

Batch : B-2  
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## Assignment No. 2 Electrical wiring shop

CO4 - Comprehend the process of PCB making, layout of house wiring, and electrical arc welding.

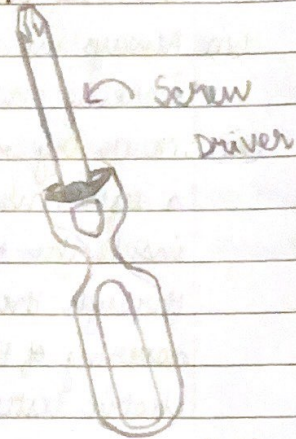
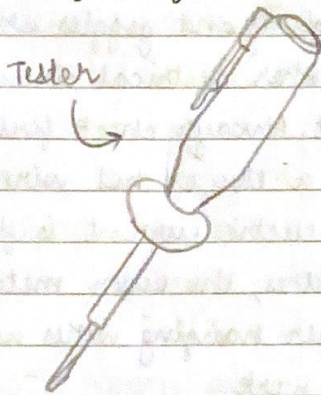
Q1) List and draw the tools required for electrician.

A) There are three broad categories in which electrical tools are divided: a) Hand Tool, b) Power tool and c) Measuring devices.

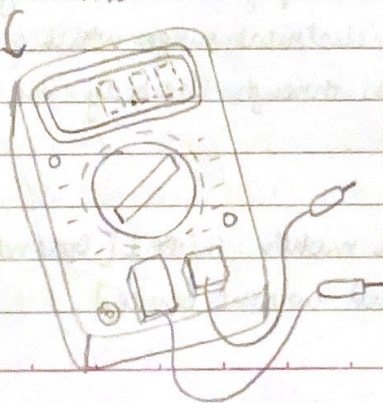
i) Hand Tool : Instruments operated using hands. Eg: screw Driver, Tester, Cutter etc.

ii) Power tool: Tools / instruments that need external power (electricity) to operate. Eg: Drill machine, Jig Saw cutter, Grinder machine etc.

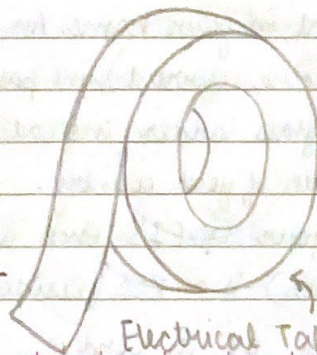
iii) Measuring devices: Devices that measure certain quantities like current, voltage, length etc. Eg: Electrical tape, Ammeter etc.



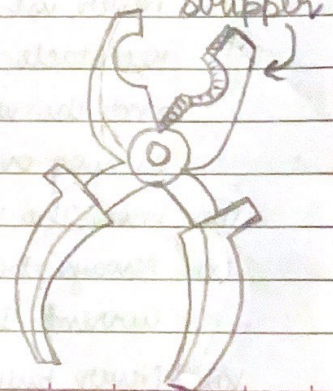
Multi meter



Pliers



Stripper





Q2) What preventive measures to be followed for electric safety?

- A) i) Avoid water at all times when working with electricity. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of the electric current.
- ii) Never use equipment with frayed cords, damaged insulation or broken plugs.
- iii) If you are working at your home then always turn off the mains. It is also a good idea to put up a sign on the service panel so that nobody turns the main switch 'ON' by accident.
- iv) Always use insulated tools while working.
- v) Electrical Hazards include exposed energized parts and unguarded electrical equipment which may become energized unexpectedly. Such equipments always carry warning signs like "Shock Risk". Always be observant of such signs and follow the safety rules established by the electrical code followed by the country you're in.
- vi) Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit.
- vii) Never try repairing energized equipment. Always check first by using a tester. When an electric tester touches a live or hot wire, the bulb inside the tester glows showing that an electric current is flowing through the respective wire. Check all wires, the outer metallic covering of the service panel and any other hanging wires with an electric tester before proceeding with your work.
- viii) Never use an aluminium or steel ladder if you are working on any receptacle at height in your home. An electrical surge will ground you and the whole electric current will pass through the body. Use a wooden, bamboo or a fiberglass ladder instead.
- ix) Know the wire code of your country.
- x) Always check all your GCFI's once a month. A GECI [Grand Fault Current Interrupter] is a RCD [Residual Current Device].
- xi) Never pull a plug by its cord.



