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Experiment - 2

Aim: Verification of KVL and KCL using given circuit.

Requirement: Multisim live (www.multisim.com).

Apparatus :-

S.No	Apparatus	Specification	quantity
1	Multimeter	Digital	01
2	Power supply	DC Regulated	01
3	Bread Board	-	01

Components Required :-

S.No.	Apparatus	Specification	Quantity
1	Resistors	1 KΩ	02
2	Resistors	4.7 KΩ	01

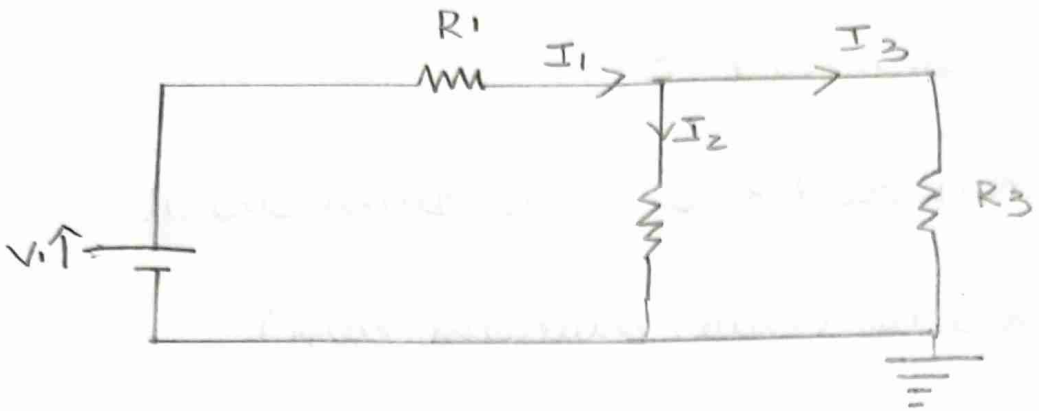
Theory

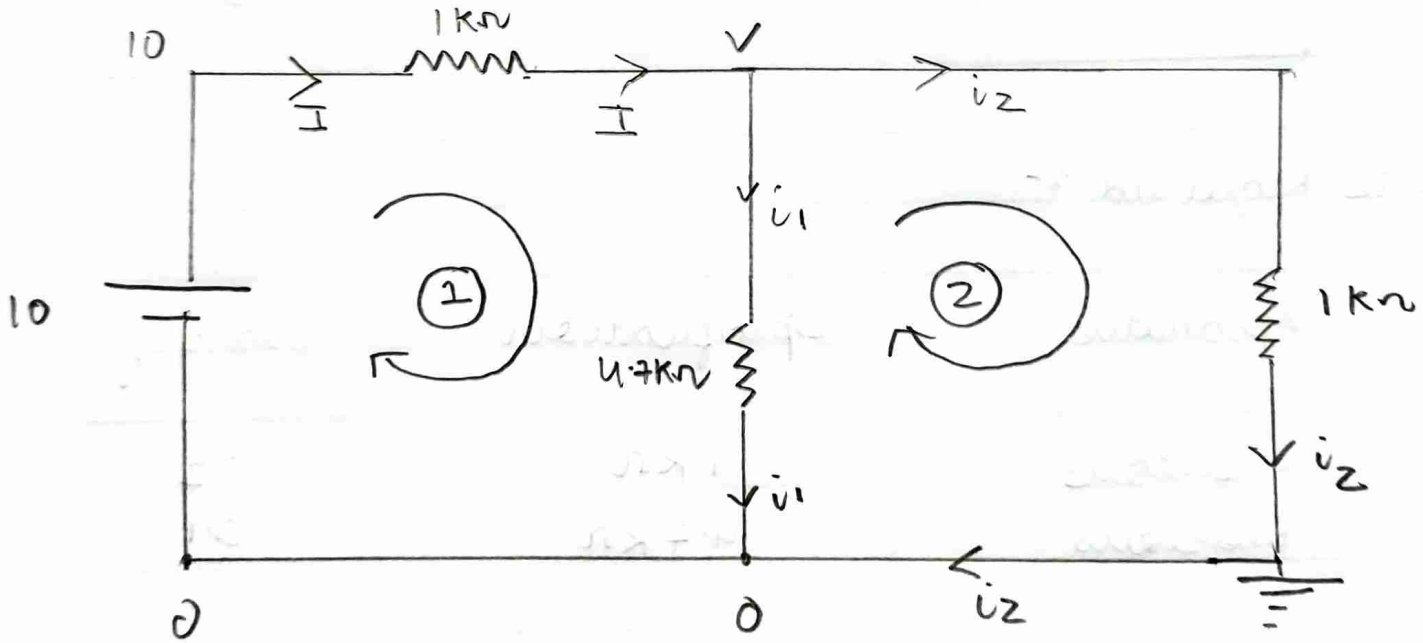
There are two Kirchoff's laws

(a) Kirchoff's Voltage law (KVL)

(b) Kirchoff current law (KCL)

Teacher's Signature _____


R1
I1
I3
I2
R3
V1


10
1Kn
V
I
I
i2
i1
1
2
10
4.7Kn
1Kn
i1
i2
i2
0
0

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- KVL states that the algebraic sum of all the voltages encountered as one goes around in complete loop is zero.
- (KCL) Kirchoffs current law states that the algebraic sum of all the currents entering or leaving a junction or node is zero.

