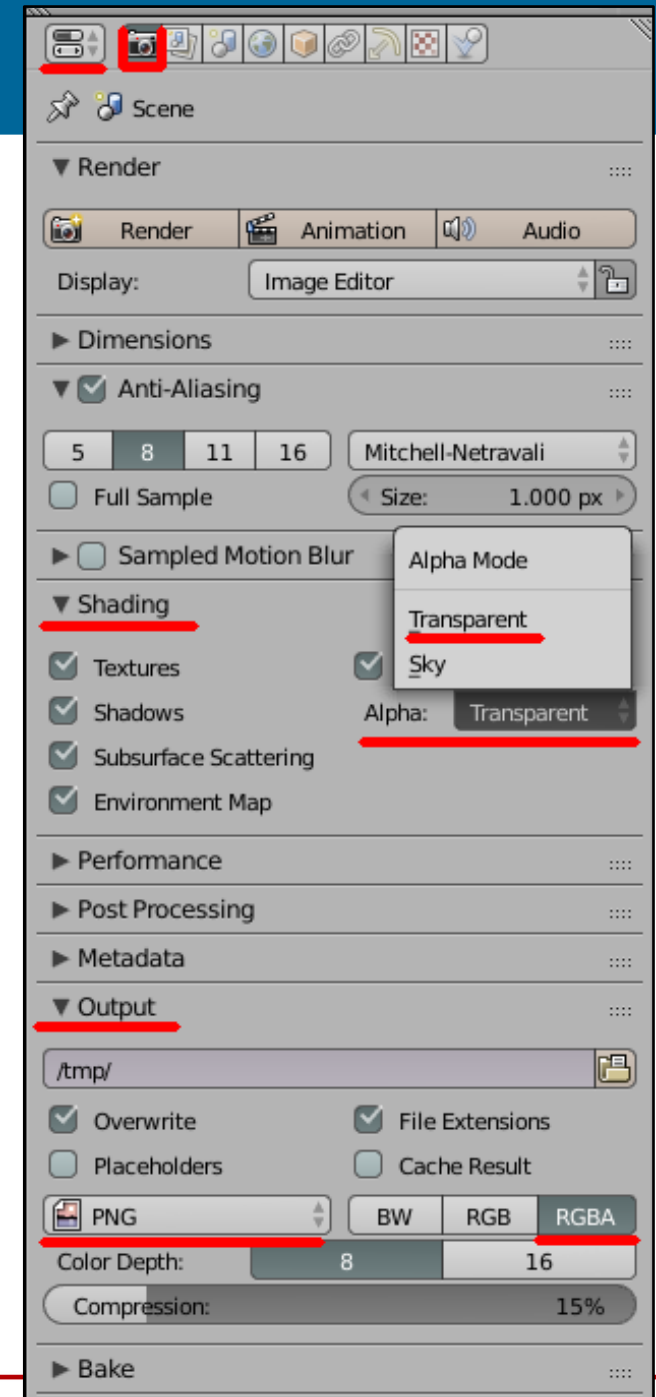


Rendering

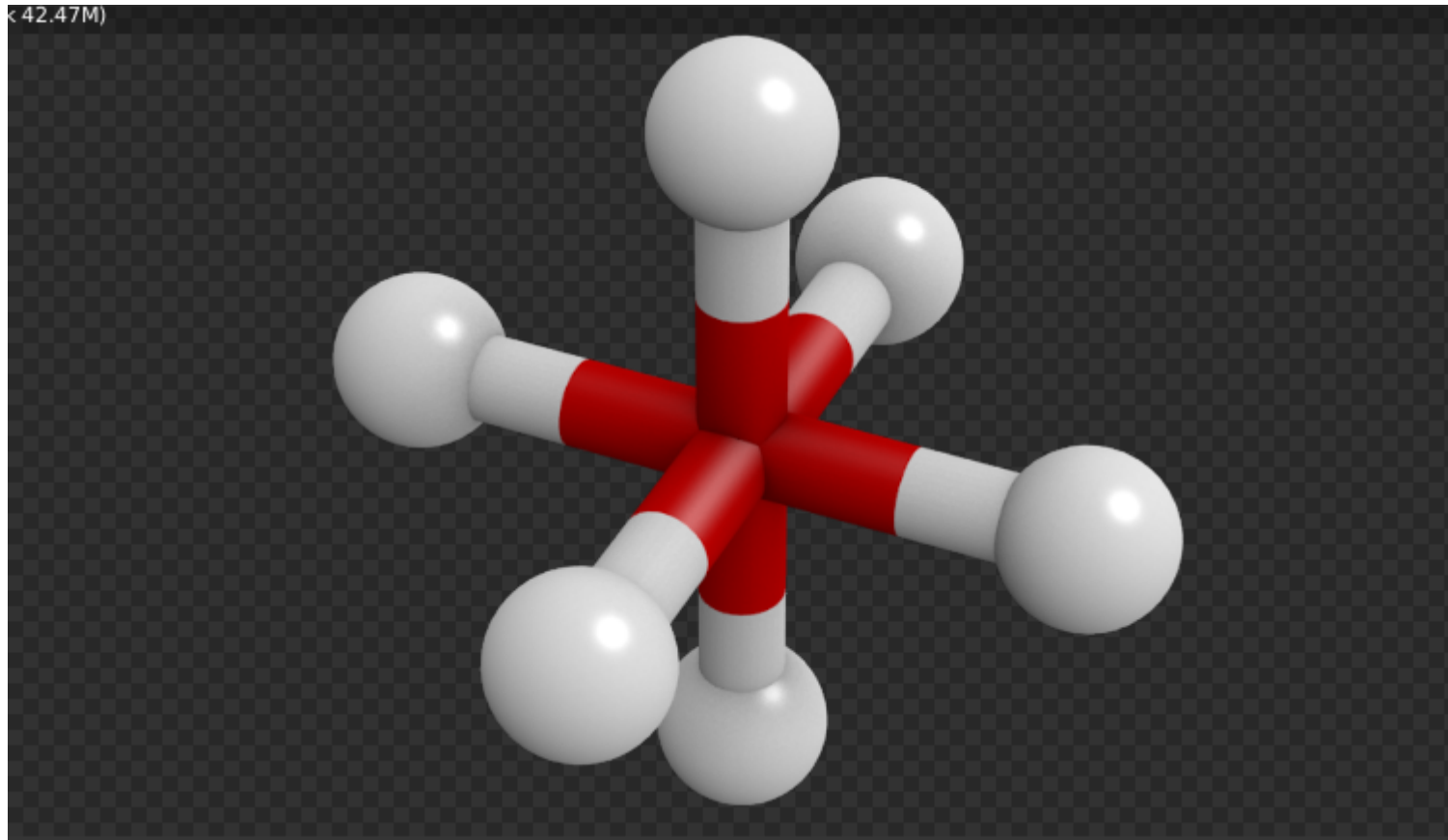


To produce an image with *transparent background* follow the steps below:

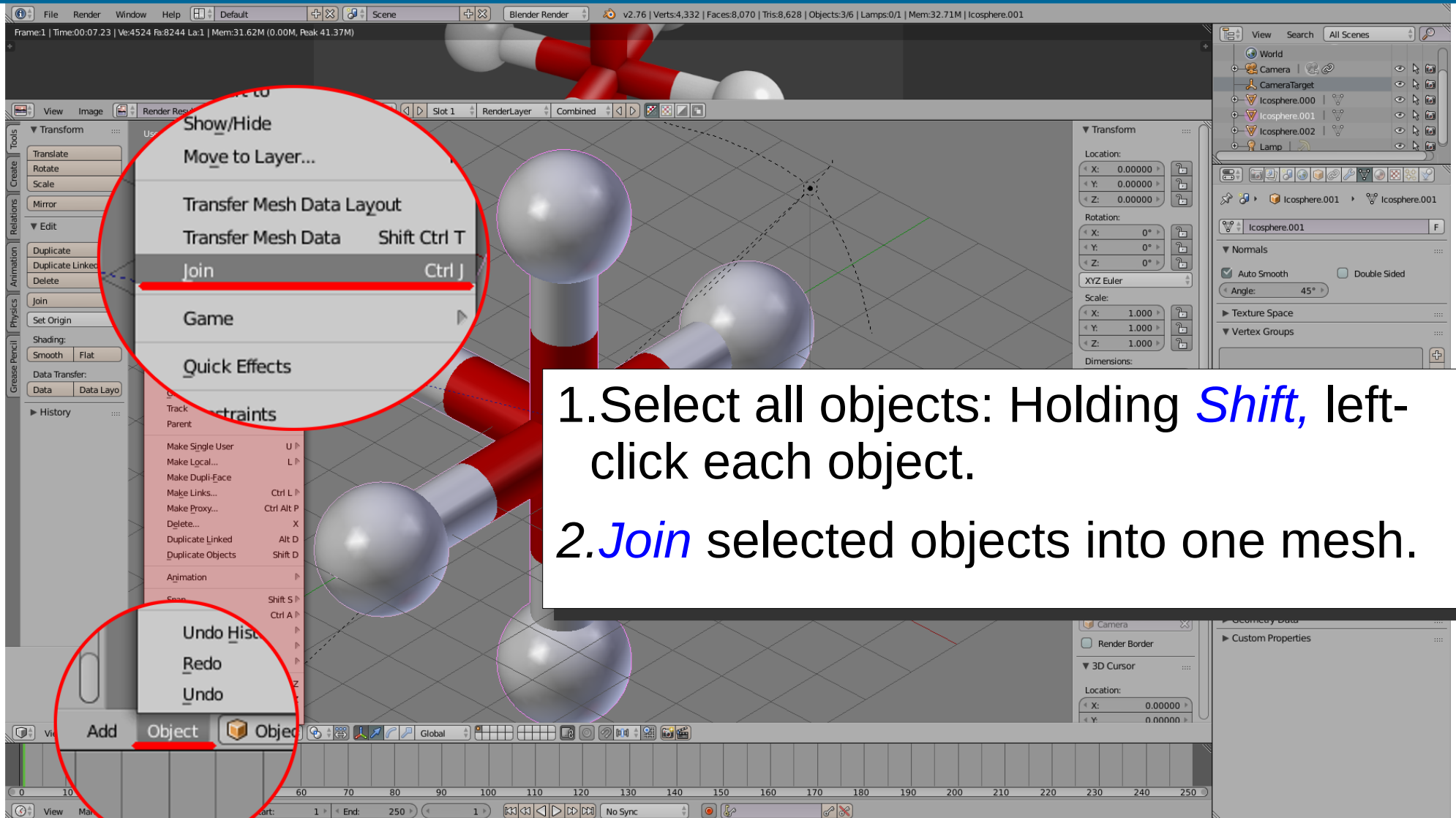
1. Open *Render Settings* tab on the right
2. Select *Shading* tab
3. For *Alpha* choose *Transparent*
4. Then Open *Output* Tab
5. Choose file format *PNG*
6. *RGBA*,
7. Compression *100%* (for Quality):



