مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

Chapter 8 : Current and Resistance

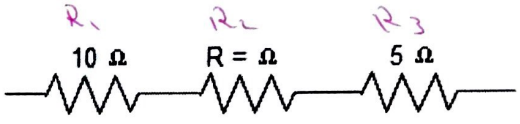
1. If the resistance of the a circuit were tripled , then the current through the circuit would be:
   a. one-third as less
   b. three times as much
   c. unchanged
   d. none of those answers

2. If the equivalent resistance value of the circuit = 30Ω. What will the value of the unknown resistance:
   a. 15Ω
   b. 10Ω
   c. 5Ω
   d. 20Ω

$R_1 + R_2 + R_3 = 30$

$R_2 = 30 - 10 - 5$

$R_2 = 15\ \Omega$



طريقة أسرع:

3. If you wish to increase the amount of current in a resistor from 120 mA to 160 mA by changing the 24 V source, what should the new voltage setting be?
   a. 32 V
   b. 24 V
   c. 40 V
   d. 10 V

0.12 A → 24 V

0.16 A → ? V_2

$V_2 = \frac{24 \times 0.16}{0.12} = 32$ volt

$I_1 = 120\ mA = 0.12\ A$, $I_2 = 160\ mA = 0.16\ A$

$V_1 = 24\ V$, $V_2 = ?$

$R = \frac{V_1}{I_1} = \frac{24}{0.12} = 200\ \Omega$

$\therefore V_2 = R \cdot I_2 = (200)(0.16) = 32$ Volt

4. If a test instrument detects a value which is higher than normal current, it could means:
   a. Resistance has decreases
   b. Resistance has increased
   c. voltage has increased
   d. a and c

5. The area of cross section of wire becomes half when its length is stretched to double . How the resistance of wire is affected in new condition : (assume that R_1 is the resistance before stretching and R_2 is the resistance after stretching)
   a. $R_2 = 4R_1$
   b. $R_1 = 4R_2$
   c. $R_2 = 2R_1$
   d. $R_1 = 4R_2$

$R_1 = \rho \cdot \frac{L}{A}$

$L \Rightarrow 2L$
$A \Rightarrow A/2$

$R_2 = \rho \cdot \frac{2L}{\frac{A}{2}} \Rightarrow R_2 = \rho \cdot \frac{4L}{A}$

$R_2 = 4\left(\rho \cdot \frac{L}{A}\right) \rightarrow R_1$

$\therefore R_2 = 4R_1$

combination of four coils of resistance 4Ω , 8Ω, 12Ω, 24Ω

(series)

a. largest resistance = 48Ω , smallest = 2Ω

largest $R = 4+8+12+24 = 48\,\Omega$

b. largest resistance = 16Ω , smallest =1/2Ω

(parallel)

smallest $R = \frac{1}{4}+\frac{1}{8}+\frac{1}{12}+\frac{1}{24} = 2\,\Omega$

c. largest resistance = 4.8Ω , smallest = 0.2Ω

d. none of those answers

7. A wire of uniform thickness with a resistance of 27Ω is cut into three equal pieces and they are joined in parallel . Find the equivalent resistance for the parallel combination.

$\frac{27}{3} = 9\,\Omega$, $R_1 = 9\,\Omega$, $R_2 = 9\,\Omega$, $R_3 = 9\,\Omega$

a. 3Ω

b. 9Ω

c. 18Ω

d. 27Ω

$\therefore \frac{1}{R_{eq}} = \frac{1}{9}+\frac{1}{9}+\frac{1}{9} = \frac{3}{9}$

$\Rightarrow R_{eq} = 3\,\Omega$

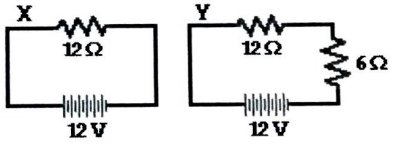
8. Compare circuit X and Y below. Each is powered by a 12V battery. The voltage drop across the 12Ω resistor in circuit Y is ____ the voltage drop across the single resistor in X.

a. smaller than

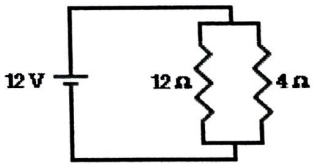
b. larger than

c. the same as

d. No answer is correct



9. A 12-V ba ery , a 12Ω resistor and a 4Ω resistor are connected as shown. The current in the 12Ω resistor is ____ that in the 4-ohm resistor.



a. 1/3

b. 1/2

c. 2/3

d. the same as

$I(12\,\Omega) = 1\ \text{Amp}$

$I(4\,\Omega) = 3\ \text{Amp}$

$\therefore I(12\,\Omega) = \frac{1}{3}\cdot I(4\,\Omega)$

10. Resistances of 2Ω, 4Ω, and 6Ω and a 24V emf device are all in series. The poten al di erence across the 2Ω resistor is:

a. 4V

b. 24V

c. 2V

d. 12V

$R_{eq} = R_1+R_2+R_3$

$= 2+4+6 = 12$

$I = \frac{V}{R_{eq}} = \frac{24}{12} = 2\ \text{Amp}$

$V(2\,\Omega) = I R_1$

$= 2(2) = 4\ \text{Volt}$

Chapter 8 : Current and Resistance

11. Four 20Ω resistors are connected in parallel and the combination is connected to a 20V emf device. The current in any one of the resistors is:
    a. 1A
    b. 4A
    c. 20A
    d. 40A

$\frac{1}{R_{eq}} = \frac{1}{20} + \frac{1}{20} + \frac{1}{20} + \frac{1}{20} = \frac{4}{20} \Rightarrow R_{eq} = \frac{20}{4} = 5\Omega$

