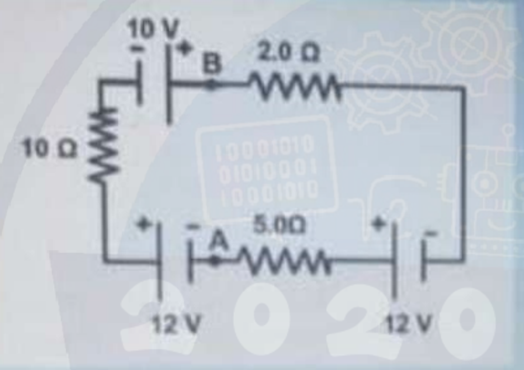
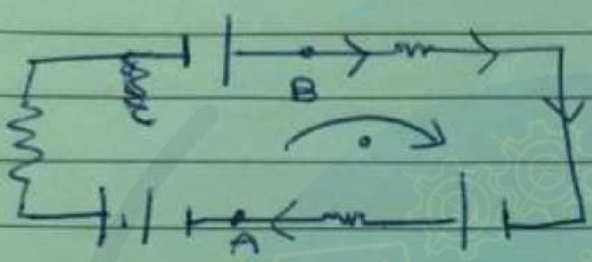
For the circuit shown, the potential of point **A** is 10 V. The potential of point **B** (in V) is:




Select one:

- 12
- 20
- 22
- 14
- 2

② Given potential at point A $\{V_A\} = 10\,V$




using KVL

$$10 - 2I + 12 - 5I + 12 - 10I = 0$$

$$34 - 17I = 0$$

$$I = \frac{34}{17} = 2\,A$$

$$-10 + 10(I) - 12 + (V_B - V_A) = 0$$

$$V_B - V_A = 22 - 10I$$

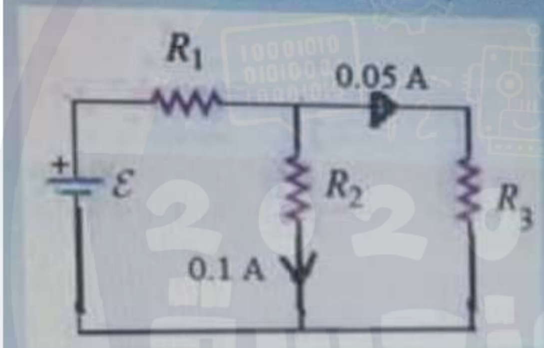
$$= 22 - 10(2)$$

$$V_B - V_A = 2$$

$$V_B = 2 + V_A = \boxed{12\,V}$$

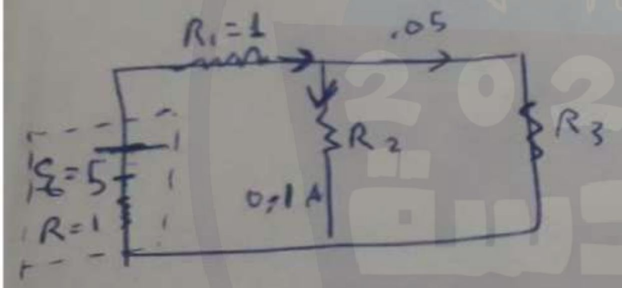
**The answer is A**

For the circuit shown, $R_1$ = 1.00 kΩ,the emf of the battery is 5.0 V and its internal resistance is 1.00 Ω. The power (in W) supplied by the battery is




Select one:

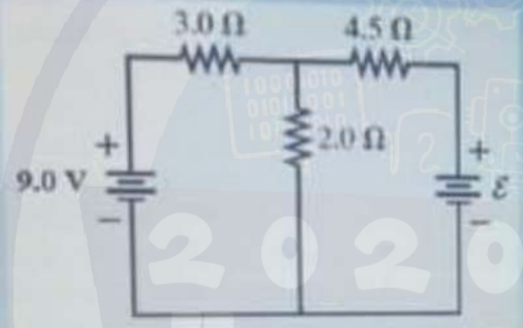
- 0.20
- 0.60
- 0.75
- 0.25
- 0.50




$$I_1 = I_2 + I_3 = .1 + .05 = .15\ A$$

$$P = IV = .15 * 5 = .75\ W$$

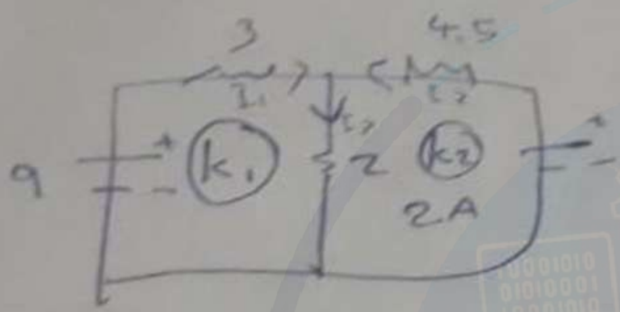
For the circuit shown, the current passing through the 4.5 Ω resistor is 2.0 A. Determine the power (in W)supplied by the unknown emf,ℰ.




Select one:

- 18
- 10
- 30
- 6
- 20

$\mathcal{E} = 5 * 2 = 10$




$I_1 + I_2 = I_3$

$\Rightarrow I_2 = I_3 - I_1$

$I_3 - I_1 = 2$

k: kerchoffs loop

$k_1: \; 3I_1 - 9 + 2I_3 = 0$ ---- ①

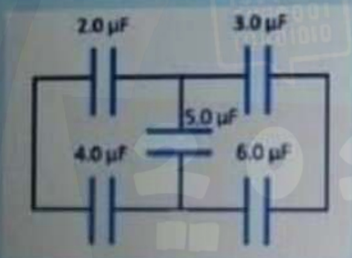
$k_2: \; 4.5 * 2 - \mathcal{E} + 2I_3 = 0$ ---- ②

$I_3 - I_1 = 2$ ---- ③

$\rightarrow I_1 = 1A \,/\, I_3 = 3A \,/\, \mathcal{E} = 15V$

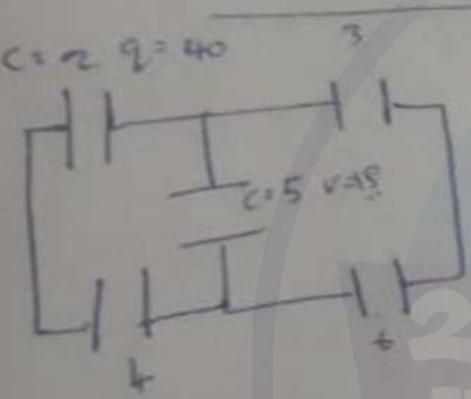
$P = VI = 15 * 2 = 30 \, W$

In the circuit shown, if the charge stored by the 2.0 microFarad capacitor is 40 microCoulomb, find the voltage across the 5.0 microFarad capacitor.




Select one:

- a. 15 V.
- b. 18 V.
- c. 9 V.
- d. 30 V.
- e. 0 V.