Observation Table

Input Voltage	V(R1)	V(R2)	V(R3)	I(R1)	I(R2)	I(R3)
10	5.4608 volts	4.5192 (V)	4.5192 (V)	5.4808 (mA)	961.54 (mA)	4.5192 (mA)

KVL loop (1)

$10 - I(1) - i_1 \times 4.7 = 0$ $\quad I = I_1 + I_2$

$10 - 5.7 i_1 - i_2 < 0 \Rightarrow (1)$

loop (2)

$4.7 i_1 - i_2 \times 1 = 0$

$i_2 = 4.7 i_1 - (2)$

From (1) and (2)

$10.4 i_1 = 10$

$i_1 = \frac{10}{10.4\ k\Omega}$

$i_1 = 961.54\ mA$

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from (2)

$i_2 = 4.7 i_1$

$i_2 = 4519.238\ \mu A$

K.C.L (Summation of currents through nodes is '0')

$$\frac{10 - V}{1K} + \frac{0 - V}{1K} + \frac{0 - V}{4.7K} = 0$$

$$\frac{1}{K}\left(\frac{47 - 4.7V - 4.7V - V}{4.7}\right) = 0$$

$$47 = 9.4V + V$$

$$47 = 10.4V$$

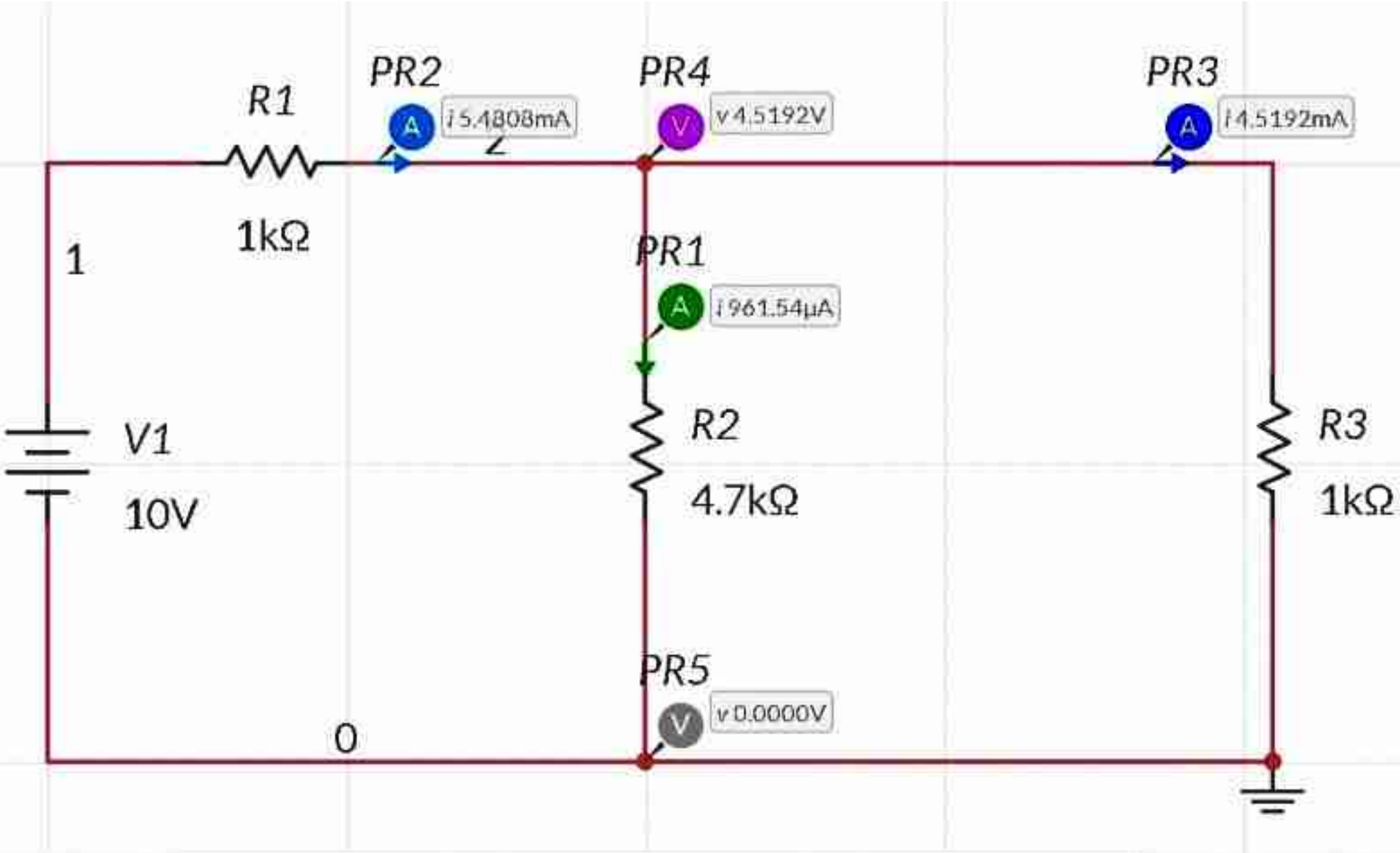
$$\boxed{V = 4.5192\ V}$$

Result: Hence KVL and KCL are verified.

Precaution:- Circuit must be grounded.

learning outcomes:-

1. The sum of all currents entering a junction must be equal to the sum of all currents leaving junction.
2. The algebraic sum of all the voltage around any closed loop in a circuit is equal to zero.


PR2
PR4
PR3
R1
i 5.4808mA
v 4.5192V
i 4.5192mA
1kΩ
1
PR1
i 961.54µA
R2
R3
V1
4.7kΩ
1kΩ
10V
PR5
v 0.0000V
0