Press F12 to render:



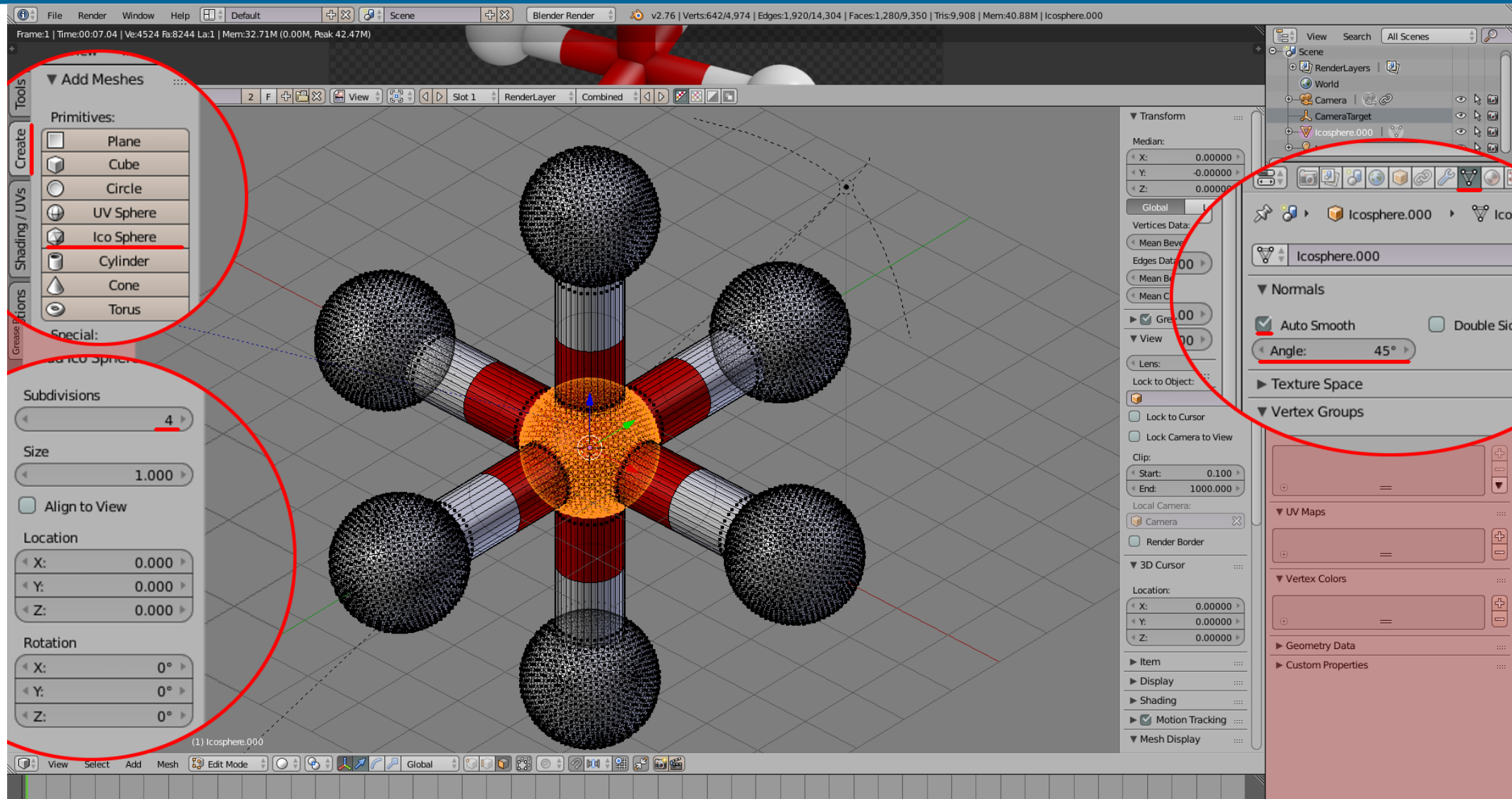
Final steps



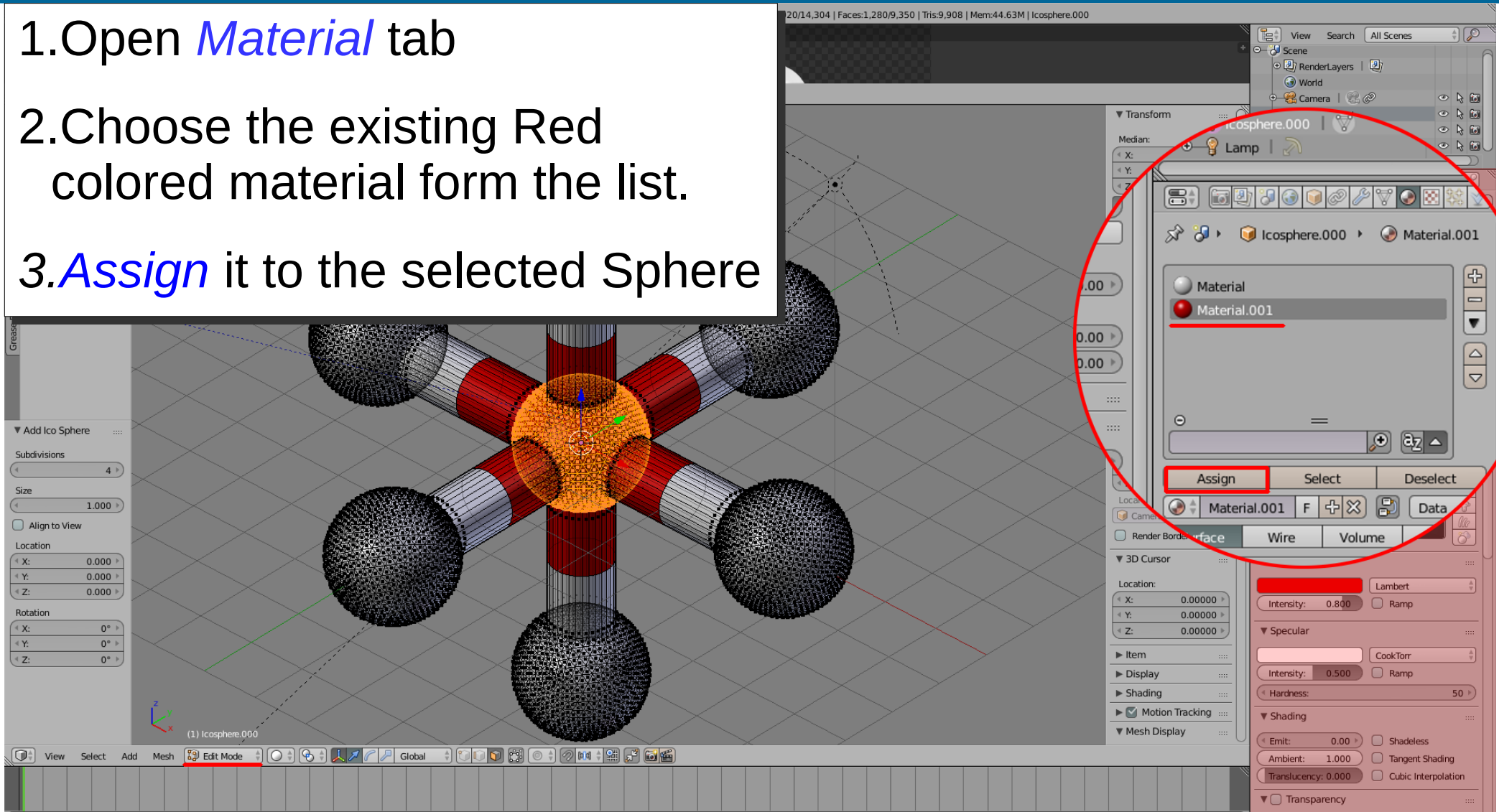
1. Select all objects: Holding *Shift*, left-click each object.
2. *Join* selected objects into one mesh.

