die yield
doping
electrical discharge machining (EDM)
electrochemical grinding (ECG)
electrochemical machining (ECM)
electrochemical polishing
electron-beam machining (EBM)
electronic assembly
delectropolishing
electrostream drilling
etch factor
etching
flip-chip
gel milling
gull wing
heat-affected zone (HAZ)
high-definition plasma integrated circuit (IC)
ion-beam machining (IBM)
J-leads
laser-beam machining (LBM)
maskant
nontraditional machining (NTM)
overcut
overhang
p-type semiconductors
photochemical blanking
photochemical machining (PCM)
photomask
photoreists
pin grid arrays
pin-in-hole
plasma arc cutting (PAC)
plasma etching
precision PAC
printed circuit board
ram EDM
reactive ion etching
screen printing
seed crystal
shaped-tube electrolytic machining (STEM)
solder balls
spark erosion
stepped machining
surface mount
thermal deburring
through-hole
vapor-phase soldering
wafer testing
wafer
wire EDM (WEDM)
wire cutting

Review Questions

1. How do the MRRs for most NTM processes compare to conventional metal cutting?
2. What are the steps in chemical machining using photosensitive resists?
3. Why is it preferable in chemical machining to apply the etchant by spraying instead of immersion?
4. What are the advantages of chemical blanking over regular blanking using punch and die methods?
5. How are multiple depths of cut (steps) produced by chemical machining?
6. Would it be feasible to produce a groove 2 mm wide and 3 mm deep by chemical machining?
7. A drawing calls for making a groove 23 mm wide and 3 mm deep by chemical machining. What should be the width of the opening in the maskant?
8. Could an ordinary steel weldment be chemically machined? Why or why not?
9. How would you produce a tapered section by chemical machining?
10. What is the principal application of thermochemical machining?
11. Is ECM related to chemical machining?
12. What effect does work material hardness have on the metal removal rate in ECM?
13. What is the principal cause of tool wear in ECM?
14. Would electrochemical grinding be a suitable process for sharpening ceramic tools? Why or why not?
15. Upon what factors does the metal removal rate depend in ECM?
16. Why is the tool insulated in the ECM schematic?
17. What is the nature of the surface obtained by electrodischarge machining?
18. What is the principal advantage of using a moving wire electrode in electrodischarge machining?
19. What effect would increasing the voltage have on the metal removal rate in electrodischarge machining? Why?
20. If the metal from which a part is to be made is quite brittle and the part will be subjected to repeated tensile loads, would you select ECM or electro discharge machining for making it? Why or why not?
21. If you had to make several holes in a large number of delicate parts, would you prefer ECM, EDM, EBM, or LBM? Why?
22. What process would you recommend to make many small holes in a very hard alloy where the holes will be used for cooling and venting?
23. Explain (using a little physics and metallurgy) why the "chips" in a thermal process like EDM are often hollow spheres?
24. What is a semiconductor?
25. In general, what technological breakthroughs were necessary to advance to each successive level of integration?
26. What is a silicon boule?
27. What is the most complicated, expensive, and critical step in microelectronics manufacturing?
28. List the photolithographic steps necessary to produce a resist mask on a silicon substrate.
29. List four requirements of a photore sist.
30. What is undercutting?
31. What are some possible defects that can result from underetching? From overetching?
32. What is meant by the term chip in electronics manufacturing versus EDM?
33. What drives the increase in component density and die area within microelectronic manufacturing?
34. Why are clean rooms so important to microelectronic processing?
35. What two subcomponents make up an IC package?
36. What are the advantages of surface mount technology versus through-hole (or pin-in-hole) technology for attachment of IC packages and discrete electrical components to boards?
37. Name the two key classes of TH packages.
38. Name the four different types of SM lead geometries, and discuss the advantages of each.
39. List the key steps involved in conventional IC packaging.
40. What is a printed circuit board (PCB)?