Problems of Electric circuits

1) A charge of 920 C was passed through a wire in 5 minutes. Calculate the average electric current during that interval.
Answer: 3.07 A.

2) How long does it take for 2320 C to pass a given point in a wire that carries an electric current of 3.7 A?
Answer: 627 s.

3) Find the resistance of a resistor through which 2520 C flow in 21 minutes if the potential difference across it is 8 V.
Answer: 4 Ω.

4) Find the electric resistance of an aluminium rod 38 m long, if its cross–sectional area is 0.3 mm^2 and its resistivity is 2.82×10^{-8} Ω·m.
Answer: 3.57 Ω.

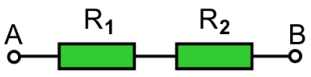
5) Calculate the resistivity of a wire 26 m long, if its cross–sectional area is 2.4 mm^2 and its electric resistance is 1.26 Ω.
Answer: 1.16×10^{-7} Ω·m.

6) Calculate the electric resistance of a silver wire 1.4 mm in diameter and 48 m long if its resistivity is 1.57×10^{-8} Ω·m.
Answer: 0.488 Ω.

7) A battery with an emf (electromotive force) of 8 V delivers 110 mA to a 72 Ω load.
a) What is the internal resistance of the battery?
b) What is its terminal potential difference when joined to this load?
Answer: **a)** 0.7 Ω, **b)** 7.923 V.

8) A 47 μF capacitor is charged to a potential difference of 52 V. Find the charge on the capacitor.
Answer: 2.444 mC.

9) For the circuit shown below, the resistors are R_1 = 22 Ω and R_2 = 26 Ω. The circuit applied voltage is $V_A - V_B$ = 18 V. Find:
a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.

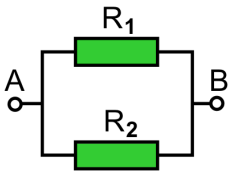


Answer: **a)** 48 Ω, **b)** 0.375 A, **c)** 9.75 V.

Problems of Electric circuits

10) For the circuit shown below, the resistors are $R_1 = 27\ \Omega$ and $R_2 = 25\ \Omega$. The circuit applied voltage is $V_A - V_B = 18$ V. Find:

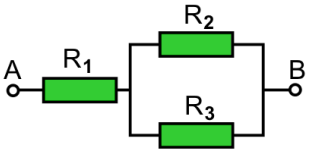
a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.



Answer: **a)** 12.98 Ω, **b)** 0.72 A, **c)** 18 V.

11) For the circuit shown below, the resistors are $R_1 = 19\ \Omega$, $R_2 = 16\ \Omega$ and $R_3 = 29\ \Omega$. The circuit applied voltage is $V_A - V_B = 45$ V. Find:

a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.



Answer: **a)** 29.31 Ω, **b)** 0.9894 A, **c)** 15.83 V.

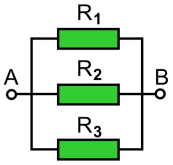
12) For the circuit shown below, the resistors are $R_1 = 2\ \Omega$, $R_2 = 18\ \Omega$ and $R_3 = 9\ \Omega$. The circuit applied voltage is $V_A - V_B = 29$ V. Find:

a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.

Answer: **a)** 29 Ω, **b)** 1 A, **c)** 18 V.

13) For the circuit shown below, the resistors are $R_1 = 17\ \Omega$, $R_2 = 7\ \Omega$ and $R_3 = 13\ \Omega$. The circuit applied voltage is $V_A - V_B = 27$ V. Find:

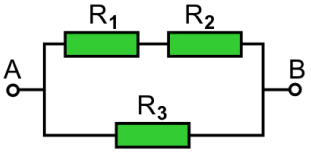
a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.



Answer: **a)** 3.589 Ω, **b)** 3.857 A, **c)** 27 V.

