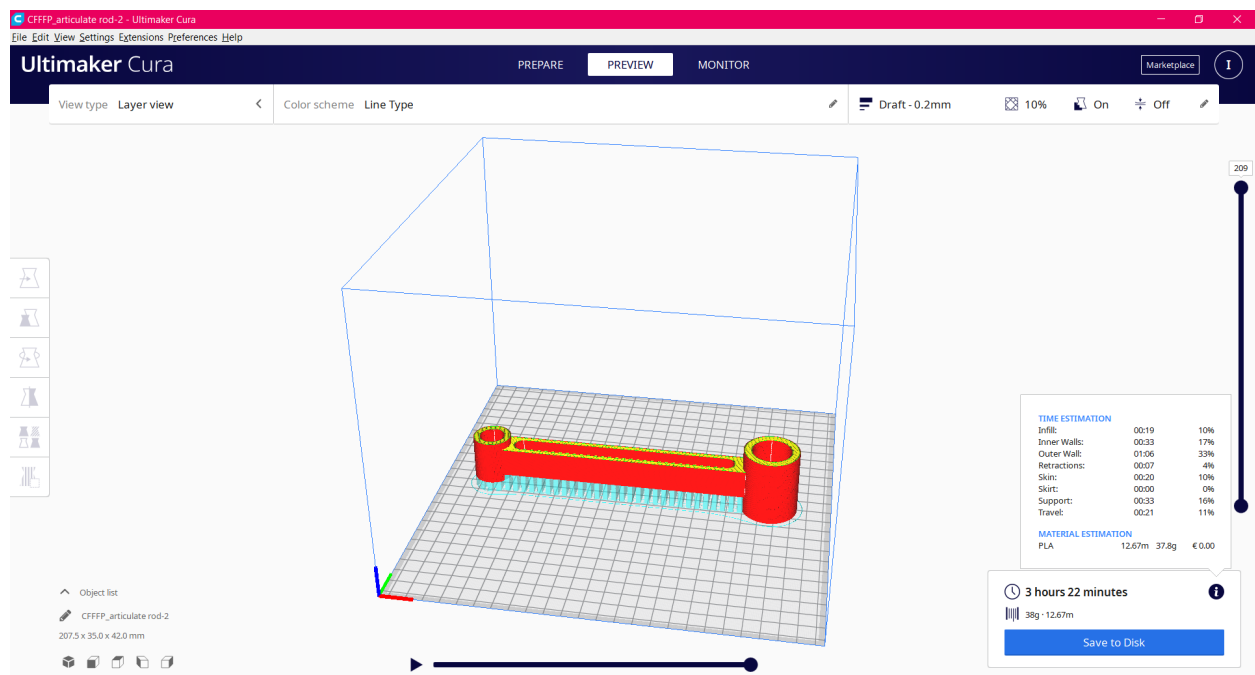


Problem statement:

Perform the slicing operation of the STL file generated in Problem-3, explain suitable part orientation and support structure design with the software. Also find the total printing time, if the layer thickness and infill density are kept 0.2 mm and 10% respectively.

First orientation:

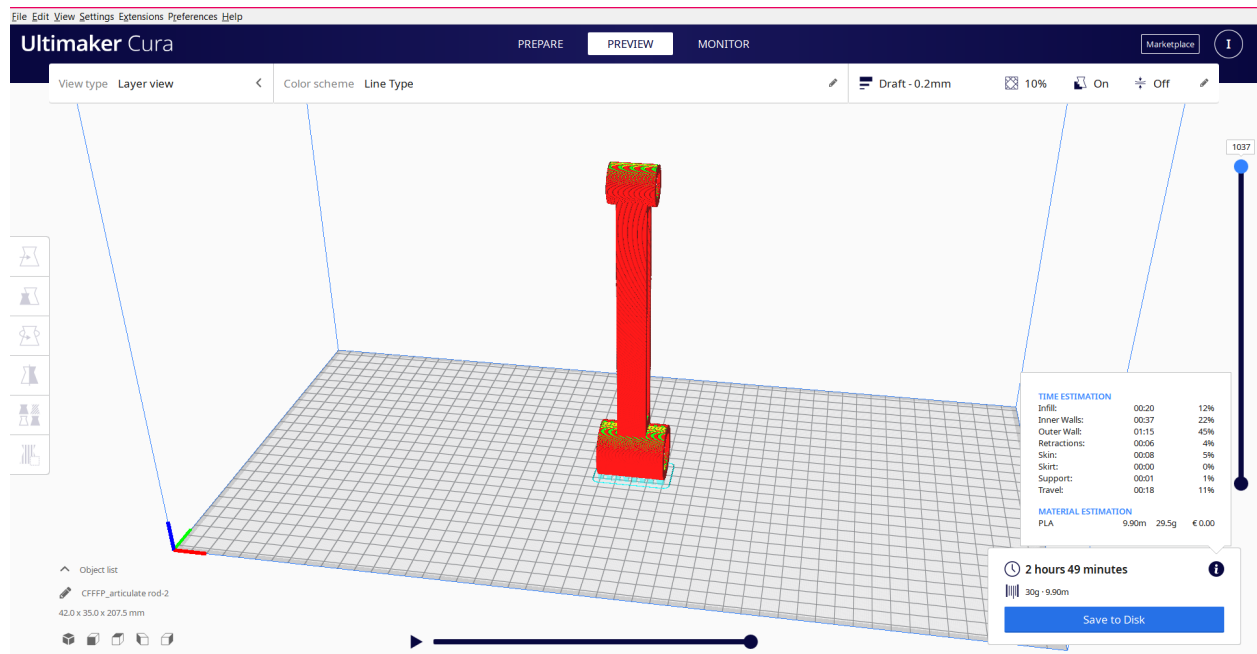
First, the orientation & settings were done and then the process of Slicing was initiated and a “preview” of the print along with its support structures was enabled to check the printing time along with the finished product after printing which came out to be around **3 hours and 22 minutes**.



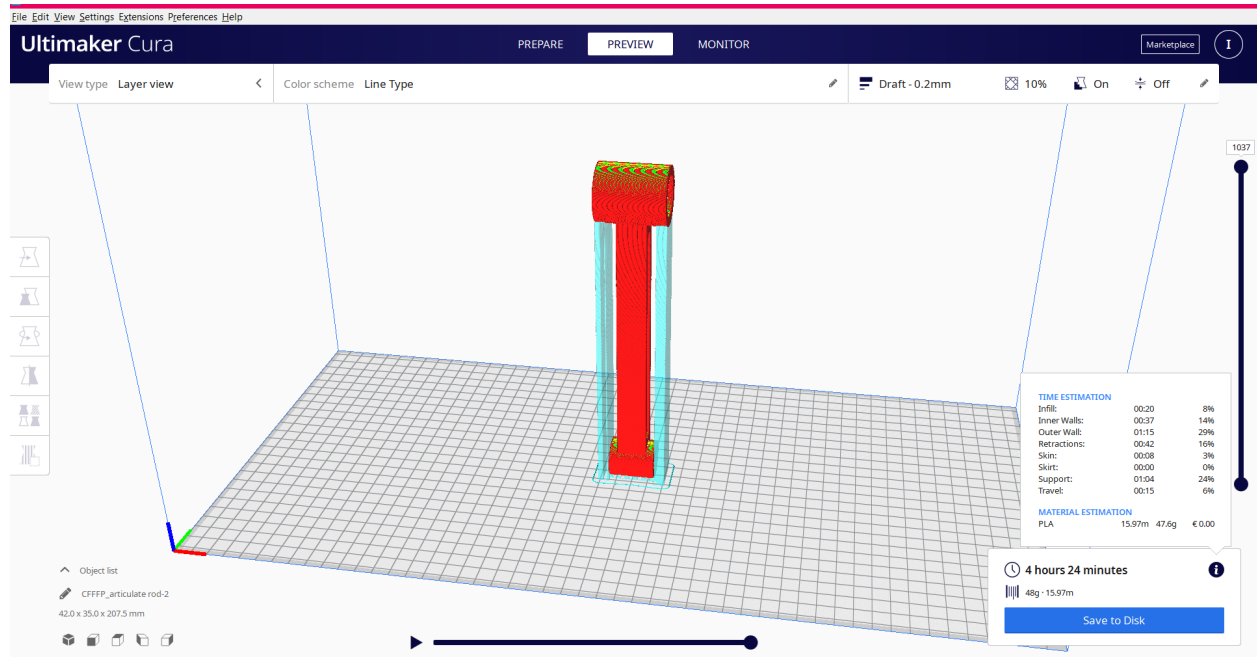
Here, the time taken for building support was 16% of the total time. And hence other orientations were tried out.

