PCB Foundations Quiz

1. PCBs should be fabricated with ____ layers.
   a. Odd number of
   b. Even number of
   c. Any number of

   *Reason: Using an odd number of layers may result in board warpage.*

2. Which of the following is not taken into consideration when calculating the characteristic impedance for each layer?
   a. Trace width
   b. Trace height
   c. Trace length
   d. Distance of the trace to a plane

   *Reason: Characteristic impedance deals with the resistance at a given point of copper based on the height and width of the trace in addition to its proximity to a copper plane.*

3. Vias-In-Pad usage and specification should be stipulated in the
   a. Assembly Notes
   b. Fabrication Notes
   c. Fabrication Files
   d. Via stack up
   e. Both b and c

   *Reason: Via-in-pads are not automatically handled by the primitives or standard documentation formats. It must be given as an instruction to the fabrication.*

4. Mechanical layers
   a. Should be unique to each project
   b. Are only declared in the PCB editor during layout
   c. Follow an IPC standard
   d. Should be used in the footprint libraries define courtyards and assembly information

   *Reason: A, B and C are simply false.*

5. Silk Screens
   a. Are not required for every component
   b. Are highly recommended for prototype boards
   c. Are not necessary for production boards
   d. All of the above
Reason: Silks have traditionally been used for test and rework to help guide those who are performing these tasks. They are not necessary for production.

6. The use of 3D component models in the PCB layout can assist with
   a. Electrical clearance
   b. Component clearance
   c. All of the above
   d. None of the above

   Reason: Component clearance rule has to do with mechanical clearances whereas electrical clearances are specific to copper of different nets.

7. True or False – The solder mask impacts the characteristic impedance of a trace.
   a. True
   b. False

   Reason: The solder mask is a dielectric material which impacts the EMF of the propagating signal.

8. When writing a requirement, the following word should be used to denote a requirement:
   a. Should
   b. Would
   c. Can
   d. Shall
   e. May

   Reason: ‘Shall’ has traditionally been used to denote a requirement.

9. When writing a requirement
   a. The use of the word “and” is okay
   b. The use of the word “or” is okay
   c. Both of the above
   d. None of the above

   Reason: The use of ‘and’ or ‘or’ will result in a requirement that requires 2 tests. Requirements should be written so that only one test needs to be performed.
10. A well written requirement
   a. Has a complex sentence structure
   b. Uses technical verbiage
   c. Is testable by its nature
   d. Can be vague

   *Reason: A well written requirement can be tested*

11. Consider the following symbol and corresponding footprint:

   ![Symbol and footprint image]

   The symbol and corresponding footprint:
   a. Would be recognized by the EDA tool as a valid component
   b. Would be flagged by the Electrical Rule checker in the schematic tool
   c. Would be flagged by the Design Rule checker in the PCB editor
   d. Both B and C

   *Reason: Though it may look like a Picasso to the human eye, the symbol pin numbers match the pad numbers.*

12. When should the bill of materials be given to purchasing?
   a. After fabrication has been started
   b. After the boards have been fabricated
   c. When the schematics are completed
   d. After the layout is complete

   *Reason: The sooner the bill of material can be reviewed and purchased, the better the chances of finding correcting issues prior to manufacturing.*
13. What is the best method to provide a unique number for each component in the library?

a. Use the manufacturer's part number
b. Use the vendor’s part number
c. Use a part number that is assign by the company you work for
d. Use a part number that you make up as you go

*Reason: Though all of these could be used, the best method is to use a part number that has been assigned by the company you work for to ensure uniqueness. In database library management, there needs to be a key field. This field has to contain data that is unique for each component. The other methods list may work; however, there is always a remote possibility that a duplicate number can be introduced.*

14. During post assembly testing, it was found that a latch on one of the connectors cannot be fully extended due to other components located nearby. What would have prevented this situation from occurring?

a. The use of a 3D component
b. The use of a 3D component and component clearance rule
c. The use of a courtyard
d. The use of a courtyard and a component clearance rule

*Reason: Though 3D is extremely useful for fitment, the courtyard takes into consideration the egress that may be needed. The component clearance rule will still be necessary for the vertical height requirement. The 3D body will only take into consideration its physical location, not the egress that maybe necessary.*

15. Though schematic tools do have to use a grid for pin connectivity, in theory, the grid used in a schematic is

a. In metric (mm)
b. In imperial (mils)
c. Both A and B interchangeably
d. Dimensionless

*Reason: Schematics, by their nature are dimensionless.*
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16. The grid used in a PCB layout tool should be
   a. In metric (mm)
   b. In imperial (mils)
   c. Both A and B interchangeably
   d. Either A or B

   **Reason:** The PCB, by its nature, represents a physical device. Sticking to a particular grid is highly recommended, as bouncing between grids will introduce tolerance and rounding errors.

17. When it comes to a trace's impedance, the most contributing factor is
   a. Clock speed of the board crystal
   b. The integrity of the signal from the output buffer of the sending component
   c. The voltage level
   d. The physical aspects of the board

   **Reason:** The 4 factors that make up the trace impedance come from the structure of the board.

18. True or False: Microvias are the same as a one layer blind or buried vias
   a. True
   b. False

   **Reason:** Though blind and buried vias can be limited to one layer, microvias are filled with copper and can be stacked.

19. Which of the following drill document(s) must be provided to the fabricator to program their drilling equipment?
   a. Drill Plot
   b. Drill Drawing
   c. NC Drill file
   d. All of the above

   **Reason:** The drill plot and drawing are graphical representations for the human eye; most fab houses use the NC drill file for programming the drills.

20. True or False: ODB++ and Gerbers are proprietary formats
   a. True
   b. False

   **Reason:** That just the way it is! IPC-2581 was specifically released to address this concern.
21. The solder paste files are generally

a. Produced in the assembly file
b. Produced in the fabrication files
c. Manually drawn
d. Part of the bill of materials

*Reason: The assembly file has nothing to do with the solder paste. It is a product of the fabrication file generation.*