14) For the circuit shown below, the resistors are $R_1 = 6\ \Omega$, $R_2 = 11\ \Omega$ and $R_3 = 11\ \Omega$. The circuit applied voltage is $V_A - V_B = 39$ V. Find:

a) The circuit's total resistance.
b) Current flowing through resistor R_2.
c) The voltage across R_2.



Answer: **a)** 6.679 Ω, **b)** 2.294 A, **c)** 25.24 V.

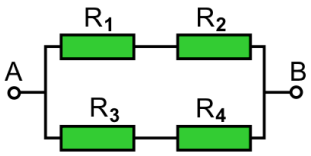
Problems of Electric circuits

15) For the circuit shown below, the resistors are $R_1 = 14\ \Omega$, $R_2 = 25\ \Omega$, $R_3 = 24\ \Omega$ and $R_4 = 8\ \Omega$. The circuit applied voltage is $V_A - V_B = 9$ V. Find:

a) The circuit's total resistance.

b) Current flowing through resistor R_2.

c) The voltage across R_2.



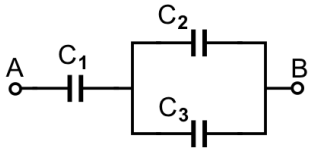
Answer: **a)** 17.58 Ω, **b)** 0.2308 A, **c)** 5.769 V.

16) For the circuit shown below the capacitances are $C_1 = 19\ \mu$F, $C_2 = 5\ \mu$F and $C_3 = 16\ \mu$F. The circuit applied voltage is $V_A - V_B = 11$ V. Find:

a) Circuit's equivalent capacitance.

b) Charge stored on capacitor C_2.

c) Potential difference across C_2.



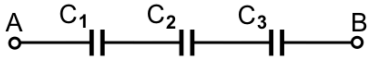
Answer: **a)** 9.975 µF, **b)** 26.13 µC, **c)** 5.225 V.

17) For the circuit shown below the capacitances are $C_1 = 4\ \mu$F, $C_2 = 11\ \mu$F and $C_3 = 7\ \mu$F. The circuit applied voltage is $V_A - V_B = 16$ V. Find:

a) Circuit's equivalent capacitance.

b) Charge stored on capacitor C_2.

c) Potential difference across C_2.



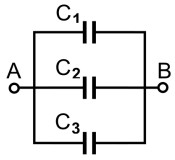
Answer: **a)** 2.067 µF, **b)** 33.07 µC, **c)** 3.007 V.

18) For the circuit shown below the capacitances are $C_1 = 9\ \mu$F, $C_2 = 27\ \mu$F and $C_3 = 11\ \mu$F. The circuit applied voltage is $V_A - V_B = 24$ V. Find:

a) Circuit's equivalent capacitance.

b) Charge stored on capacitor C_2.

c) Potential difference across C_2.



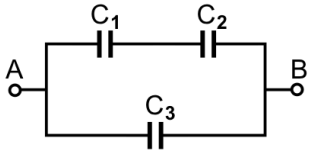
Answer: **a)** 47 µF, **b)** 648 µC, **c)** 24 V.

19) For the circuit shown below the capacitances are $C_1 = 28\ \mu$F, $C_2 = 7\ \mu$F and $C_3 = 20\ \mu$F. The circuit applied voltage is $V_A - V_B = 14$ V. Find:

a) Circuit's equivalent capacitance.

b) Charge stored on capacitor C_2.

c) Potential difference across C_2.

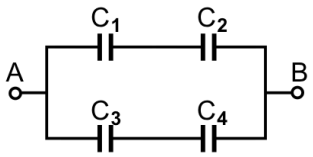


Answer: **a)** 25.6 µF, **b)** 78.4 µC, **c)** 11.2 V.

