

AP Physics 2 Algebra Based : Unit - 4 - Electric Circuits Practice Test

Question 1

Professor Sharon rubbed two balloons with a piece of wool. What will happen when the balloons are brought near each other?

- A. The balloons will attract each other
- B. The balloons will pop
- C. The balloons will repel each other
- D. The balloons will become positive (+) charged

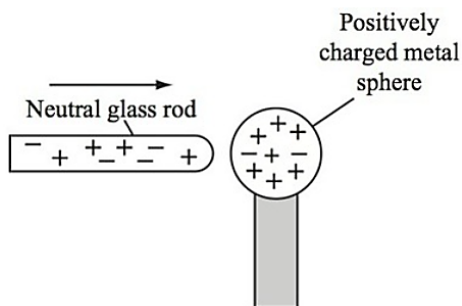
Question 2

You create a cylinder of an unknown material that has a diameter of 2cm, and a height of 1cm. You attach the electrodes to the faces of the cylinder and find the sample has a resistance of 25Ω . What is the resistivity of the material?

- A. $35\ \Omega\cdot\text{cm}$
- B. $78.5\ \Omega\cdot\text{cm}$
- C. $51.3\ \Omega\cdot\text{cm}$
- D. $69.5\ \Omega\cdot\text{cm}$

Question 3

The figure shows a neutral glass rod and a positively charged metal sphere.



Which of the following best describes the movement of charges as this glass rod touches the sphere?

- A. Protons move from the sphere to the glass rod
- B. Electrons move from the sphere to the glass rod
- C. Protons move from the glass rod to the sphere
- D. Electrons move from the glass rod to the sphere

Question 4

You have 3 capacitors in series. Their capacitances are $4\mu\text{F}$, $3\mu\text{F}$, and $2\mu\text{F}$. What is the total capacitance of the system?

- A. $\frac{1}{9}\ \mu\text{F}$
- B. $9\ \mu\text{F}$
- C. $\frac{2}{13}\ \mu\text{F}$

D. $\frac{12}{13} \mu\text{F}$

Question 5

A cloth has a positive charge and can attract some paper scraps when held near them, what kind of charge can the paper scraps NOT have?

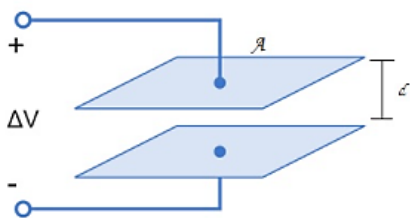
- A. Positive
- B. Negative
- C. Atomic
- D. Neutral

Question 6

In this parallel-plate capacitor, the distance d between the plates is 3cm, the area of each plate is 15cm^2 , and the voltage across them is 5V. Calculate the capacitance.

Use:

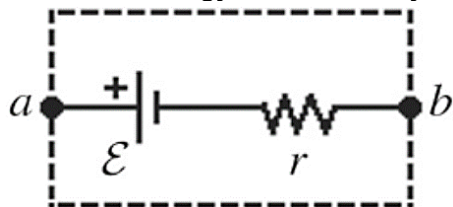
$$\epsilon_0 = 8.854 \cdot 10^{-12} \frac{\text{C}^2}{\text{N} \cdot \text{m}^2}$$



- A. $1.29 \times 10^{-12} \text{ F}$
- B. $3.36 \times 10^{-10} \text{ F}$
- C. $4.43 \times 10^{-13} \text{ F}$
- D. $2.24 \times 10^{-11} \text{ F}$

Question 7

A battery has an emf $\epsilon = 12 \text{ V}$ and an internal resistance $r = 2.0 \Omega$, as shown in the figure below. When a $3.0\text{-}\Omega$ cable is connected across the battery terminals a and b , the rate at which chemical energy in the battery is depleted is closest to?



- A. 34 W
- B. 29 W
- C. 45 W
- D. 20 W

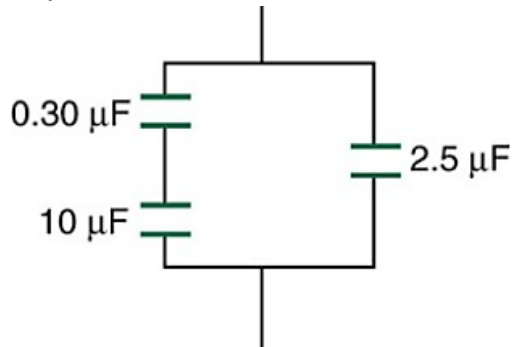
Question 8

The length of a certain conductor of resistance 100 is doubled and its cross-sectional area is halved. Its new resistance is

- A. 400
- B. 200
- C. 100
- D. 50

Question 9

Find the total capacitance of the combination of capacitors shown in the figure below.



- A. $2.79\ \mu\text{F}$
- B. $3.18\ \mu\text{F}$
- C. $13\ \mu\text{F}$
- D. $0.263\ \mu\text{F}$

Question 10

A battery with an emf of 15 V and an internal resistance of 3 ohms is connected to a circuit with a resistor be varied from ohms to 6 ohms. If the resistor is increased from 3 ohms to 6 ohms, what happens the terminal voltage across the battery as the resistor increases?