$I = \frac{V}{R_{eq}} = \frac{20}{5} = 4A$

(For each resistance) ← $I(20\Omega) = 1$ Amp

12. A total resistance of 3Ω is to be produced by combining an unknown resistor R with a 12Ω resistor. What is the value of R and how is it to be connected to the 12Ω resistor?
    a. 4Ω, parallel
    b. 2.4Ω, parallel
    c. 4Ω, series
    d. 2.4Ω, series

$\frac{12R}{12+R} = 3$

$12R = 3R + 36$

$12R - 3R = 36 \Rightarrow 9R = 36 \Rightarrow R = 4\Omega$

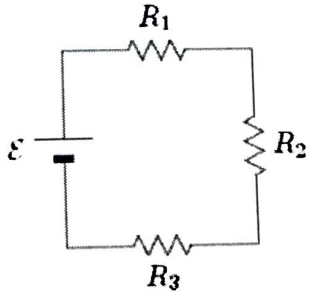
13. A Nichrome wire is 1m long and 1×10^{-6} m^2 in cross-sectional area. When connected to a potential di erence of 2V, a current of 4A exists in the wire. The resistivity of this Nichrome is:
    a. 5×10^{-7} Ω·m
    b. 4×10^{-7} Ω·m
    c. 8×10^{-7} Ω·m
    d. 2×10^{-7} Ω·m

$R = \frac{V}{I} = \frac{2}{4} = 0.5\Omega$

$\rho = R \cdot \frac{A}{L}$

$= 0.5 \frac{(1 \times 10^{-6})}{1} = 5 \times 10^{-7}\ \Omega \cdot m$

14. In the diagram $R_1 > R_2 > R_3$. Rank the three resistors according to the current in them, least to greatest.
    a. 1, 2, 3
    b. 3, 2, 1
    c. 1, 3, 2
    d. All are the same



15. Calculate the value of the resistance which must be connected to a 15Ω resistor to provide an equivalent resistance of 6Ω
    a. 15Ω
    b. 10Ω
    c. 6Ω
    d. 30Ω

$\frac{15R}{15+R} = 6$

$15R = 6R + 90$

$15R - 6R = 90$

$\Rightarrow R = 10\Omega$

Chapter 8 : Current and Resistance

16. If an electric charge of 900C flow through the filament of an electric bulb for 30 min half an hour . What is the electric current will be in the filament?

a. 0.5 A
b. 0.05 A
c. 30 A
d. 0.005 A

$I = \frac{\Delta Q}{\Delta t} = \frac{900}{30 \times 60} = 0.5$ Amp

17. 0.9V potential difference is applied across 1.5m length of tungsten wire that has across sec onal of $0.6mm^2$. What is the current in the wire? (the resistivity of tungsten is $5.6 \times 10^{-8}\ \Omega \cdot m$)

a. 6.43A
b. 64.3A
c. 0.16A
d. 1.6A

$R = \rho \cdot \frac{L}{A}$

$= 5.6 \times 10^{-8} \frac{(1.5)}{0.6 \times 10^{-6}} = 0.14\ \Omega$

$I = V/R = \frac{0.9}{0.14} = 6.43A$

18. In particular cathode ray tube , the measured beam current is 30μA . How many electrons strike the tube screen every 40s?

a. 0.75×10^{13} electron
b. 7.5×10^{15} electron
c. 750×10^{17} electron
d. 0.075×10^{12} electron

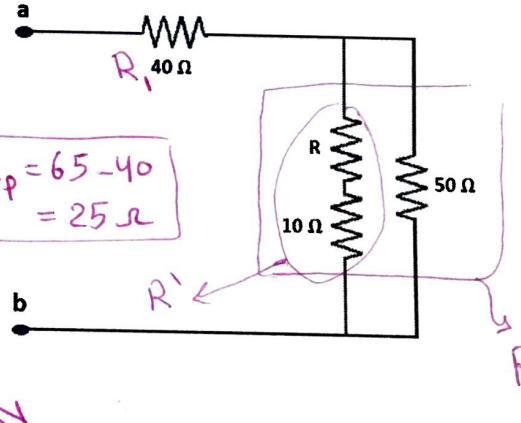
$\Delta Q = I \cdot \Delta t$

$= (30 \times 10^{-6})(40) = 1.2 \times 10^{-3}\ C$

$n = \frac{\Delta Q}{q_e} = \frac{1.2 \times 10^{-3}}{1.6 \times 10^{-19}} = 7.5 \times 10^{15}$ electron

19. The equivalent resistance between terminals a and b in the gure below is 65Ω. Calculate the value of the resistor R.

a. 40 Ω.
b. 60 Ω.
c. 25 Ω.
d. 10 Ω.



$R_{eq} = R_1 + R_p$

$65 = 40 + R_p \Rightarrow R_p = 65 - 40 = 25\ \Omega$

$\frac{1}{25} = \frac{1}{R_p} = \frac{1}{50} + \frac{1}{R'}$

$\frac{1}{25} = \frac{1}{50} + \frac{1}{R'}$

$\frac{1}{R'} = \frac{2 \times 1}{2 \times 25} - \frac{1}{50}$

$\frac{1}{R'} = \frac{1}{50} \Rightarrow R' = 50\ \Omega$

$R' = 10 + R$

$50 = 10 + R \Rightarrow R = 40\ \Omega$

20. Resistance of a conductor depends upon

a. Nature of conductor
b. length of conductor
c. Area of cross section of conductor
d. All of the previous