1. Change to *[Edit Mode]*
2. Open *Create* Tab on the left and Create *Ico Sphere*
3. Open *Shading/UVs* Tab on the left
4. Under “Faces” choose *Smooth*
5. On the right panel choose Object *Data* tab
6. Check *Auto Smooth*
7. Set Angle to *45 degrees*

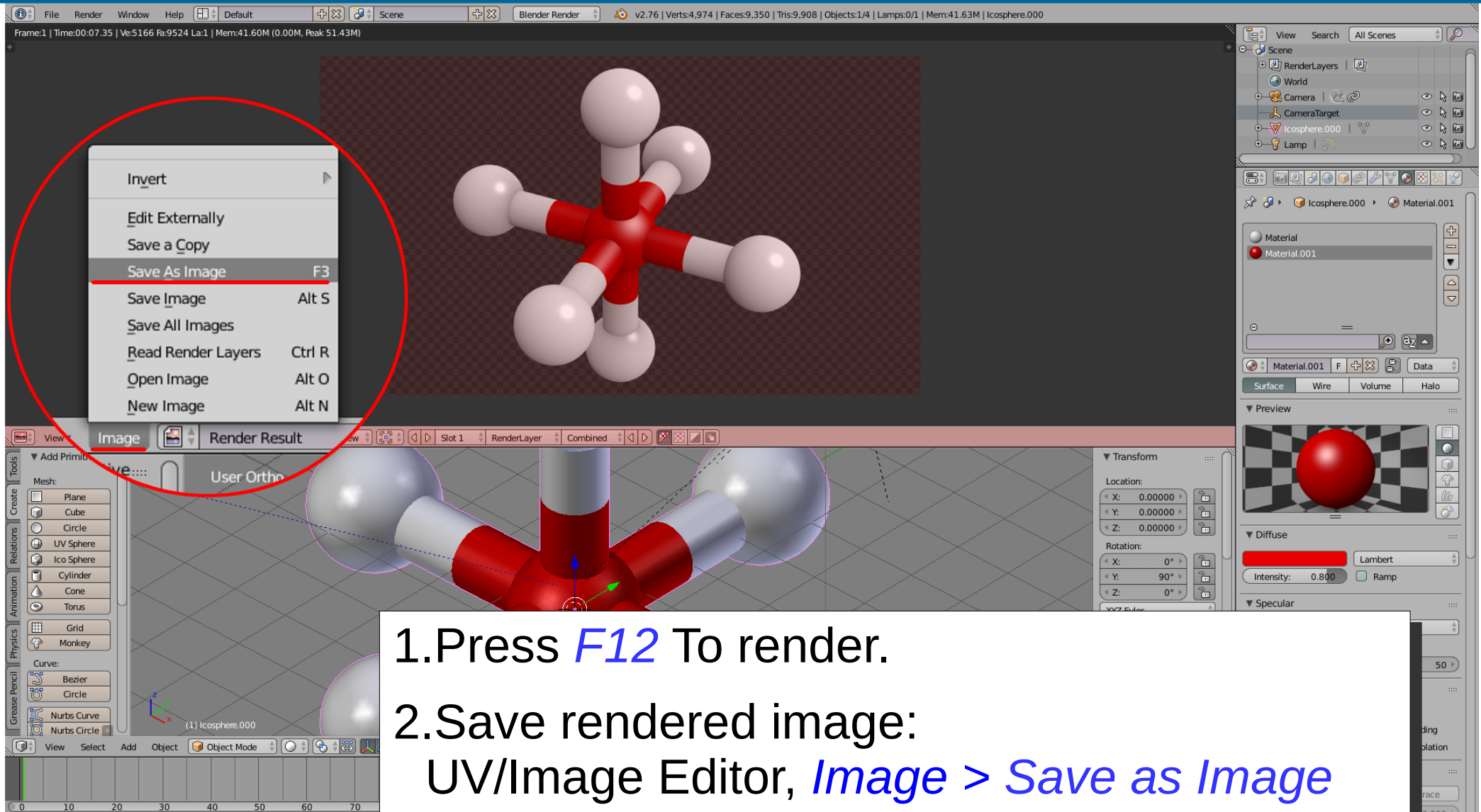
Final steps



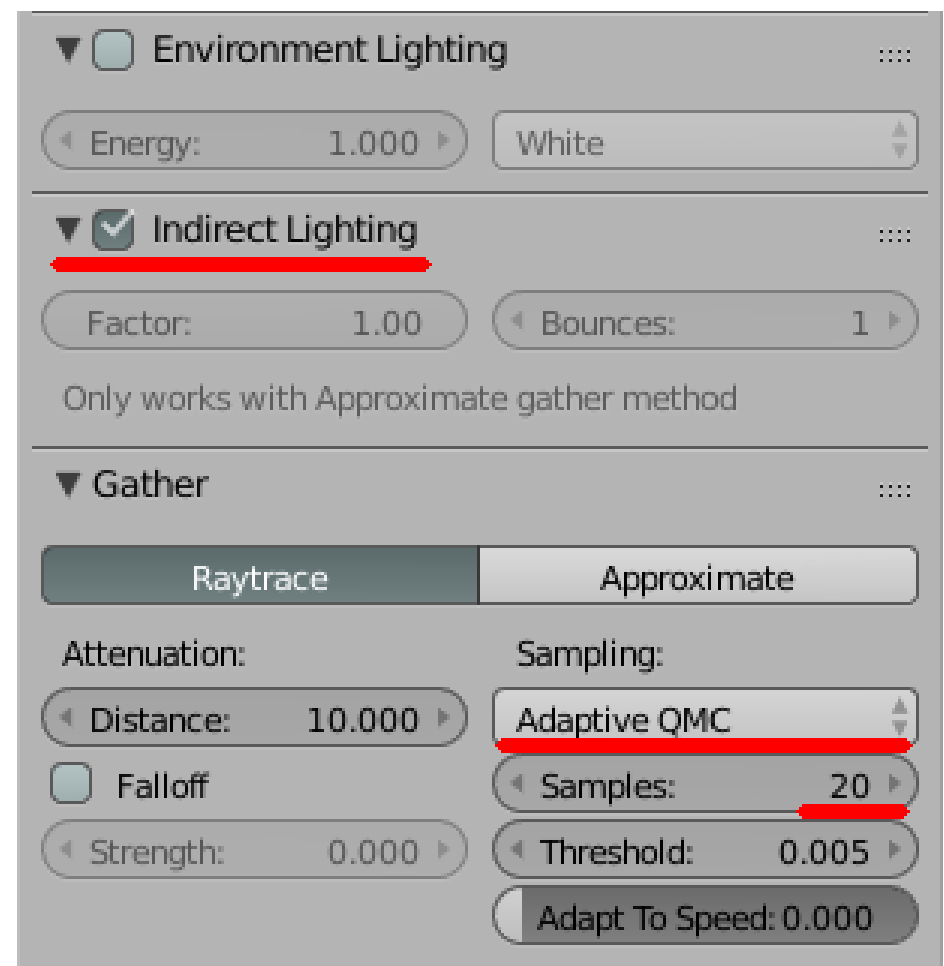
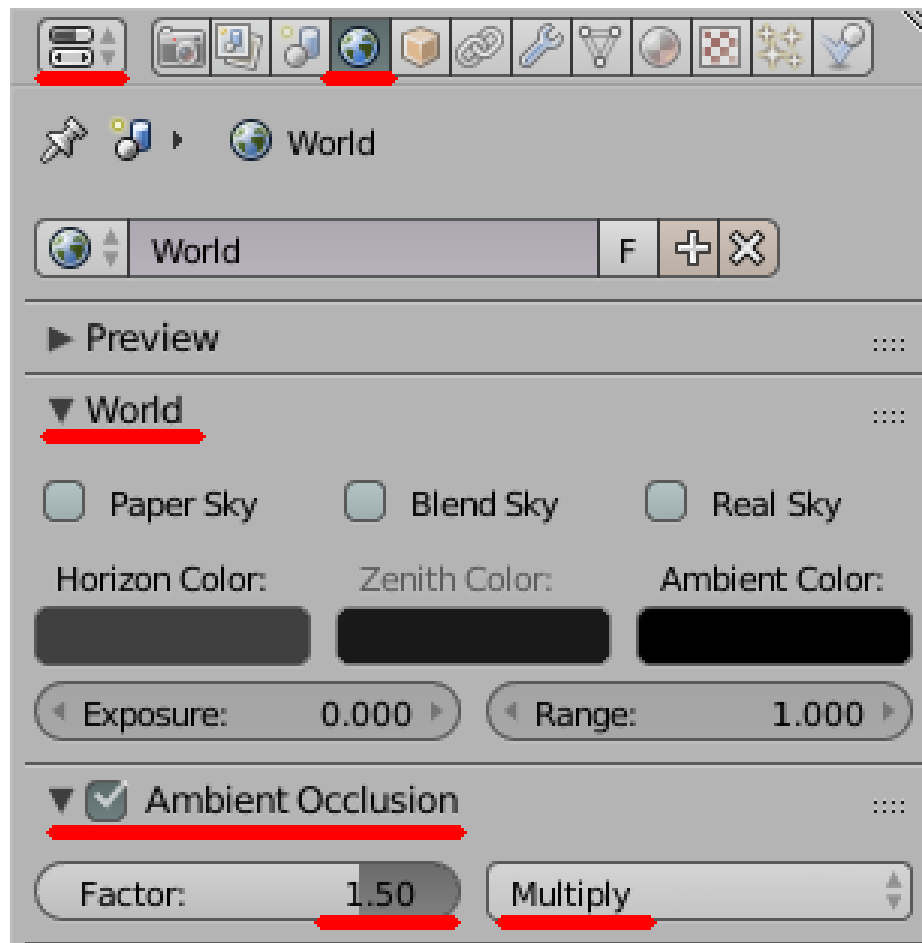
1. Open *Material* tab
2. Choose the existing Red colored material form the list.
3. *Assign* it to the selected Sphere