Q3) Explain the working principle of electric fuse. What do you mean by MCB?  
[Miniature Circuit Breaker]

- A) • An electric fuse is based on the principal of heating effect of electric current.
- It is made up of thin metallic wire of non-combustible material.
  - A fuse is always connected between the ends of the terminal in a series connection with the circuit.
  - When an excessive current flows through the circuit it leads to the melting of fuse due to its low melting point; it opens the circuit and stops the current flow.
  - Once a fuse melts, it can be changed or replaced with a new fuse.
  - A fuse is normally made up of elements like Zinc, Copper and Aluminium.
  - It acts as a protector of electric appliances and also as a safety measure for humans.

A Miniature Circuit Breaker [MCB] is an automatically operated electrical switch used to protect low voltage electrical circuits from damage caused by current from an overload or short circuit. MCB's are typically rated upto 125 A, do not have adjustable trip characteristic and can be thermal or thermal-magnetic in operation. MCB's are more expensive than fuse.

Q4) With sketch explain working of LED tube light.

- A) A light emitting diode is a two-lead semiconductor light source. It is a p-n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light is determined by the energy band gap of the semiconductor.



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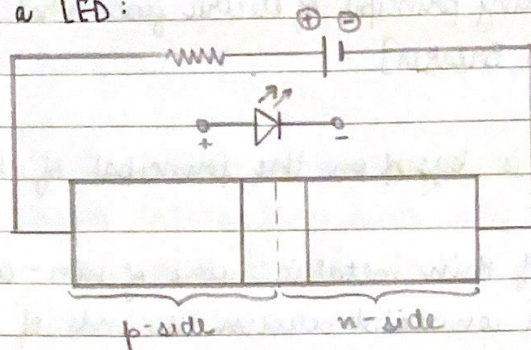
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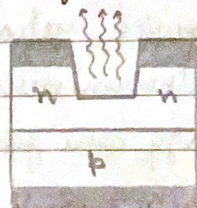
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Working of a LED:



- A p-n junction made from a translucent semi-conductor like gallium arsenide or indium phosphide is provided with metallised contacts.
- When it is forward biased through a series resistance  $R$ , light photons are emitted from the non-metallised surface of the n-region. The series resistance  $R$  limits the current through the LED and hence controls the intensity of light emitted by it.
- When the p-n junction is forward biased,  $e^-$  are sent from n-region to p-region (where they are minority carriers) and holes are sent from p-region to n-region (where they are minority carriers). Near the junction, the concentration of minority carriers increases as compared to the equilibrium concentration (i.e. when there is no bias).
- On either side of the junction, the excess minority carriers combine with the majority carriers. On recombination, the energy is released in the form of photons. Photons with energy equal to or slightly ~~equal~~ less than the band gap are emitted. When the forward bias of the diode is small, the intensity emitted light is small. As the forward bias increases, the intensity of light increases and reaches a maximum. Further increase decreases the light intensity. LEDs are biased such that the light emitting efficiency is maximum.
- The colour of the light emitted by an LED depends on its band-gap energy.



← Metallised contact



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Q5) Give reasons for:

a) ceiling fan rotating at slow speed

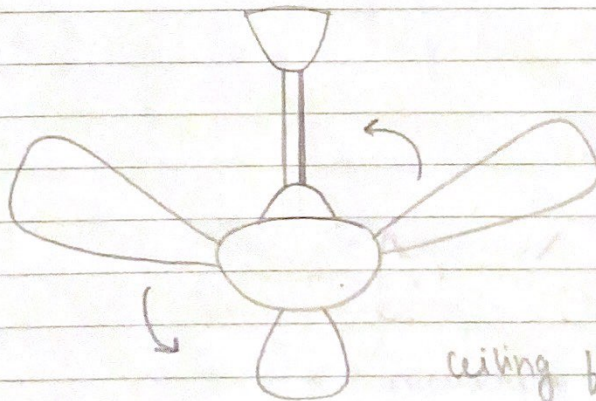
Ans) Ceiling fans that operate at speeds slower than normal are due to various reasons. Ceiling fans have very little torque and almost any problem may cause the fan to run slowly.

Some of the electrical reasons can be:

- A bad / faulty capacitor [unusual buzzing]
- Damaged winding
- Loss of bearing lubrication [grinding or squeaking noise]
- Poor blade balance [wobbling]
- Fan not compatible with speed control.

b) ceiling fan not rotating when power supply is on.

Ans) If ceiling fan stops working or turning on even with power supply on, it could be because it isn't receiving any electricity. This could be because the circuit breaker has tripped or is off. Check panel to confirm this. If the circuit breaker works fine, it could be a problem with loose wiring and connections. The ceiling fan can also stop working due to internal defects namely shot ball bearings or an overheated motor. The Reverse switch could be in the neutral position, which stops the fan from working. Flip the switch several times to lock into position.



ceiling fan rotation