Process Sheet

General Information
Steps are given in one of many possible orders. These may be rearranged as needed. Also, this process need not be followed exactly. You will be given a piece of material that is approximately five inches in length. These steps will machine the workpiece such that the headpiece is at one end, and the body at the other. The tapered features on the body and headpiece will match the respective ends of the workpiece.

Lathe Steps
For annealed brass material, the single point HSS cutting tool speed should be 600 fpm, per Machinery's Handbook. For a 0.75" outer diameter starting material, the lathe speed should then be approximately 1525 rpm. The lathes set aside for the project will not go that fast, so set them around 1000 rpm.

Corkscrew Headpiece and Body Blanking
1) Insert approximately half of your workpiece into a 3/4" lathe collet, and install collet in lathe. Ensure that the workpiece is gripped tightly.
2) Install cutting tool and align with workpiece.
3) Set lathe speed (~1000 rpm).
4) Take face cut on end of workpiece.
5) Taking cuts with depths no greater than 0.020", lathe 0.394" from end of workpiece to within 0.005" of final diameter of 0.437".
6) Make final cut to get to final diameter of 0.437".
7) Install 0.094" wide cut-off tool and align with workpiece.
8) Take skim cut, checking cross slide reading.
9) Using calipers, verify diameter of screw thread relief section.
10) Taking cuts with depths no greater than 0.020", lathe to within 0.005" of final diameter of 0.350". Again note final cross slide scale reading.
11) Make final cut to get to final diameter of 0.350".
12) Before any other lathe cuts are made, move to the mill to drill and ream large hole (see section on Milling).
13) Reinstall newly machined end of workpiece in collet, and take face cut from other end.
14) Remove workpiece and lay out required dimensions. Starting from one end of the workpiece that will correspond to the tapered section of the body, mark body cuts. Starting from the other end of the workpiece that will correspond to the tapered section of the headpiece, mark headpiece cuts.
15) Reinstall workpiece in lathe with headpiece end inserted into collet.
16) Taking cuts with depths no greater than 0.030", lathe up to 2.364" from end of workpiece, to within 0.005" of final diameter of 0.562". Note cross slide scale reading, and verify with calipers.
17) Make final cut to get to final diameter of 0.562".
18) Set up compound cross slide to 15°, and machine taper on end of workpiece.
19) Install parting tool in lathe, and part body from headpiece, allowing enough material to take final cut to make stop ring on body the correct thickness. Save body blank.
20) Lathe headpiece to proper length.
21) Set up compound cross slide to 15°, and machine taper on end of headpiece.
22) Reinstall workpiece in lathe with tapered end of headpiece inserted into collet.
23) Install drill chuck in tail stock of lathe.
24) Install necessary drill to drill headpiece to accept-corkscrew. Allow 0.002” clearance between drilled hole and screw base.
25) Remove headpiece, and install 0.562” diameter of body workpiece in 9/16” collet. Install collet in lathe.
26) Install 0.368” (U) drill in drill chuck.
27) Drill center of workpiece to a depth of 2.40”.
28) Install lathe cutting tool.
29) Face off end of workpiece to 0.193” thickness.
30) Remove workpiece.

**Mill Press Steps**
The step of drilling the clearance hole in headpiece should be done on the mill.

**Corkscrew Headpiece**
1) Install workpiece in V-Block fixture, and lock in vise.
2) If necessary, install drill chuck, and set mill speed to approximately 400 rpm.
3) Using edge finder, locate centerline of workpiece, and 0.565” from end of workpiece (center of clearance hole).
4) Install center drill in drill chuck, and drill to approximately 0.25”.
5) Install 0.25” drill, and drill through for pilot hole.
6) Install 0.5” drill in drill chuck and drill through workpiece.
7) Install 0.562” reamer and set mill speed to approximately 100 rpm. Ream hole.
8) Remove workpiece from machine.

**Hand Tool Steps**
Note that these steps can (and should) be done in the lathe.

**Corkscrew Headpiece Final**
1) Check fit of large drilled hole with body. Rework as needed to ensure a small running clearance fit between the two.
2) Obtain 7/16-14 UNC split die and handle.
3) Mount workpiece in vise or other securing fixture.
4) Carefully, and with some lubricating oil, turn threads on reduced section of workpiece.
5) Check fit of screw with small drilled hole. Install and silver solder (see instructor) screw in place so that final length of assembly is 3.500”.
6) As a final step, break all sharp edges with a file or sandpaper, then clean and polish headpiece.

**Corkscrew Body Final**
1) Obtain 7/16-14 UNC tap and handle.
2) Mount workpiece in vise or other securing fixture.
3) Carefully, and with some lubricating substance, tap to a depth of 0.625” into workpiece.
4) As a final step, break all sharp edges with a file or sandpaper, then clean and polish body.