$C_2$ & $C_4$ [series] so $q_2 = q_4$

$q = CV$

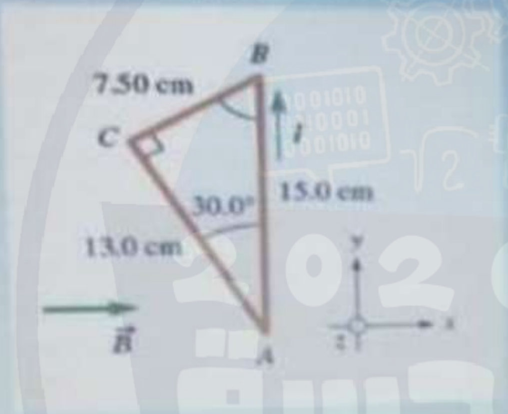
$\rightarrow V = \frac{q}{C}$

$V_2 = \frac{40}{2} = 20$

$V_4 = \frac{40}{4} = 10$

$V_5 = V_2 + V_4 = 10 + 20 = 30V$

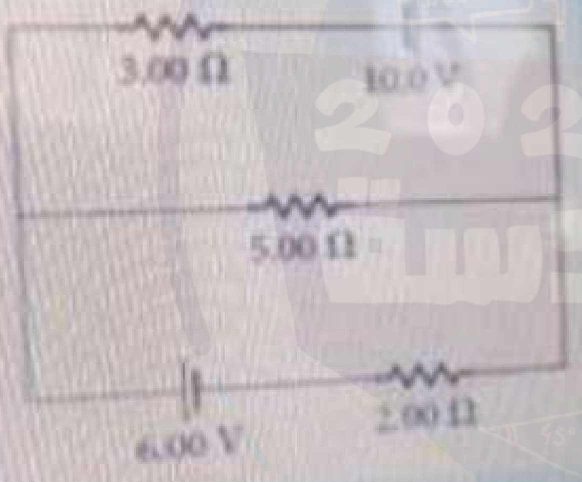
A triangle is placed in a uniform magnetic field, $\mathbf{B} = 0.25\ \mathrm{T}\ \hat{i}$ (the green arrow displayed in the figure). The current passing through the triangle (the blue arrow displayed in the figure) is 0.125 A. The magnetic force on the side AC has a magnitude of (in $10^{-2}$ N):



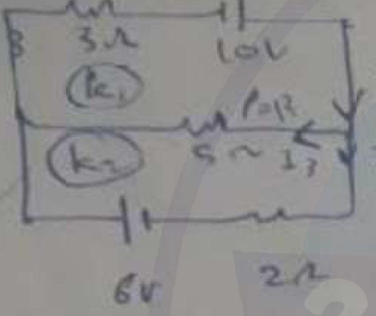

Select one:

- 4.22
- 1.17
- 2.22
- 1.47
- 3.52

For the circuit shown, determine the power (in W) delivered to the 5.00 Ω resistor.



K: kershoph loop




$I_1 = I_2 + I_3$

$k_1: -10 + 3I_1 + 5I_3 = 0 \Rightarrow I_1 = \ldots$

$k_2: 5I_3 - 2I_2 + 6 = 0$

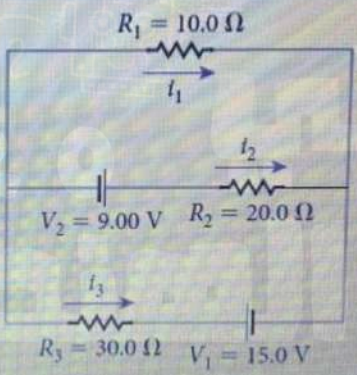
$\rightarrow I_1 = 3.226\ A$

$I_2 = 3.161\ A$

$I_3 = .0645\ A$

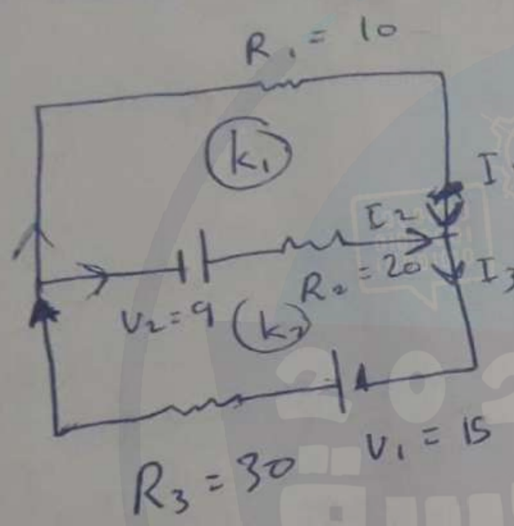
$P = I^2R = (.0645)^2 * 5 = .0208\ W$

For the circuit shown, find the power (in W) dissipated in the resistor $R_1$.




Select one:

- 0.0074
- 11.31




$I_1 + I_2 = I_3$

$k_1: \; 10I_1 + 9 - 20I_2 = 0$

$k_2: \; 20I_2 - 9 + 30I_3 - 15 = 0$

$I_1 = .027 \; A$

$I_2 = .4636 \; A$

$I_3 = .491 \; A$

$P_{(R_1)} = RI^2 = 10(.027)^2$

$= 7.29 \times 10^{-3} \; W$

A 102 PHY student has connected [ *n* ] identical capacitors in parallel across a power supply o voltage 150.0 V. How many capacitors [ *n* ], each with C = 80.0 μF, were connected to supply 114.3 J of energy? Report your result for [ *n* ] as an integer number of capacitors.

Select one:

- ○ 2023
- ○ 402
- ○ 489
- ◉ 127
- ○ 13

Clear my choice

in Parallel so ⇒ V is equal an Cequivalent = C₁C₂C₃...

$C_{eq} = nC$

$\Rightarrow E = \frac{1}{2} C_{eq} V^2 \Rightarrow 114.3 = \frac{1}{2} C_{eq} (150)^2$

$C_{eq} = .01016\ F$

$\Rightarrow .01016F = n * 80\ \mu F$

$n = \frac{.01016}{80 * 10^{-6}} = 127$

Which of the following is an **incorrect** statement?

Select one:

- ○ The capacitance depends only on the geometry of the device and can never be negative quantity.
- ○ The temperature coefficient of electric resistivity is a pure number with no dimension.
- ○ The electromotive force has the same unit as the electric potential.
- ○ The potential drops across electronic devices connected in parallel are equal.
- ◉ Ohm's law states that the ratio of the current density to the applied electric field is constant.

Clear my choice

The answer is A

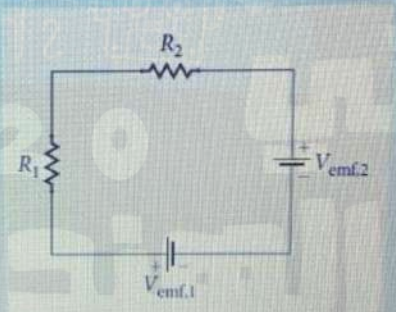
A parallel plate capacitor consists of square plates of area 6.0 $cm^2$ separated by a distance of 2.0 mm. The capacitor is connected to a 6.0 V battery. If the plates are pulled apart so that the separation becomes 3.0 mm, how much work (in MeV) is done?

Select one:

- ○ 18.61
- ○ 5.05
- ○ 808.03
- ○ 789.47
- ◉ 99.56

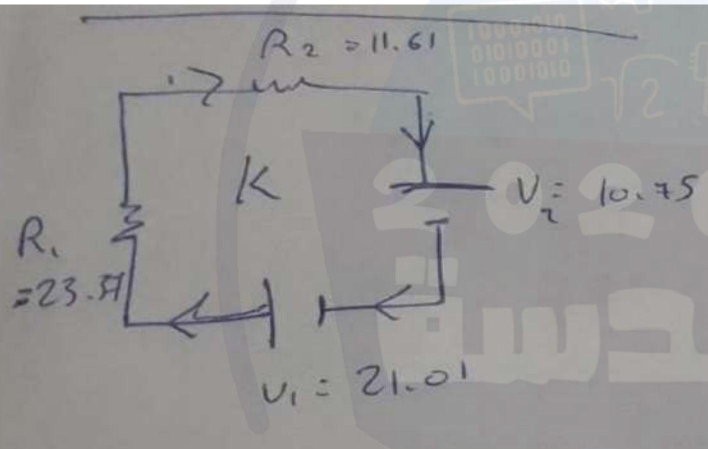
Clear my choice

For the circuit shown, $R_1 = 23.37\ \Omega$, $R_2 = 11.61\ \Omega$, $V_{emf,1} = 21.01$ V, and $V_{emf,2} = 10.75$ V. Determine the current (in A) flowing through $R_1$.




Select one:

- (●) 0.293
- ( ) 0.007




$$k: 11.61\, I_1 + 23.37\, I_1 - 21.01 + 10.75 = 0$$

$$\Rightarrow I_1 = .2933\ A$$

A gold wire has a resistance *R*. If its length and diameter are both cut in half, its resistivity will:

Select one:

- ○ decrease by a factor of 4
- ○ increase by a factor of 4
- ◉ stay the same
- ○ increase by a factor of 2
- ○ decrease by a factor of 2

Clear my choice

The answer is C

A nickel wire has a resistance *R*. If its length and diameter are both reduced by a factor of 4, its resistivity will:

Select one:

- decrease by a factor of 4
- stay the same
- decrease by a factor of 16
- increase by a factor of 4
- increase by a factor of 16

The answer is B

A block of iron of volume 807 $mm^3$ is used to make a wire 23.7 m long. What is the resistance (in Ω) of such a wire at room temperature?

Take $\rho = 9.70 \times 10^{-8}$ Ω.m

Select one:

- ○ 0.07
- ◉ 67.51
- ○ 504.78
- ○ 1989.18
- ○ 19.89

Clear my choice

$$R = \frac{\rho L}{A} \qquad V = AL \Rightarrow A = \frac{V}{L}$$

$$R = \frac{\rho L}{\frac{V}{L}} \Rightarrow \frac{\rho L^2}{V} = \frac{9.7 * 10^{-8} * 23.7}{.807} = 67.51$$

Capacitors A and B are identical. Capacitor A is charged so it stores 4 J of energy and capacitor B is uncharged. The capacitors are then connected in parallel. The total stored energy (in J) in the capacitors is now:

*

(2 Points)

- ○ $\frac{1}{4}$
- ○ 16
- ○ 8
- ○ 4
- ◉ 2

Parallell so $V_1 = V_2$ and $C_1 = C_2$

then $Q_1 = Q_2$ and the voltage will drop by 2

$\Rightarrow V_s = 2V$ ~~$\frac{Q}{C}$~~

A parallel plate capacitor consists of square plates of area $3.0\ cm^2$ separated by a distance of 3.0 mm. The capacitor is connected to a 6.0 V battery. If the plates are brought closer so that the separation becomes 2.0 mm, how much work (in MeV) is done?

Select one:

- 408.37
- 1111.78
- 49.78
- 423.09
- 2.88

A 102 PHY student has connected [ *n* ] identical capacitors in parallel across a power supply of voltage 210.0 V. How many capacitors [ *n* ], each with C = 45.0 μF, were connected to supply 231.2 J of energy? Report your result for [ *n* ] as an integer number of capacitors.

Select one:

- 404
- 465
- 27
- 233
- 911

$C_{eq} = nC$

$E = \frac{1}{2} C_{eq} U^2$

$231.2 = \frac{1}{2} * n * 45*10^{-6} * 210^2$

$n = 233$

Useful Constants

$k_e = 1/4\pi\varepsilon_o = 9 \times 10^9$ N.m²/C²; $\varepsilon_o = 8.85\times10^{-12}$ C²/N.m²; e = $1.6\times10^{-19}$ C; $m_{electron} = 9.11 \times 10^{-31}$ kg; $m_{proton} = 1.67 \times 10^{-27}$ kg; g = 9.8 m/s²

---------------------------------------------------------------

-------------------------

If a potential difference of 2 V is applied across a 1-µF capacitor, then the charge (in µC) on the capacitor is

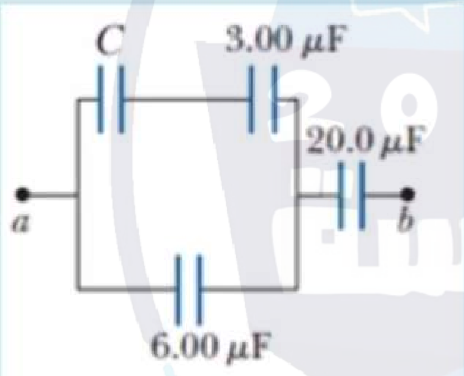
- a. 2
- b. 4
- c. 6
- d. 8
- e. 10

## Useful Constants

$k_e = 1/4\pi\varepsilon_o = 9 \times 10^9\ N.m^2/C^2$; $\varepsilon_o = 8.85 \times 10^{-12}\ C^2/N.m^2$; e = $1.6 \times 10^{-19}$ C; $m_{electron} = 9.11 \times 10^{-31}$ kg; $m_{proton} = 1.67 \times 10^{-27}$ kg; g = 9.8 m/$s^2$

---------------------------------------------------------

Four capacitors are connected as shown in the figure. If *C* = 3.0 $\mu$F, the equivalent capacitance (in $\mu$F) between points *a* and *b* is



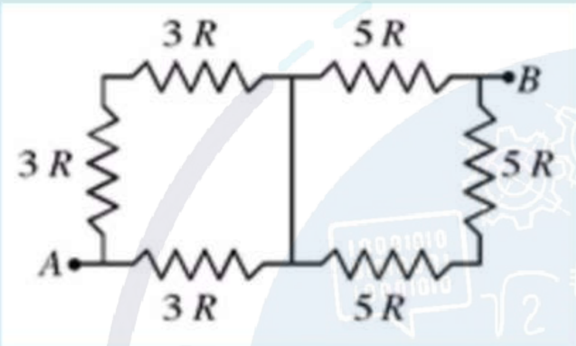

- a. 6.0
- b. 5.7
- c. 5.5
- d. 5.0
- e. 5.3

$10^{-27}$ kg; g = 9.8 m/s$^2$

----------------------------------------

-----------------

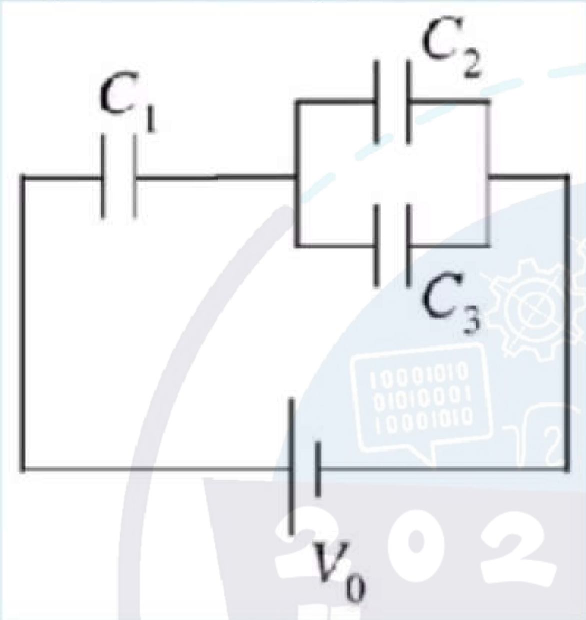
If $R = 9\ \Omega$, what is the equivalent resistance (in Ω) between points $A$ and $B$ in the figure?






- a. 64
- b. 96
- c. 112
- d. 48
- e. 32

Determine the charge stored by $C_1$ (in mC) when $C_1$ = 20 $\mu$F, $C_2$ = 10 $\mu$F, C3 = 30 $\mu$F, and $V_0$ = 36 V.






- a. 0.36
- b. 0.24
- c. 0.32
- d. 0.4
- e. 0.48

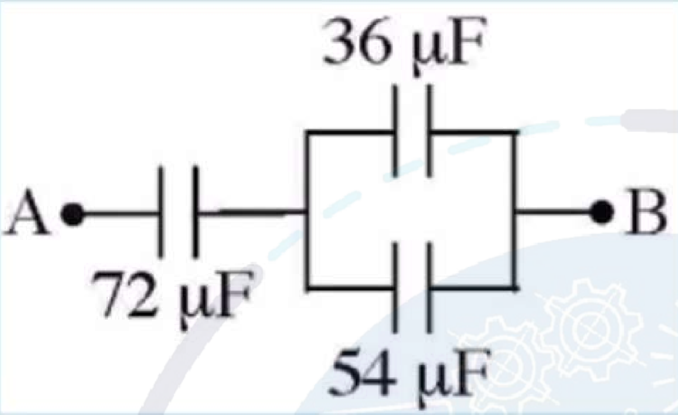
$10^{-27}$ kg; g = 9.8 m/s$^2$

-----------------------------------------------------------

A potential difference of 7.0 V is applied across a cylindrical conductor. The conductor is 20.0 m long, and has a radius of 0.5 mm and a resistivity of 5.6 × $10^{-8}$ Ω.m. The current flowing in the conductor (in A) is

- a. 1.4
- b. 2.5
- c. 4.2
- d. 4.9
- e. 6.1

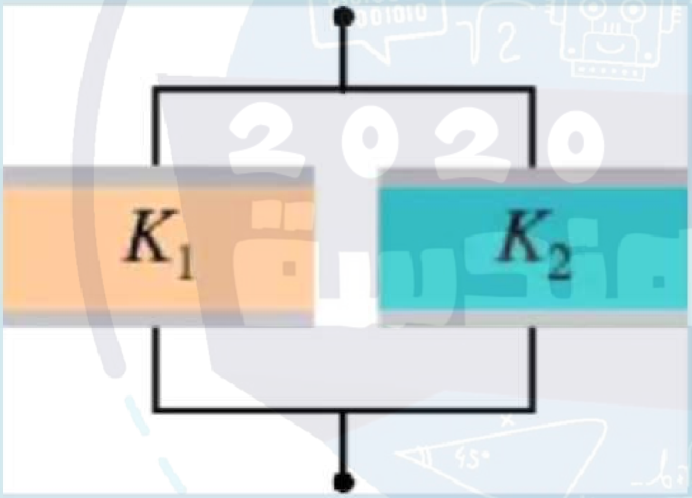
If $V_A - V_B = 60$ V, how much energy (in mJ) is stored in the 54-$\mu$F capacitor?






- a. 50.3
- b. 13.3
- c. 26.1
- d. 34.1
- e. 19.2

Two identical parallel-plate capacitors each having plate area $A$ = 50.0 cm$^2$ and plate separation $d$ = 1.0 mm are completely filled with two different dielectrics of dielectric constants $K_1$ = 2.0 and $K_2$ = 5.5, and then connected as shown in the figure. The equivalent capacitance (in pF) of the combination is




- a. 221
- b. 266
- c. 332
- d. 389
- e. 416

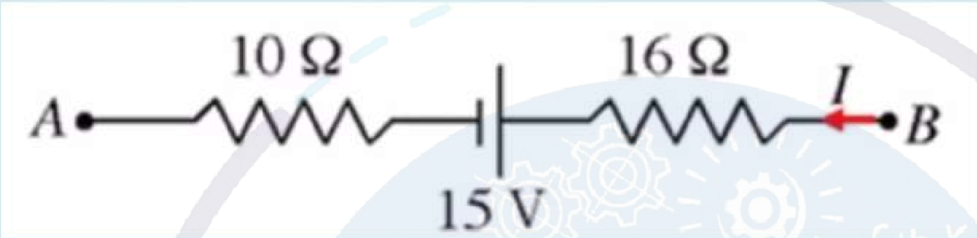
-----------------

A capacitor in a single-loop *RC* circuit is charged to 85% of its final potential difference in 3.2 s. What is the time constant (in s) for this circuit?



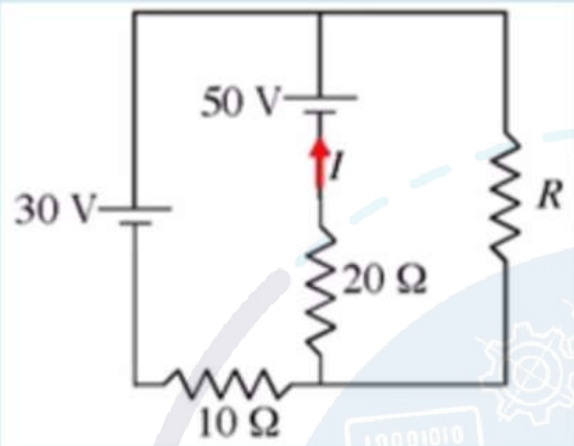
- a. 1.27
- b. 0.79
- c. 2.11
- d. 1.69
- e. 2.64

What is the potential difference $V_B - V_A$ (in V) when $I = 2.0$ A in the circuit segment shown below?




- a. +54
- b. +67
- c. -54
- d. -67
- e. +18

Determine the resistance $R$ (in Ω) when $I$ = 2.0 A.





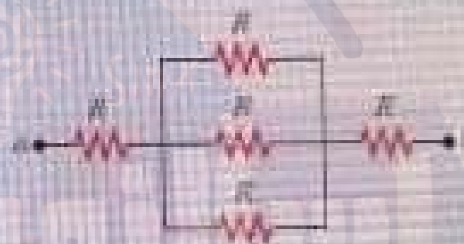

- a. 8
- b. 30
- c. 2.5
- d. 4.1
- e. 16.3

Useful Constants

$k_e = 1/4\pi\varepsilon_o = 9 \times 10^9$ N.m$^2$/C$^2$; $\varepsilon_o = 8.85\times10^{-12}$ C$^2$/N.m$^2$; e = 1.6x10$^{-19}$ C; $m_{electron} = 9.11 \times 10^{-31}$ kg; $m_{proton} = 1.67 \times 10^{-27}$ kg; g = 9.8 m/s$^2$

---

What is the equivalent resistance (in Ω) of the combination of identical resistors between points *a* and *b* in the figure if *R* = ?18 Ω




35 .a

28 .b

42 .c

49 .d

56 .e

Useful Constants

$k_e = 1/4\pi\varepsilon_o = 9 \times 10^9$ N.m²/C²; $\varepsilon_o = 8.85 \times 10^{-12}$ C²/N.m²; $e = 1.6 \times 10^{-19}$ C; $m_{electron} = 9.11 \times 10^{-31}$ kg; $m_{proton} = 1.67 \times 10^{-27}$ kg; $g = 9.8$ m/s²

---

If a potential difference of 40 V is applied across a 10-Ω resistor, then the current (in A) flowing in the resistor is

a. 1

b. 2

c. 3

d. 4

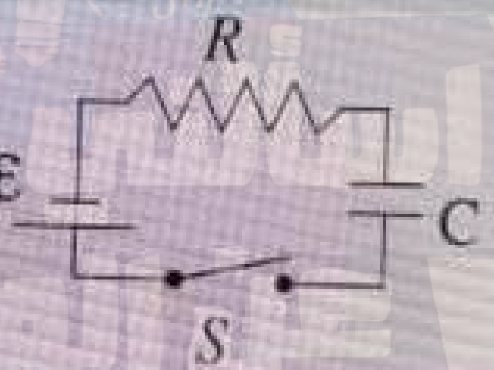
e. 5

Useful Constants

$k_e = 1/4\pi\varepsilon_0 = 9 \times 10^9$ N.m²/C²; $\varepsilon_0 = 8.85\times10^{-12}$ C²/N.m²; e = $1.6\times10^{-19}$ C; $m_{electron} = 9.11 \times 10^{-31}$ kg; $m_{proton} = 1.67 \times 10^{-27}$ kg; g = 9.8 m/s²

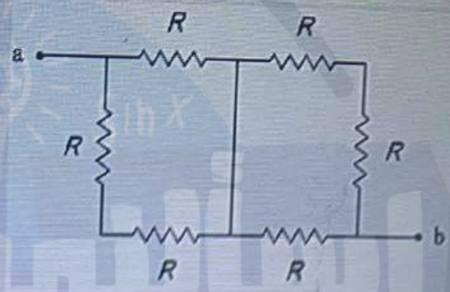
---

The capacitor in the figure is initially uncharged. If $R = 15.0$ kΩ, $\varepsilon = 24.0$ V, and the time constant is $t = 55.0$ μs, then after closing the switch the time (in μs) it takes for the voltage across the capacitor to reach 8.0 V is:




a. 10
b. 38
c. 22
d. 60
e. 99

3




In the figure, if R = 12 Ω, the equivalent resistance (in Ω) between points a and b is: *
(2 Points)

- 16
- 6
- 24
- 28
- 20

8

A parallel plate capacitor with a capacitance of 12 μF is connected to a source of emf with a potential difference of 3 V. If a dielectric material of κ = 6 is inserted between the plates of the capacitor, then the change in the stored electrical energy, ΔU (in J) is: *
(2 Points)

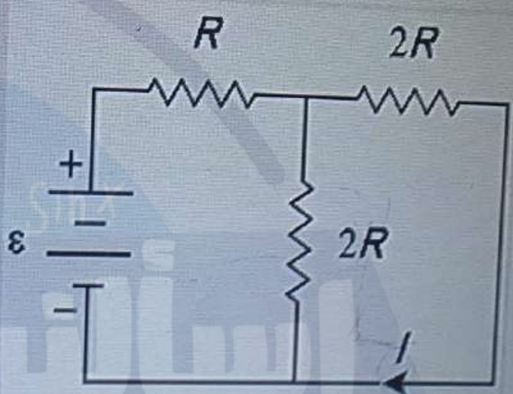
- 0
- $1.2 \times 10^{-5}$
- $1.4 \times 10^{-6}$
- $5.4 \times 10^{-5}$
- $2.7 \times 10$[illegible]

2

A 10.0 µF capacitor is charged using a 10.0 V battery through a resistor R. If the potential difference on the capacitor reaches 4.00 V in 3.00 sec, then R (in kΩ) is : *
(2 Points)

- 1.35
- 391
- 587
- 402
- 108

10




In the figure shown, if I = 0.50 A and R= 12 Ω , determine ε (in Volt). *
(2 Points)

- 24
- 12
- 6
- 30

5

A 10.0 μF capacitor is charged using a 10.0 V battery through a resistor R. If the potential difference on the capacitor reaches 4.00 V in 3.00 sec, then R (in kΩ) is : *
(2 Points)

- 402
- 108
- 587
- 1.35
- 391

5

A 10.0 μF capacitor is charged using a 10.0 V battery through a resistor R. If the potential difference on the capacitor reaches 4.00 V in 3.00 sec, then R (in kΩ) is : *
(2 Points)

- ○ 402
- ○ 108
- ◉ 587
- ○ 1.35
- ○ 391

6

2

A parallel plate capacitor with a capacitance of 12 μF is connected to a source of emf with a potential difference of 3 V. If a dielectric material of κ = 6 is inserted between the plates of the capacitor, then the change in the stored electrical energy, ΔU (in J) is: *
(2 Points)

- $1.4 \times 10^{-6}$
- $1.2 \times 10^{-5}$
- $2.7 \times 10^{-4}$
- $5.4 \times 10^{-5}$
- 0

4

Two spheres are made of conducting material. Sphere #2 has twice the radius of sphere #1. What is the ratio of the capacitance of sphere #2 to the capacitance of sphere #1? *
(2 Points)

- $\frac{1}{4}$
- 1
- 4
- 2
- *None of the above is correct*

9

A 12.0 μF capacitor is charged to a potential of 50.0 V and then discharged through a 225-Ω resistor. How long does it take the capacitor to lose half of its stored energy? *
(2 Points)

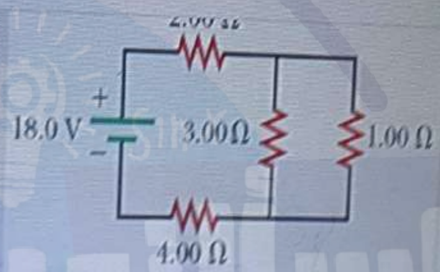
- 1.871 *ms*
- 0.936 *ms*
- *None of the above*
- 0.468 *ms*
- 0.234 *ms*

Required

1

A long copper wire of cross sectional area of 4.0x10^-6 m^2 and carrying a current of 5 A. The drift speed in (m/s) of the electrons in wire is : ( the concentration of electrons is 6.0x10^28 / m^3, e=1.6x10^-19 C) *
(2 Points)

- $4.0 \times 10^{-4}$
- $0.13 \times 10^{-4}$
- *None of the above*
- $13 \times 10^{-4}$
- $1.3 \times 10^{-4}$




What is the current ( in A) in the 1.00-Ω resistor shown in the figure? *
(2 Points)

- 3.00
- 0.67
- 2.42
- 2.00
- 0.30

9

A 12.0 μF capacitor is charged to a potential of 50.0 V and then discharged through a 225-Ω resistor. How long does it take the capacitor to lose half of its stored energy? *
(2 Points)

- ○ 1.871 *ms*
- ● 0.936 *ms*
- ○ *None of the above*
- ○ 0.468 *ms*
- ○ 0.234 *ms*

(1)

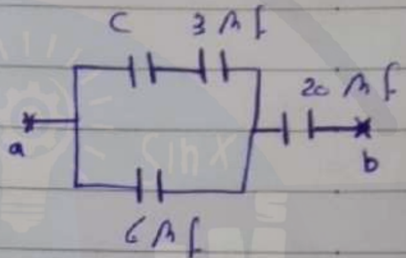
$\Delta V = 2\,V \quad C = 1\,\mu F \quad q = ???$

$C = \dfrac{q}{\Delta V} \Rightarrow q = 2 * 1 * 10^{-6}$

$q = \boxed{2\,\mu C}$ (a)

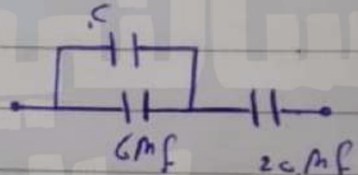
Q2

C = 3 μf



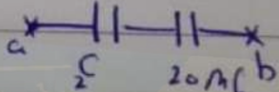

(C, 3) (series)

$$C_1 = \frac{3\times10^{-6} \times 3\times10^{-6}}{6\times10^{-6}} = \frac{3}{2}\times10^{-6} \text{ f}$$




($C_1$, 6) (parallel)

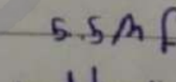
$$C_2 = \frac{3}{2}\times10^{-6} + 6\times10^{-6} = 7.5\times10^{-6} \text{ f}$$




($C_2$, 20) (series)

$$C_q = \frac{7.5\times10^{-6} \times 20\times10^{-6}}{27.5\times10^{-6}} = \boxed{5.5\times10^{-6} \text{ f}}$$

C

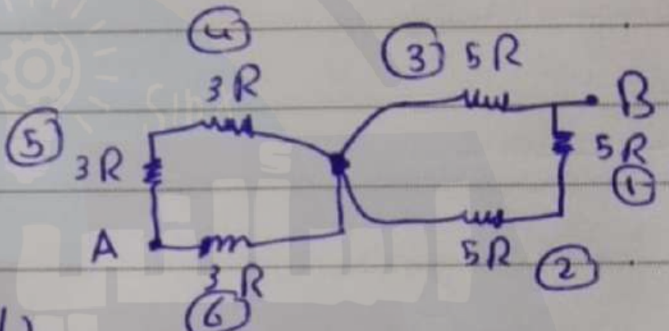


27.5 * 10

(1, 2) (5, 4) (series)

① $5R + 5R = 10R = R_1$

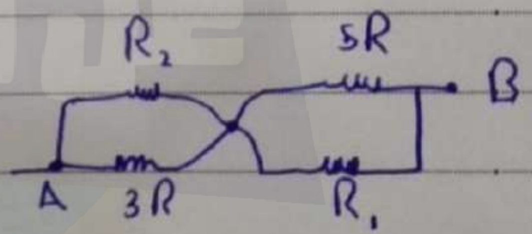
② $3R + 3R = 6R = R_2$



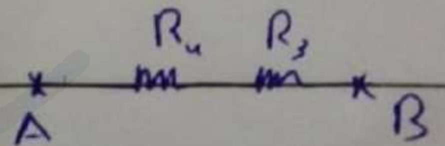

$(R_1, 5R)$ $(R_2, 3R)$ (Parallel)

① $\frac{10R * 5R}{10R + 5R} = \frac{50R^2}{15R} = 3.33R = R_3$

② $\frac{6R * 3R}{6R + 3R} = \frac{18R^2}{9R} = 2R = R_4$




$(R_3, R_4)$ (series)

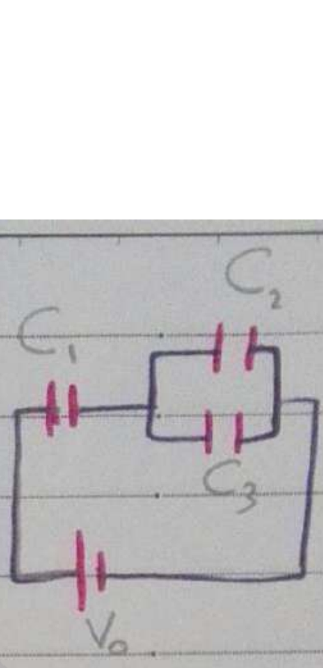



$3.33R + 2R = 5.33R \Rightarrow 5.33 * 9 = 48$

ⓓ

$C_1 = 20\,\mu f \quad C_2 = 10\,\mu f \quad C_3 = 30\,\mu f$

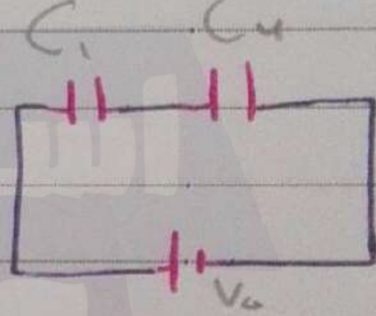
$V_0 = 36V$




$(C_2 , C_3)$ (Parallel)

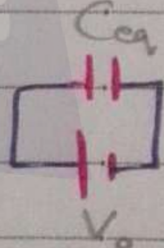
$(10 + 30) * 10^{-6} = \boxed{40 * 10^{-6} f = C_4}$

$(C_1 , C_4)$ (series)




$$\frac{40*10^{-6} * 20*10^{-6}}{(40+20)*10^{-6}} = \frac{800}{60} * 10^{-6}$$

$$= \boxed{\frac{40}{3}\,\mu f = C_{eq}}$$



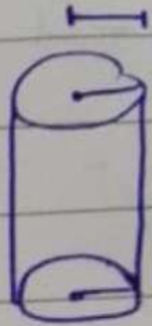

$I_{tot} = C * V \Rightarrow I_{tot} = \frac{40}{3} * 10^{-6} * 36 =$

$\Rightarrow I_{tot} = \boxed{480\,\mu A}$

$\boxed{I_{inc} = ,48\ mC}$ e

(5)

$\rho = 5.6 \times 10^{-8}$




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

$R = \frac{5.6 \times 10^{-8} \times 20}{\pi \times (.5 \times 10^{-3})^2}$

$R = 1.426$

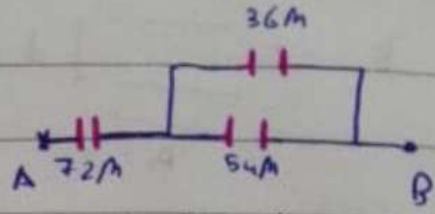
$R = \frac{V}{I} \Rightarrow I = \frac{7}{1.426} = 4.9$

$\boxed{I = 4.9}$ (d)

6

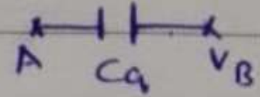
(36, 54) ( Parallel )

$36 + 54 = \boxed{90\ \mu f} = C$




( C , 72) ( series )

$$\frac{90 \times 10^{-6} \times 72 \times 10^{-6}}{(90 + 72) \times 10^{-6}} = \boxed{40 \times 10^{-6}} = C_q$$




$$C = \frac{q}{\Delta V} \Rightarrow q_{tot} = 40 \times 10^{-6} \times 60 \Rightarrow \boxed{q_{tot} = 24 \times 10^{-4}}$$

V in C, :-

$$V = \frac{24 \times 10^{-4}}{90 \times 10^{-6}} = \frac{4}{15} \times 100 = \boxed{\frac{80}{3}\ V}$$

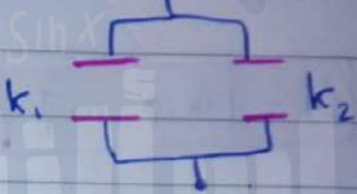
$V \text{ in } (54\ \mu f) = \frac{80}{3}$

$$\text{energy} = \frac{CV^2}{2} \Rightarrow U = \frac{54 \times 10^{-6} \times \left(\frac{80}{3}\right)^2}{2}$$

$\boxed{U = 19.2\ mJ}$

التوصيل على التوازي :-

$\epsilon_0 = 8.85 * 10^{-12}$




$$C_{eq} = \frac{k_1 * A * \epsilon_0}{d} + \frac{k_2 * A * \epsilon_0}{d}$$

$$C_{eq} = (k_1 + k_2) \frac{A * \epsilon_0}{d}$$

$k_1 = 2 \quad A = 50\,cm^2 \quad d = 1\,mm$

$k_2 = 5.5 \quad A = 50\,cm^2 \quad d = 1\,mm$

$$= (2 + 5.5) * \frac{50 * 10^{-4} * 8.85 * 10^{-12}}{1 * 10^{-3}}$$

$$= \frac{7.5 * 50 * 10^{-4} * 8.85 * 10^{-12}}{1 * 10^{-3}} = 331.875 * 10^{-12} \cong 332\, pf$$

$$v(t) = \varepsilon(1 - e^{-\frac{t}{\tau}})$$

$$.85\,\varepsilon = \varepsilon\,(1 - e^{-\frac{t}{\tau}})$$

$$.85 - 1 = e^{-\frac{t}{\tau}}$$

$$+0.15 = +e^{-\frac{t}{\tau}}$$

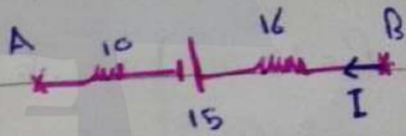
$$\ln 0.15 = \ln e^{-\frac{t}{\tau}}$$

$$-1.9 = -\frac{3.2}{\tau}$$

$$\tau = \frac{3.2}{1.9} = \boxed{1.69}$$ (d)

Q2a

$$V_A + 10I + 15 + 16I = V_B$$




$I = 2A$

$$V_B - V_A = +67$$

(b)

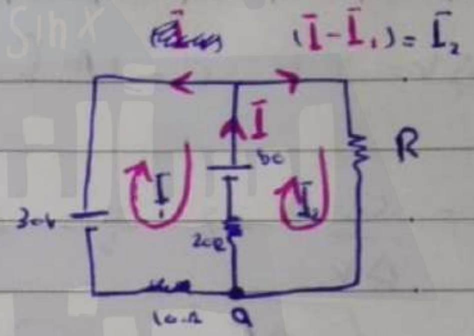
10

$I = 2$

1:- $V_a + 10 I_1 + 30 - 50 + 20 I = V_a$

$10 I_1 - 20 + 40 = 0$

$I_1 = \frac{-20}{10} = -2$




$V_a - 20 I + 50 - R(I - I_1) = V_a$

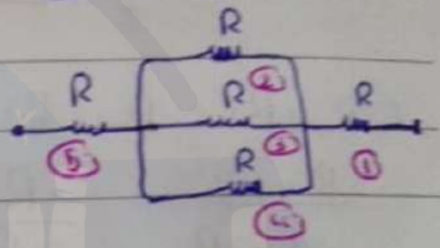
$-40 + 50 - R(4) = 0$

$4R = 10 \Rightarrow R = \frac{10}{4}$

$R = 2.5$

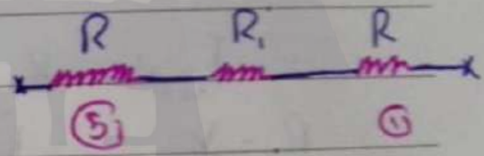
$V_B - V_A = +67$ (b) $I = 2A$

(2, 3, 4) (Parallel)




$$\frac{1}{R} + \frac{1}{R} + \frac{1}{R} = \frac{1}{R_1}$$

$$\frac{3}{R} = \frac{1}{R_1} \Rightarrow R_1 = \frac{R}{3}$$




(1, $R_1$, 5) (series)

$$R + R_1 + R \Rightarrow R + \frac{R}{3} + R =$$

$$= 2R + \frac{R}{3} = \frac{7}{3}R =$$

$$\Rightarrow \frac{7}{3} \times 18 = 42$$ (c)

(12)

Pr12 $V = 40\,V$ $R = 10\,\Omega$ $I = ???$

$R = \frac{V}{I} \Rightarrow I = \frac{40}{10} = 4\,A$

$I = 4\,A$ (d)

$$V = \varepsilon\left(1 - e^{\frac{-t}{RC}}\right)$$

$$\Rightarrow \overset{1}{\cancel{8}} = \overset{3}{\cancel{24}}\left(1 - e^{\frac{-t}{RC}}\right)$$

$$\frac{1}{3} - 1 = -e^{\frac{-t}{RC}}$$

$$\frac{2}{3} = e^{\frac{-t}{RC}}$$

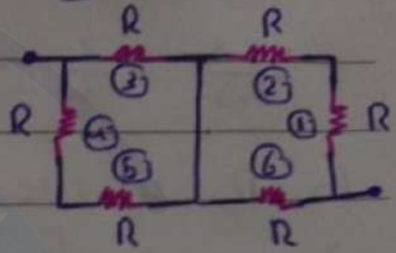
$$-0.4055 = \frac{-t}{55 \times 10^{-6}}$$

$$\boxed{t = 22\ \mu s}$$

(1) (2)
(1,2) (4,5) (series)

① $R + R = 2R = R_1$

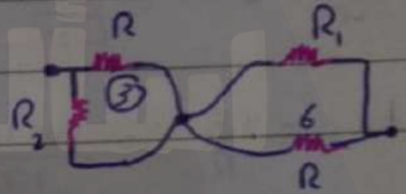
② $R + R = 2R = R_2$




(1) (2)
$(R_1, 6)$ $(3, R_2)$ (Parallel)

① $\frac{2R * R}{2R + R} = \frac{2R^2}{3R} = \frac{2}{3}R = R_3$

② $\frac{2R * R}{2R + R} = \frac{2}{3}R = R_4$




$(R_3, R_4)$ (~~Parallel~~ series)

$\frac{2}{3}R + \frac{2}{3}R = \frac{4}{3}R \Rightarrow \frac{4}{3} * 12 = 16$

energy = U

$$U = \frac{CV^2}{2}$$

$$U_1 = \frac{12*10^{-6} * 9}{2} = 54*10^{-6}\ J$$

$$U_2 = \frac{C_{New} V^2}{2}$$

$$C_{New} = C\ k$$

$$C_{New} = 12*10^{-6} * 6 = 72*10^{-6}\ f$$

$$U_2 = \frac{72*10^{-6} * 9}{2} = 324*10^{-6}\ J$$

$$\Delta U = U_2 - U_1$$

$$\Delta U = 324*10^{-6} - 54*10^{-6} = 270*10^{-6}\ J$$

$$\Delta U = 2.7*10^{-4}\ J$$

10

$V = 4\,V \quad \varepsilon = 10\,V \quad C = 10\,\mu F \quad t = 3\,s$

$$v(t) = \varepsilon\left(1 - e^{-\frac{t}{RC}}\right)$$

$$4 = 10\left(1 - e^{\frac{-3}{R*10*10^{-6}}}\right)$$

$$\frac{4}{10} - 1 = -e^{\left(\frac{-3}{R\,10*10^{-6}}\right)}$$

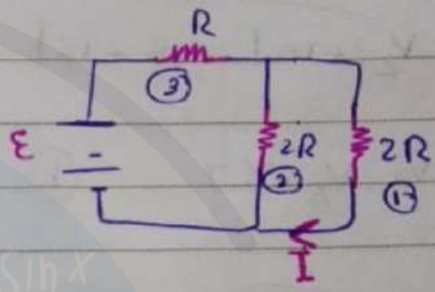
$$\ln(+0.6) = \ln\left(+e^{\left(\frac{-3}{R*10*10^{-6}}\right)}\right)$$

$$-0.510826 = \frac{-3}{R*10*10^{-6}}$$

$$\boxed{R = 587\,\Omega}$$

$R = 12 \quad I = .5$

1. نحسب الجهد عند المقاومة (1) :-

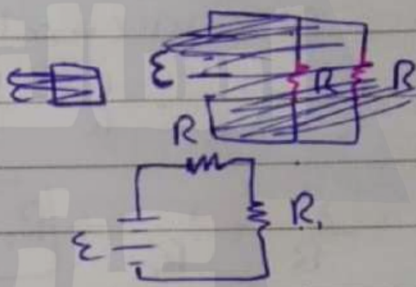



$2R = \frac{V}{I} \Rightarrow V = 2R * I$

$V = 2 * 12 * \frac{1}{2} = \boxed{12\,V}$

(2R, 2R) (Parallel)

$\frac{2R * 2R}{2R + 2R} = \frac{4R^2}{4R} = \boxed{R} = R_1$




2. من جهد $R_1$ بنطلع $I_{tot}$ :-

$R_1 = \frac{V}{I_{tot}} \Rightarrow I_{tot} = \frac{12}{R} = \frac{12}{12} = \boxed{1A}$

$(R_1 , R)$ (series)

$R + R = 2R$

$\varepsilon = 2R * I_{tot} = 2R = \textcircled{24}$

energy = U

1. اصل الطاقة

$$U_{old} = \frac{Q^2}{2C}$$

$Q = C\,V = 12 * 10^{-6} * 50$

$Q_{max} = 600 * 10^{-6}\ C$

$$U = \frac{(600 * 10^{-6})^2}{2 * 12 * 10^{-6}} = \boxed{15 * 10^{-3}\ J}$$

2. نص الطاقة

$U_{New} = 7.5 * 10^{-3}$

$$U = \frac{Q^2}{2C}$$

$$\Rightarrow \frac{7.5 * 10^{-3}}{1} \times \frac{Q^2}{2 * 12 * 10^{-6}}$$

$Q = \sqrt{180 * 10^{-9}} \Rightarrow Q = 424.2641 * 10^{-6}$

$$Q(t) = Q_{max}\, e^{\frac{-t}{RC}}$$

$$424.2641 * 10^{-6} = 600 * 10^{-6} * e^{\frac{-t}{RC}}$$

$$\ln .70711 = \ln e^{\frac{-t}{RC}}$$

$$+0.34657 = \frac{+t}{225 * 12 * 10^{-6}}$$

$t = 935.75 * 10^{-6}$

$\boxed{t = 0.936\ ms}$

$A = 4 * 10^{-6}\ m^2$ $\quad I = 5\ A$ $\quad q = 1.6 * 10^{-19}\ C$ $\quad N = 6 * 10^{28}$

$I = N * |q| * V_d * A$

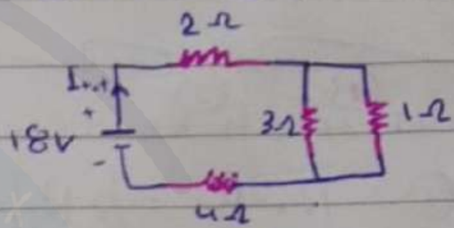
$5 = 6 * 10^{28} * 1.6 * 10^{-19} * V_d * 4 * 10^{-6}$

$5 = 38.4 * 10^{3}\ V_d$

$V_d = 1.3 * 10^{-4}$

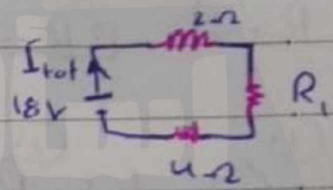
(1, 3) Ω (Parallel)

$\frac{1 \times 3}{1+3} = \frac{3}{4}\ \Omega = R_1$




(2, $R_1$, 4) (series)

$\frac{3}{4} + 2 + 4 = \boxed{\frac{27}{4} = R_Q}$




$I_{tot} = \frac{18}{R_Q} = \frac{4 \times 18}{27} = \frac{8}{3}\ A$

$V \text{ in } R_1 \Rightarrow V = I_{tot} * R_1 = \frac{8}{3} \times \frac{3}{4} = \boxed{2V} = V \text{ in } (1\Omega)$

$I \text{ in } (1\Omega) \Rightarrow I = \frac{2}{1} = 2A$