Experiment 2

Loading effect on voltmeter

Object: To study the loading effect of voltmeter

Theory:

The sensitivity of a d.c voltmeter is an important factor when selecting a meter for a certain voltage measurement. A low sensitivity meter give correct readings when measuring voltage in low resistance circuits, but it is certain to produce very unreliable readings in low resistance circuits. A voltmeter when connected across two points in a high resistive circuit, acts as a shunt for that portion of the circuit and thus reduces the equivalent resistance in that portion of the circuit.

The meter will then give a lower indication of the voltage drop than actually existed before the meter was connected. This effect is called the loading effect of an instrument; it is caused principally by low sensitivity instruments.

The internal resistance of the voltmeter is

$$R_{in} = S \times V_{range}$$

Where S = sensitivity of the voltmeter = $(1/Im)$ Ω/v

Procedure:

1. Connect the circuit shown in fig. (1).
2. Measure the voltage of R2 using voltmeter of 20 K Ω / V sensitivity on scale 10 V.
3. Repeat step 2 using scale greater than 10 V.
4. Connect the circuit shown in fig. (2) Repeat step 2.

Discussion:

1. What are the reasons of the difference between the reading of step 2 and step 3?
2. Derive the unit of the sensitivity.
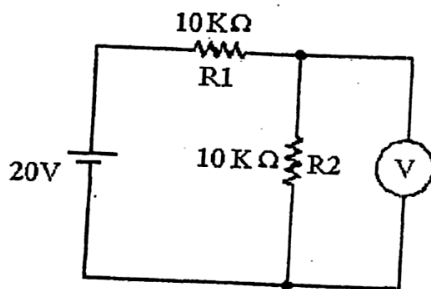3. How we can minimize the loading effect on voltmeter?
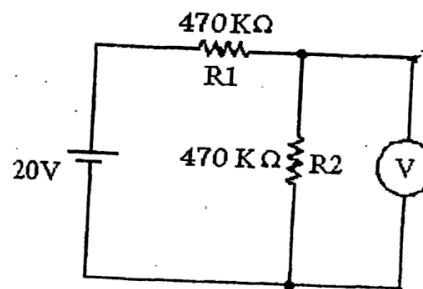

Fig. (1)

Fig. (2)