Circuit Analysis

Calculate. For each loop in the circuits below, use Kirchhoff's voltage law to determine any missing voltage values.

(a)

$V_s = 9$ V

$V_1 = 4$ V

$V_2 = 5V$

$V_2 =$

(b)

$V_s = 9$ V

$V_t =$

$V_1 = 18$ V

$V_1 = 9V$

(c) Hint: which loop should you do first?

$V_s = 1.5V$

$V_1 = 1.0V$

$V_2 = 0.5V$

$V_3 = 0.5$ V

(d)

$V_s = 1.5V$

$V_1 = 1.2V$

$V_2 = 1.5V$

$V_3 = 0.3$ V

Calculate. For each loop in the circuits below, use Kirchhoff's current law to determine any missing current values.

(a)

$I_s = 4A$

$I_1 = 4A$

$I_2 = 4A$

(b)

$I_s = 1.5A$

$I_t = 1.5A$

$I_1 = 3$ A

(c) Hint: which loop should you do first?

$I_s = 6A$

$I_1 = 6$ A

$I_2 = 4A$

$I_3 = 2$ A

(d)

$I_s = 8$ A

$I_1 = 3A$

$I_2 = 2$ A

$I_3 = 3A$

SPH 3U – Electricity – Circuit simulation

Answer the questions below using the circuit simulation. No need to do any calculations!
https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc

1) **Verify Ohm's law**: Use a voltmeter and an ammeter to find the current and voltage across a 6 ohm resistor in a simple circuit. Enter your results in the table below. Using your results, find an equation for voltage, current and resistance?

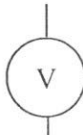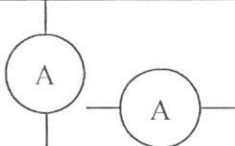| Voltage (V)	Current (I)	Resistance (Ohms)
3	0.5	6
6	1.0	6
12	2.0	6
18	3.0	6
24	4.0	6

3.0 V   6.0 Ω
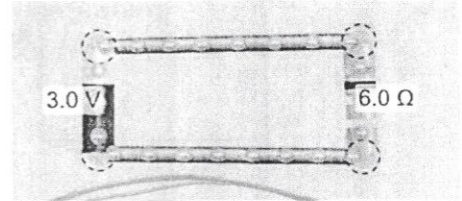
$$V = IR$$

2) Use a voltmeter and an ohmmeter to find the current and voltage across the resistors for the following circuits:

   a) A simple circuit: a 12 V battery connected to one 6 ohm resistor

   b) A series circuit: a 12V battery connected to one 9 ohm and one 3 ohm resistor

   c) A parallel circuit: a 12V battery connected to 6 ohm and 3 ohm resistors in parallel

   d) A complex circuit: a battery with resistors in series and parallel
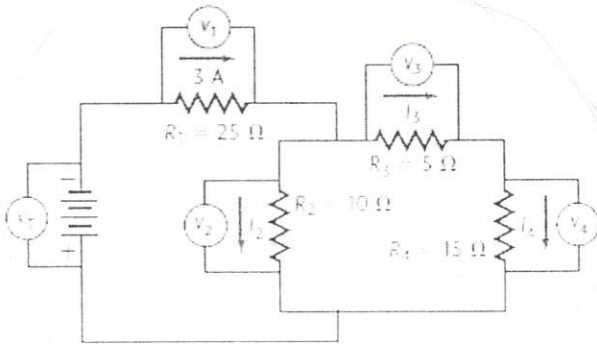
   Draw your 4 circuits on the next page using the following symbols, find and label the voltage and the current across each resistor.   Make conclusions based on your observations.
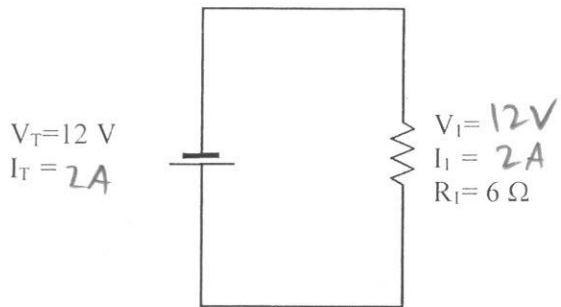
Battery	Resistor	wire	Voltmeter	Ammeter
			V	A A

3) Build the following circuit and determine all the unknown voltages, resistances and currents.

   d) Fig.16.26

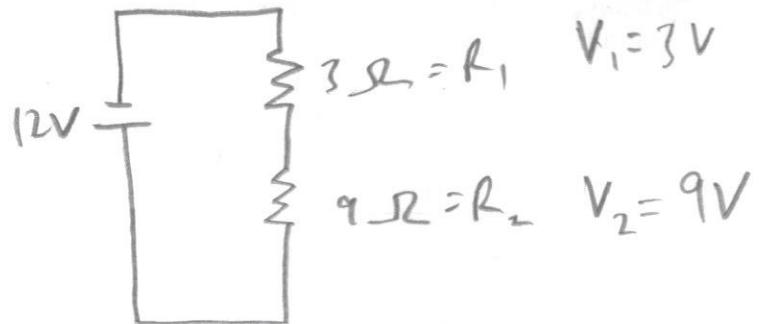| Name	V (V)	I (A)	R (Ω)
R_1	75	3	25
R_2	20	2	10
R_3	5	1	5
R_4	15	1	15
Total. R_0	95 V	3	31.7

3a) A simple circuit: a 12 V battery connected to one 6 ohm resistor.