It is always preferred to have the least amount of support structures because of the following 2 reasons :

- 1) Time taken to print the support structures gets reduced.
- 2) The time taken in the post process where support structures are removed is reduced which makes it easier to have a better product without fear of it being damaged while removal of these structures.



With the base of the printing being broad and stable now the need for support structures, was almost reduced to null, reducing the time taken to print by 32 minutes more and thus providing with the least time possible of **2 hours and 49 minutes** with 1% time consumption in making the support structures. Thus, the following iteration is preferred with the least time to print taken into account.



Here, in the above-shown orientation, maximum time was taken for building support structure and hence is the most unsuitable one for 3-D print.

G-code Generation :

After selecting and previewing and deciding the infill density and all settings needed to 3D print, the following file was saved as a g-code file which is used by the printer to print the product

G-code started



CFFFP_articulate rod-2 - Notepad

```
File Edit Format View Help
;FLAVOR:Marlin
;TIME:10265
;Filament used: 10.3906m
;Layer height: 0.2
;MINX:146.455
;MINY:100.796
;MINZ:0.3
;MAXX:353.547
;MAXY:149.204
;MAXZ:34.9
;Generated with Cura_SeamEngine 4.10.0
M140 S60
M105
M190 S60
M104 S200
M105
M109 S200
M82 ;absolute extrusion mode
G28 ;Home
G1 Z15.0 F6000 ;Move the platform down 15mm
;Prime the extruder
G92 E0
G1 F200 E3
G92 E0
G92 E0
G92 E0
G1 F1500 E-6.5
;LAYER_COUNT:175
;LAYER:0
M107
G0 F3600 X148.132 Y109.191 Z0.3
;TYPE:SKIRT
G1 F1500 E0
G1 X148.544 Y108.737 E0.03059
G1 X148.931 Y108.411 E0.05583
G1 X149.363 Y108.149 E0.08104
G1 X149.832 Y107.959 E0.10628
G1 X150.324 Y107.845 E0.13148
G1 X150.837 Y107.807 E0.15714
G1 X151.315 Y107.8 E0.18099
G1 X165.045 Y107.8 E0.86599
G1 X165.749 Y107.81 E0.90111
G1 X166.253 Y107.857 E0.92637
G1 X166.638 Y107.949 E0.94611
G1 X167.474 Y108.205 E0.98973
G1 X168.56 Y108.554 E1.04664
G1 X171.218 Y109.328 E1.18476
G1 X173.871 Y110.018 E1.32152
G1 X176.511 Y110.626 E1.45668
G1 X179.238 Y111.172 E1.59543
G1 X181.913 Y111.631 E1.73004
G1 X184.602 Y112.014 E1.86635
G1 X187.369 Y112.328 E2.00528
G1 X190.048 Y112.556 E2.13942
G1 X192.795 Y112.712 E2.27669
G1 X195.559 Y112.79 E2.41464
G1 X196.933 Y112.8 E2.48319
G1 X277.705 Y112.8 E6.51292
G1 X280.502 Y112.76 E6.65248
G1 X283.219 Y112.645 E6.78815
G1 X285.966 Y112.45 E6.92554
G1 X288.67 Y112.182 E7.06111
G1 X291.394 Y111.834 E7.19811
G1 X294.094 Y111.409 E7.33448
G1 X296.803 Y110.906 E7.47194
G1 X299.427 Y110.341 E7.60585
G1 X302.139 Y109.677 E7.74515
G1 X304.746 Y108.959 E7.88006
G1 X307.393 Y108.149 E8.01816
G1 X309.988 Y107.274 E8.15479
G1 X312.525 Y106.338 E8.2897
```