Problems of Electric circuits

20) For the circuit shown below the capacitances are C_1 = 11 µF, C_2 = 26 µF, C_3 = 15 µF and C_4 = 25 µF. The circuit applied voltage is $V_A - V_B$ = 5 V. Find:

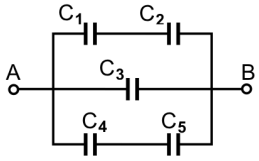
a) Circuit's equivalent capacitance.
b) Charge stored on capacitor C_2.
c) Potential difference across C_2.



Answer: **a)** 17.1 µF, **b)** 38.65 µC, **c)** 1.486 V.

21) For the circuit shown below the capacitances are C_1 = 22 µF, C_2 = 16 µF, C_3 = 10 µF, C_4 = 19 µF and C_5 = 2 µF. The circuit applied voltage is $V_A - V_B$ = 45 V. Find:

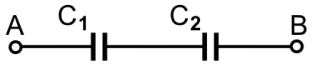
a) Circuit's equivalent capacitance.
b) Charge stored on capacitor C_2.
c) Potential difference across C_2.



Answer: **a)** 21.07 µF, **b)** 416.8 µC, **c)** 26.05 V.

22) For the circuit shown below the capacitances are C_1 = 16 µF and C_2 = 18 µF. The circuit applied voltage is $V_A - V_B$ = 38 V. Find:

a) Circuit's equivalent capacitance.
b) Charge stored on capacitor C_2.
c) Potential difference across C_2.



Answer: **a)** 8.471 µF, **b)** 321.9 µC, **c)** 17.88 V.

23) A light bulb has an operating potential difference of 40 V and draws a current of 5 A. Calculate its power rating and its resistance.
Answer: 200 W, 8 Ω.

24) How much does it cost to operate a 17 W light bulb for 16 days if electrical energy costs 0.112 $ per kW·h?
Answer: 0.73 $.

25) A 73 W lamp is operated for 15 hours a day. How much energy does it take to operate the lamp for 27 days? Express your answer in joules and kilowatt–hours.
Answer: 1.064×10^8 J, 29.57 kW·h.

26) A resistor is rated at 870 W and its electrical resistance is 1040 Ω.
a) What is the maximum voltage that can be applied across the resistor?
b) What is the current at this voltage?
Answer: **a)** 951.2 V, **b)** 914.6 mA.

Problems of Electric circuits

27) Three resistors, 45 Ω, 57 Ω, and 68 Ω, are connected in series across a battery that provides 24 V.
a) Calculate the voltage across each resistor.
b) Calculate the power dissipated in each resistor.
Answer: **a)** 6.35 V, 8.05 V, 9.6 V, **b)** 0.897 W, 1.14 W, 1.36 W.

28) Two resistors, 23 Ω and 30 Ω, are connected in parallel. If the current through the 23 Ω resistor is 4 A, find:
a) The current in the other resistor.
b) The total power consumed by the two resistors.
Answer: **a)** 3.07 A, **b)** 650 W.

29) Find the electric potential drop across a 92 W resistor that draws a current of 250 mA.
Answer: 368 V.

30) A 55 W electric lamp draws a current of 4.1 A. Find the voltage applied and the resistance of the lamp.
Answer: 13.4 V, 3.27 Ω.

31) An 196 nF capacitor is charged with 153.9 µC. Find the voltage and the energy stored.
Answer: 785 V, 60.39 mJ.

32) A capacitor is connected across a 750 V supply. If the energy stored is 29.53 J, find:
a) The capacitance of the capacitor.
b) The charge on the capacitor.
Answer: **a)** 105 µF, **b)** 78.75 mC.

33) **a)** Calculate the energy stored in an 130 µF capacitor when charged to 460 V.
b) Find also the charge on the capacitor.
Answer: **a)** 13.75 J, **b)** 59.8 mC.

34) A 476 nF capacitor is required to store 106.8 mJ of energy. Find:
a) Potential difference to which the capacitor must be charged.
b) The charge on the capacitor.
Answer: **a)** 670 V, **b)** 318.9 µC.