3b) A series circuit: a 12V battery connected to one 9 Ω and one 3 Ω resistor

$V_T = 12\ V$
$I_T = 2A$

$V_1 = 12V$
$I_1 = 2A$
$R_1 = 6\ \Omega$

$3\Omega = R_1 \quad V_1 = 3V$

$12V$

$9\Omega = R_2 \quad V_2 = 9V$

$$I_1 = I_2 = I_3 = 1\ A$$

3c) A parallel circuit: a 12V battery connected to a 6 ohm and a 3 ohm resistors in parallel

3d) A complex circuit: a battery with resistors in series and parallel

$12V \quad R_1 \quad\quad R_2 = 3\Omega$
$= 6\Omega$

$$V_1 = 12V \quad\quad V_2 = 12V$$

$$I_1 = 1.33A \quad I_2 = 4A$$

$$I_T = 5.33\ A$$

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35. Determine all missing values. You might need to use other paper.

a) Fig.16.23
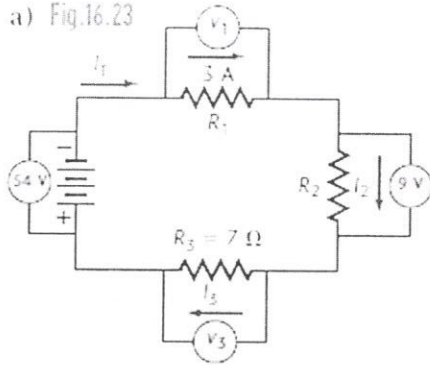
Name	V (V)	I (A)	R (Ω)
R₁	24	3	8
R₂	9	3	3
R₃	21	3	7
Total, R₀	54	3	18

b) Fig.16.24
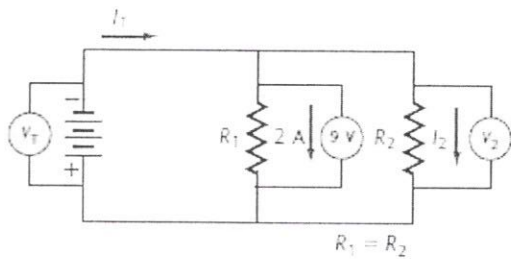
Name	V (V)	I (A)	R (Ω)
R₁	9	2	4.5
R₂	9	2	4.5
Total, R₀	9	4	2.25

c) Fig.16.25
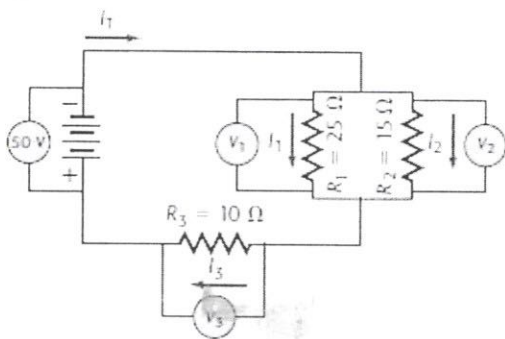
Name	V (V)	I (A)	R (Ω)
R₁	24.2	0.97	25
R₂	24.2	1.6	15
R₃	25.8	2.6	10
Total, R₀	50	2.6	19.4

d)
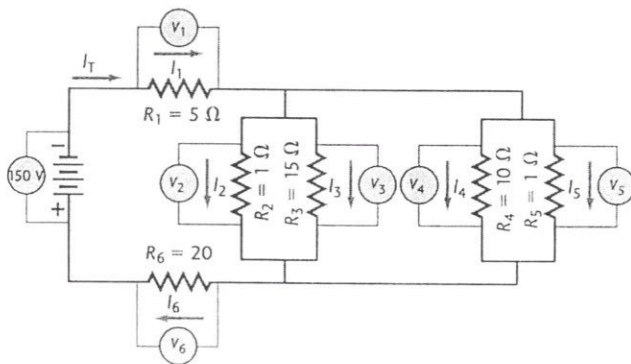
Name	V (V)	I (A)	R (Ω)
R₁	29.5	5.9	5
R₂	2.5	2.5	1
R₃	2.5	0.17	15
R₄	2.5	0.25	10
R₅	2.5	2.5 A	1
R₆	118.8	5.9	20
Total, R₀	150	5.9 A	25.5

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