G-code ended



CFFFP_articulate rod-2 - Notepad

```
File Edit Format View Help
G1 F1500 X337.652 Y115.461 E2072.42133
G0 F7200 X337.652 Y114.895
G1 F1500 X334.846 Y117.701 E2072.55331
G0 F7200 X334.846 Y117.135
G1 F1500 X337.652 Y114.329 E2072.6853
G0 F7200 X337.652 Y113.764
G1 F1500 X334.846 Y116.57 E2072.81728
G0 F7200 X334.846 Y116.004
G1 F1500 X337.652 Y113.198 E2072.94927
G0 F7200 X337.652 Y112.632
G1 F1500 X334.846 Y115.438 E2073.08125
G0 F7200 X334.846 Y114.873
G1 F1500 X337.652 Y112.067 E2073.21324
G0 F7200 X337.652 Y111.501
G1 F1500 X334.846 Y114.307 E2073.34523
G0 F7200 X334.846 Y113.741
G1 F1500 X337.652 Y110.935 E2073.47721
G0 F7200 X337.652 Y110.37
G1 F1500 X334.846 Y113.175 E2073.60917
G0 F7200 X334.846 Y112.61
G1 F1500 X337.652 Y109.804 E2073.74116
G0 F7200 X337.652 Y109.238
G1 F1500 X334.846 Y112.044 E2073.87314
G0 F7200 X334.846 Y111.478
G1 F1500 X337.652 Y108.673 E2074.00511
G0 F7200 X337.652 Y108.107
G1 F1500 X334.846 Y110.913 E2074.13709
G0 F7200 X334.846 Y110.347
G1 F1500 X337.652 Y107.541 E2074.26908
G0 F7200 X337.652 Y106.976
G1 F1500 X334.846 Y109.781 E2074.40104
G0 F7200 X334.846 Y109.216
G1 F1500 X337.652 Y106.41 E2074.53303
G0 F7200 X337.652 Y105.844
G1 F1500 X334.846 Y108.65 E2074.66501
G0 F7200 X334.846 Y108.084
G1 F1500 X337.652 Y105.279 E2074.79697
G0 F7200 X337.195 Y105.17
G1 F1500 X334.846 Y107.519 E2074.90746
G0 F7200 X334.846 Y106.953
G1 F1500 X336.63 Y105.17 E2074.99135
G0 F7200 X336.064 Y105.17
G1 F1500 X334.846 Y106.387 E2075.04862
G0 F7200 X334.846 Y105.822
G1 F1500 X335.498 Y105.17 E2075.07929
G0 F7200 X334.933 Y105.17
G1 F1500 X334.846 Y105.256 E2075.08336
;TIME_ELAPSED:10265.467978
G1 F1500 E2068.58336
M140 S0
M107
M104 S0
M140 S0
;Retract the filament
G92 E1
G1 E-1 F300
G28 X0 Y0
M84
M82 ;absolute extrusion mode
M104 S0
;End of Gcode
;SETTING_3 {"global_quality": "[general]\\nversion = 4\\nname = Draft #2\\ndefin
;SETTING_3 ition = custom\\n\\n[metadata]\\nntype = quality_changes\\nquality_typ
;SETTING_3 e = draft\\nsetting_version = 17\\n\\n[values]\\nadhesis_type = skir
;SETTING_3 t\\n\\nsupport_enable = True\\n\\nsupport_type = buildplate\\n\\n", "extrud
;SETTING_3 er_quality": "[general]\\nversion = 4\\nname = Draft #2\\ndefinition
;SETTING_3 = custom\\n\\n[metadata]\\nntype = quality_changes\\nquality_type = d
;SETTING_3 raft\\n\\nsetting_version = 17\\n\\nposition = 0\\n\\n[values]\\n\\nbottom_lay
;SETTING_3 ers = 2\\n\\nfill_sparse_density = 10\\n\\nspeed_print = 50\\n\\ntop_layers
;SETTING_3 = 2\\n\\n\\n"]}
```