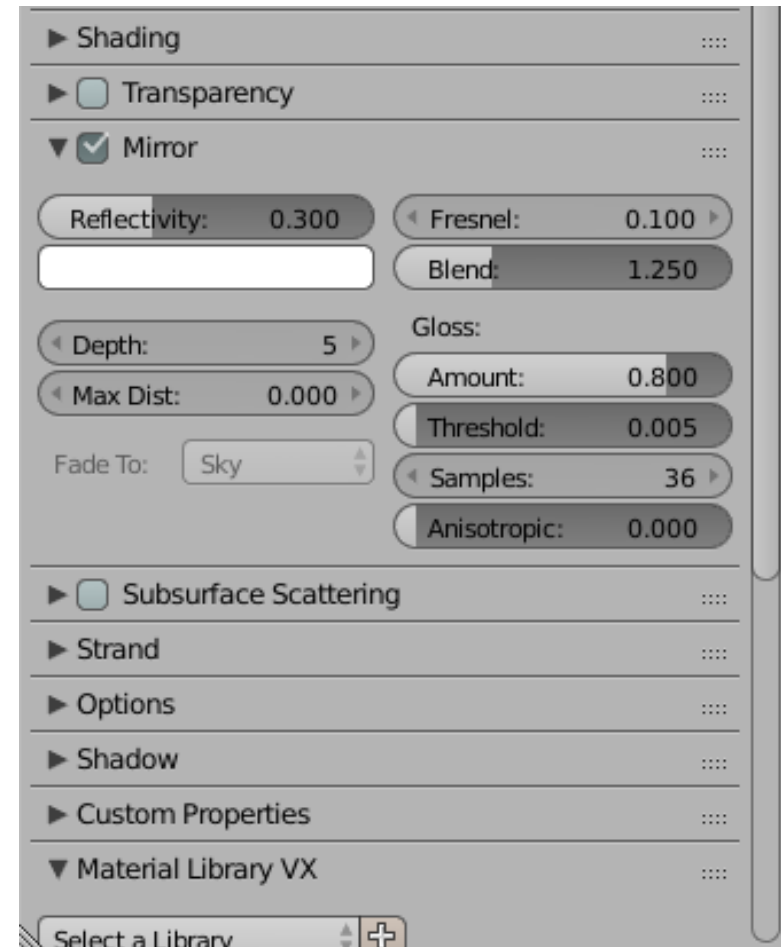
Rendering



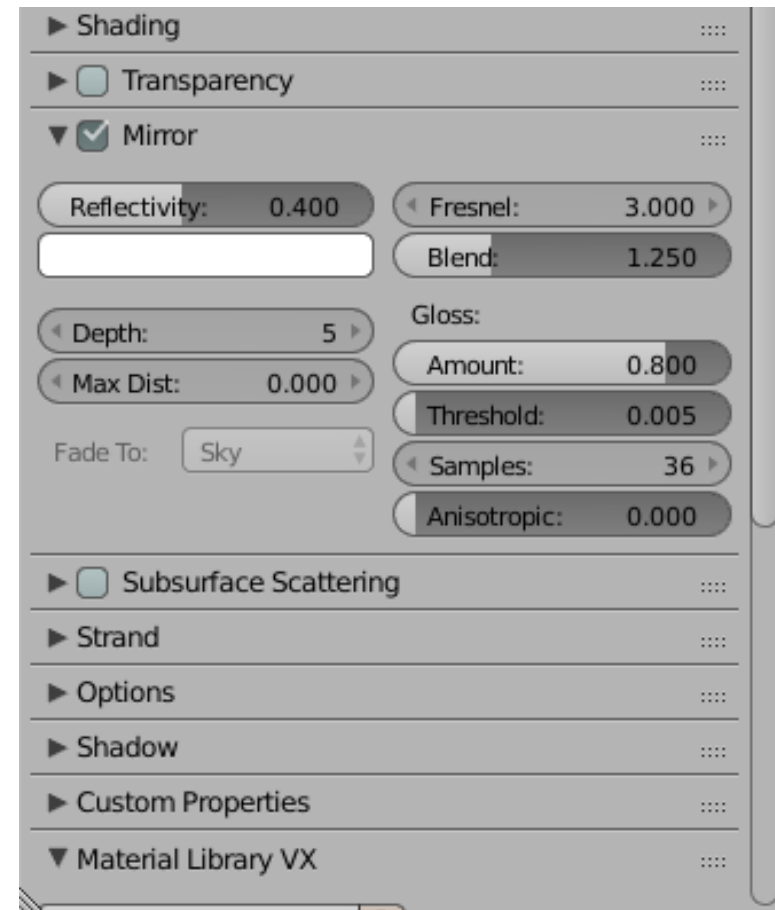
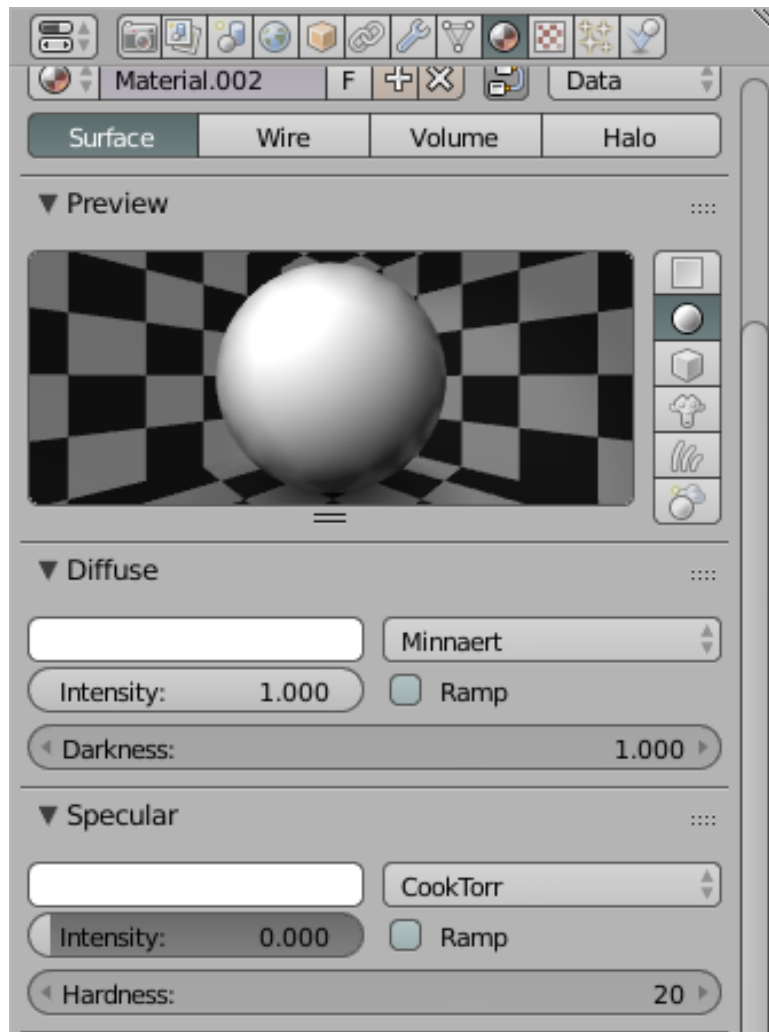
In the *World* tab update settings to the following values:



Update red material:



Update white material:



Update red material:

