

Title : Electrical System (Ch No. 5 as per syllabus)

Date: 31/03/2020 (10:30 am to 11:30 am)

Name of Faculty: Mr. Chetan R. Patel

Lecture No : 02 (8th Sem MED)

Source of information : Automobile Engineering / Tech-Neo

Publications

Battery

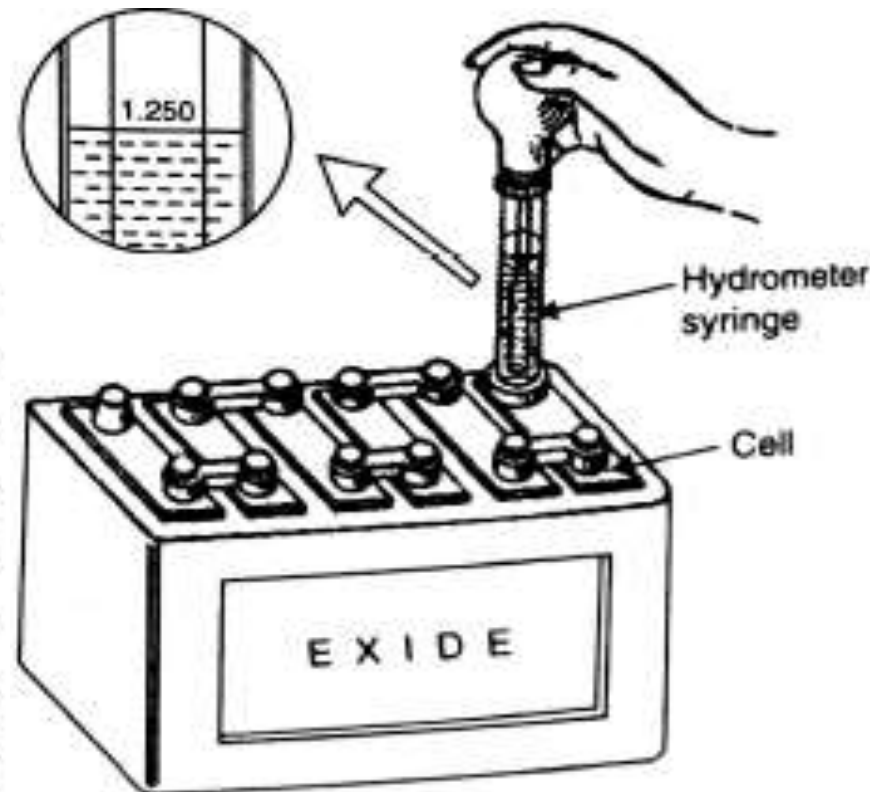
• Battery testing

1. Specific gravity test (*Hydrometer test*) :

This test is carried out with the help of a *hydrometer*. By measuring specific gravity of the electrolyte with a hydrometer, an indication of the appropriate state of charge of the battery can be obtained.

While the chemical reactions are taking place in the battery during discharge, the electrolyte becomes dilute due to formation of water. The proportion of water goes on increasing as the discharging continues. The relative amount of water and acid is determined by the specific gravity test. This is done by the use of a *hydrometer* contained in the syringe.

Fig. 10.12 shows a battery with a hydrometer. The electrolyte is drawn up into the syringe by the bulb and the hydrometer float sinks to a greater or lesser extent according to amount of sulphuric acid in the electrolyte. If the hydrometer reads 1.280, it indicates that the liquid is 1.280 times as heavy as water, and at the reading the battery is fully charged.



Climate below 32°C :

1.270 to 1.290 ... Cell is fully charged.

1.190 to 1.210 ... Cell is about half discharged.

1.110 to 1.130 ... Cell is fully discharged.

Climate frequently above 32°C :

1.210 to 1.230 ... Cell is fully charged.

1.130 to 1.150 ... Cell is about half discharged.

1.050 to 1.070 ... Cell is fully discharged.

Battery

2. Open volt test :

Where the hydrometer cannot be used to determine the state of the charge, the vehicles are now fitted with maintenance free (sealed) batteries. In such a case, the same can be determined from the *open volt test* of the battery.

The open circuit voltage of a fully charged battery cell is about 2.1 volts. This can be measured with the help of a voltmeter. It can be observed that a change of 0.01 volt of open circuit voltage is equivalent to a change of 0.010 in the specific gravity of the electrolyte. Thus, the gravity measurements can be indirectly made with a voltmeter also.

3. High rate discharge test :

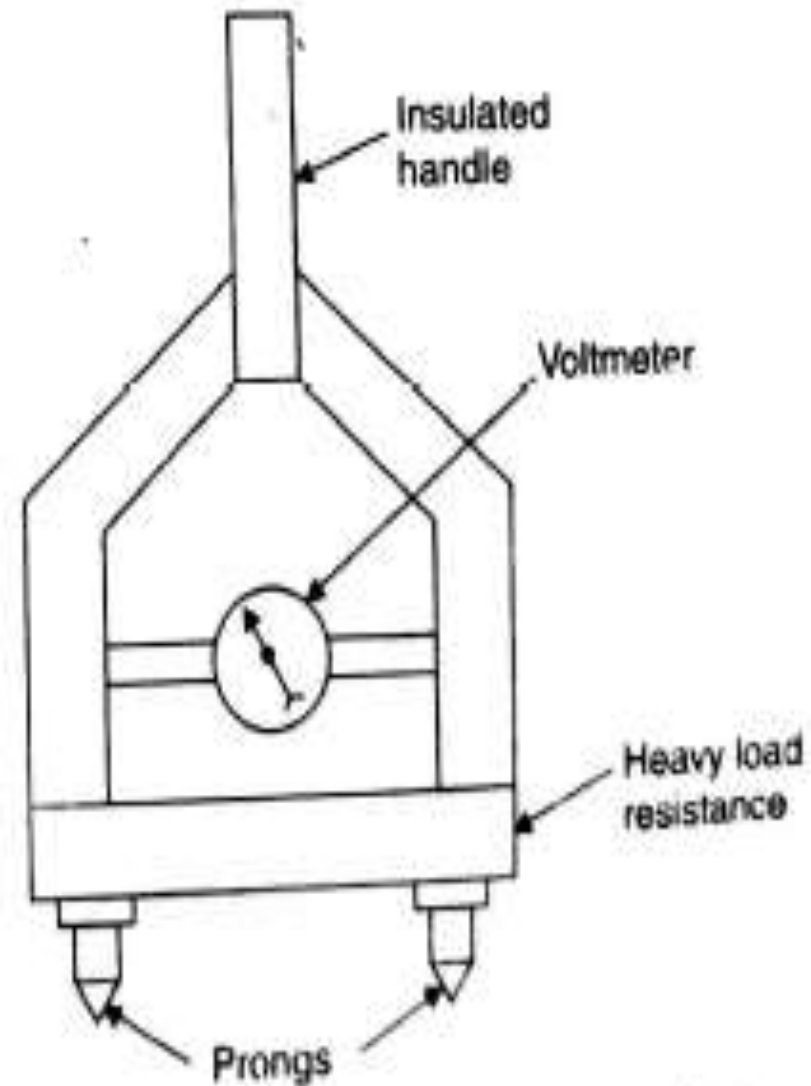
The hydrometer test indicates only the chemical conditions of a battery and is not necessarily an indication of the actual battery condition. A high-rate discharge test with a voltmeter measures the actual capacity of a battery to convert the chemical energy into electrical energy. There are many designs of the high rate discharge test equipment, which are in use, this test using a cell tester is described below.



Battery

The high rate discharge test by a *cell tester* (Fig. 10.13) is made by using an individual cell tester consisting of a *low-reading voltmeter* and *heavy fixed resistance*. The individual cell tester indicates the voltage of each cell on the voltmeter.

In order to carry out the test, contact the voltmeter rods to the proper cell terminals *i.e.*, red to the positive and black to the negative using caution *not* to connect across more than one cell. For each cell reading, the point of the prongs will have to be pushed through the sealing compound to make contact with the buried link. The circuit is closed through the fixed resistance of the cell tester (for about 10 seconds). Under normal starting-motor load, the voltage of the cell is indicated on the voltmeter of the cell tester.



Battery

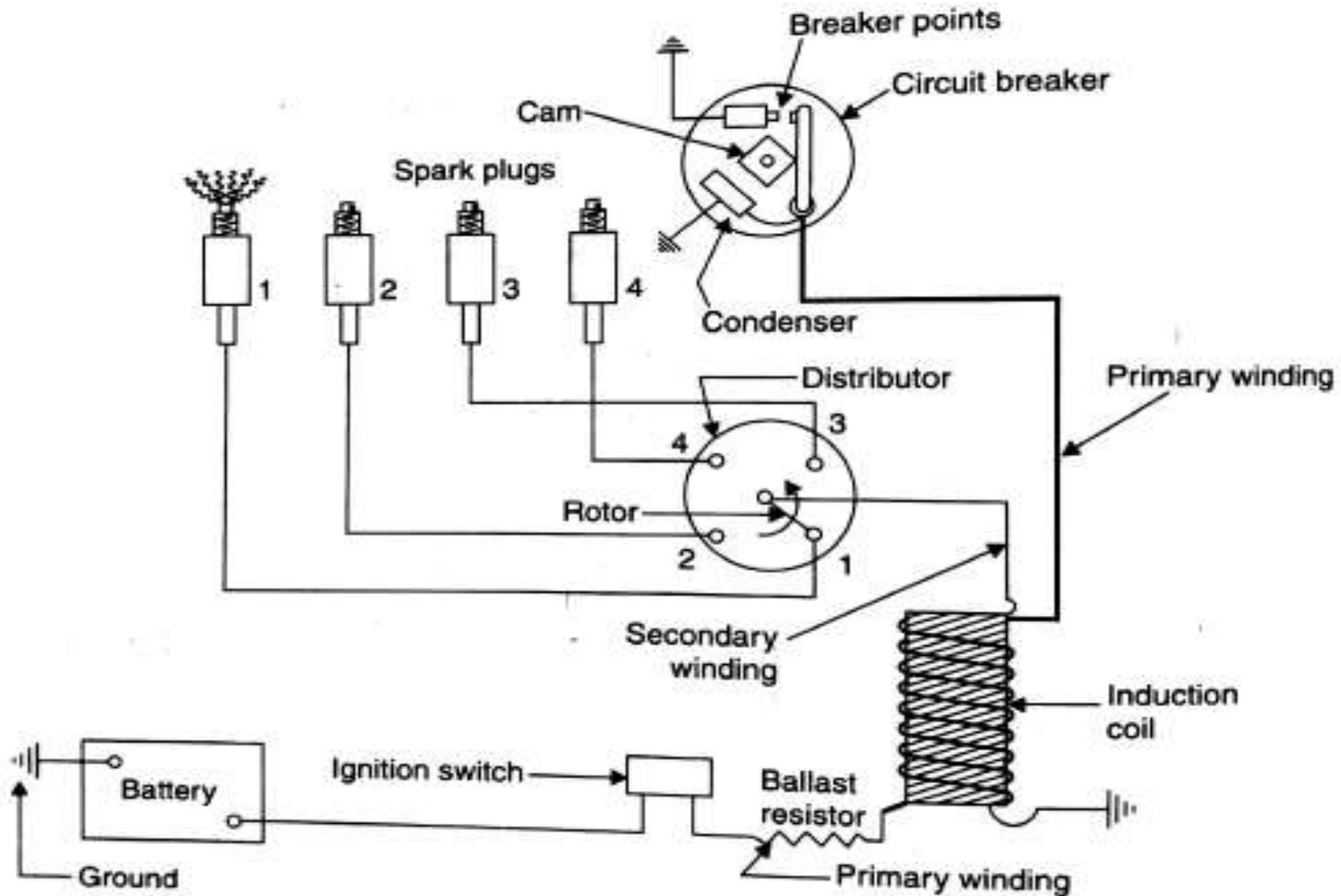
4. Cadmium test :

This test is carried out to *ascertain whether the battery plates are defective or not.*

This test is conducted with the help of a cadmium rod enclosed in a perforated ebonite tube. The rod is immersed in the electrolyte, and connected to the negative terminal of a voltmeter. Its positive terminal is connected alternately to the positive and negative terminals of the battery cell. When connected with *positive* terminals, the voltage reading *should not be less than 2.5 volts*, a *lower reading would indicate defective positive plates*. When connected with *negative* terminals, the voltage reading *should not be more than 0.2 volt*, a *higher reading would indicate defective negative plates*.

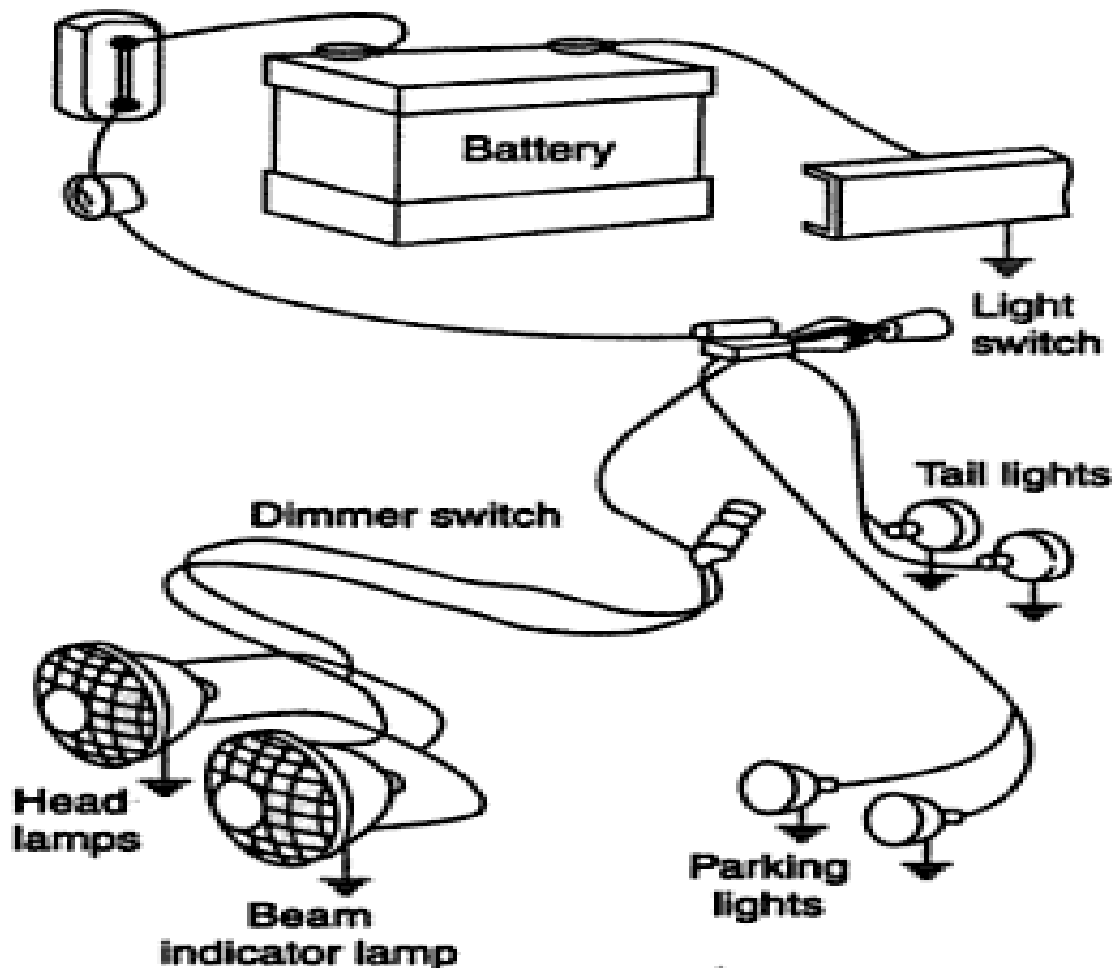
Battery

Battery ignition system



Lighting system

The lighting system of an automobile, as earlier stated, consists of *head lamps, side, tail, stop and reverse lamps*. In addition to this there are *instrument panel lights, direction indicator flash lights and the lights inside the body to light up passenger compartment*.



Lighting system

Wiring circuit

The required electric current in the automobile flows from the battery to the various electric parts and then returns to the battery. *The paths through which the electric current flows are called electric circuits.*

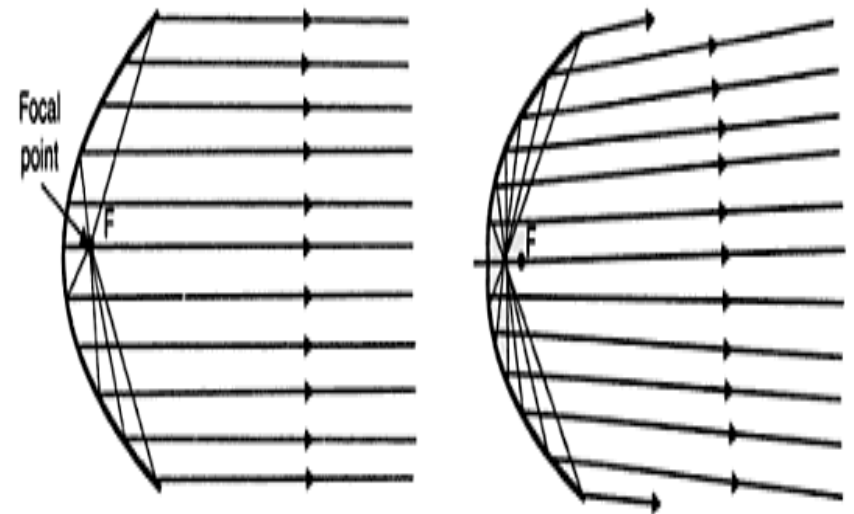
*The wiring that serves these paths may be cord bundled together, called **wiring harness**, or may be individual cords, called “single wire”. There are two types of wires used in the wiring as follows :*

1. *For high voltage circuits* ... High voltage wire (ignition circuit secondary side)
2. *For low voltage circuits* ... Low voltage wire (Lighting circuit, charging circuit, starting circuit, ignition primary circuit)

Lighting system

Head lights

The head light fitted to vehicle should be good enough to illuminate the road so that the driver can see the road clearly even in dark nights from a quite far distance. At the same time light beam should not be strong as to make other drivers coming from opposite side blind. At the same time there should be back light and stop light also emitting enough light so that the following vehicle can see the vehicle moving on the road. Apart from this there should be light inside the vehicle and in the dashboard so that instrument and gauges can be read.



Lighting system

Indicator lights

1. Main beam warning light :

- This light glows when the main beams of the headlights are on.
- This reminds the driver to dip the lights for the oncoming vehicles.

2. Ignition warning light :

- The ignition warning light lights up when the ignition is switched on. It goes off when the engine speed is increased.
- This lamp serves as a warning against leaving the ignition switched on when the engine is not running.

3. **Flashing indicator warning light.** This light which is also flashing, lights up when the flashing direction indicator is operative.

4. Oil pressure warning light :

- This light lights up when the oil pressure in the lubricating system falls below the desired level. This lights up when the ignition is switched on.
- When the engine is started and oil pressure is built up to the specified level, this warning lamp will extinguish. If, with the engine running, the light comes on, it is a warning to the driver that oil pressure has fallen below the safe limit which should be immediately investigated.

Lighting system

Trouble shooting of lighting system

S. No.	Troubles	Causes	Remedies
1.	<i>No light.</i>	<ul style="list-style-type: none">(i) Blown up fuse.(ii) Light switch not making proper contact.(iii) The battery may be disconnected or the circuit may be broken.	<ul style="list-style-type: none">(i) After determining the basic cause, replace the fuse.(ii) Replace the switch, if found defective.(iii) Check the circuit and the defect, if any, remedied accordingly.
2.	<i>Dim light.</i>	<ul style="list-style-type: none">(i) The battery may be discharged.(ii) The bulbs may be for a voltage higher than the specified one or may be otherwise of a poor quality.(iii) Reflectors or lenses may be dirty.(iv) Bad contacts at terminals.(v) Bad contacts in the switches.	<ul style="list-style-type: none">(i) Test the battery and recharge if necessary.(ii) In such a case the same should be replaced.(iii) May be cleaned at once.(iv) The contacts to be properly cleaned.(v) Replace the switch(es).
3.	<i>Lamps light, but gradually fade out.</i>	<ul style="list-style-type: none">(i) May be due to discharged battery.	<ul style="list-style-type: none">(i) Recharge the battery.
4.	<i>Lights flicker.</i>	<ul style="list-style-type: none">(i) Loose connections.	<ul style="list-style-type: none">(i) The connections may be inspected and tightened properly.
5.	<i>Frequent burning out of the bulbs.</i>	<ul style="list-style-type: none">(i) Excessive battery voltage.(ii) The bulb may be for a voltage lower than specified one or may be otherwise of a poor quality.	<ul style="list-style-type: none">(i) The battery voltage to be checked properly and remedied, if required.(ii) The bulb may be replaced with one of proper voltage and good quality.

Assignment : 06

1. Explain Battery testing methods.
2. Explain Lighting system.

Note:- Kindly write the above assignment in Separate notebook which you have prepared for online assignments and submit it on 15/4/2020.

- If any query regarding above topic kindly contact me on my mobile no.:-9998213196

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Thank You