- A. The terminal voltage decreases
- B. The terminal voltage remains the same
- C. The terminal voltage increases
- D. The terminal voltage becomes zero

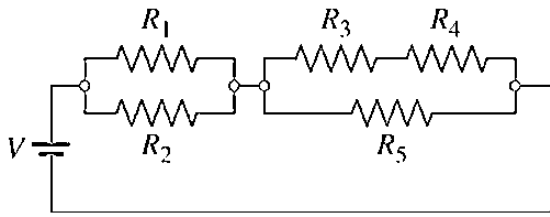
Question 11

Suppose a circuit consists of a battery connected to four resistors, all of which are connected in parallel. If a fifth resistor is added in parallel to this circuit, how will the current in the other four resistors change?

- A. The current through the four resistors will halve
- B. The current through the four resistors will double
- C. There is not enough information given to answer the question
- D. There will be no change in the current through the four resistors

Question 12

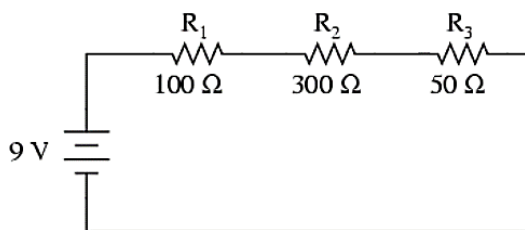
Which resistor has the greatest current going through it? Assume that all the resistors are equal.



- A. R1
- B. R5
- C. R3 and R4
- D. R1 and R2

Question 13

The equivalent resistance in this circuit is



- A. 400 Ω
- B. 450 Ω
- C. 300 Ω
- D. 350 Ω

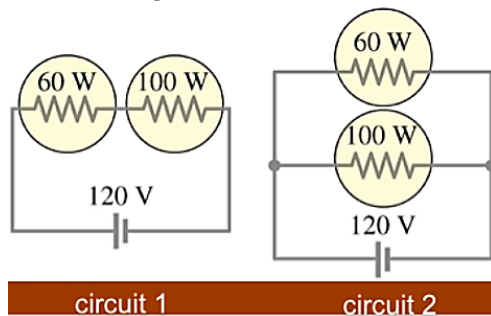
Question 14

A 130 mF capacitor and a 150 mF capacitor are each connected across a 6 V dc source. The voltage across the 330 pF capacitor is?

- A. 2 V
- B. 4 V
- C. 6 V
- D. 8 V

Question 15

The light bulbs in the circuit below are identical with the same resistance R . Which circuit produces more light?

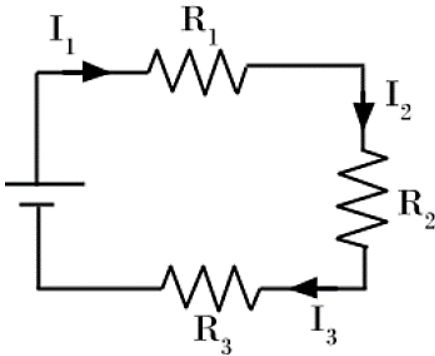


- A. It depends on R
- B. Circuit 1

- C. Both the same
- D. Circuit 2

Question 16

For the circuit shown, the resistances are $R_1 > R_2 > R_3$. What is true about the current through each resistor?



- A. $I_1 < I_2 < I_3$
- B. $I_1 > I_2 > I_3$
- C. $I_1 = I_2 = I_3$
- D. $I_1 > I_3 > I_2$

Question 17

Analysis of a circuit produces two loop equations:

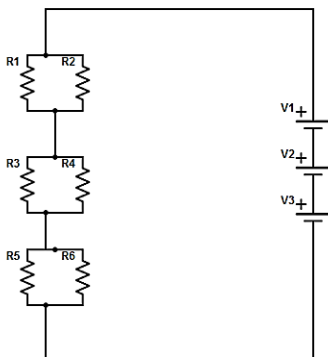
$$10x + 30y = 7 \text{ and } 40x - 20y = 0$$

What are the currents x and y ?

- A. $X = 50$; $Y = 10$
- B. $X = 1.5$; $Y = 2.16$
- C. $X = 0.2$; $Y = 0.1$
- D. $X = 2$; $Y = 1$

Question 18

Determine the current through R_2 .



Given:

$$R_1 = R_4 = 1\Omega$$

$$R_2 = R_5 = 2\Omega$$

$$R_3 = R_6 = 3\Omega$$

$$V_1 = V_2 = V_3 = 3V$$

- A. 1.14 A
- B. 2.28 A
- C. 3.35 A
- D. 4.63 A

Question 19

Kirchhoff's junction rule is a statement of _____

- A. The Law of Conservation of Momentum
- B. The Law of Conservation of Charge
- C. The First Law of Motion
- D. The Law of Conservation of Energy

Answer Key

1. C
2. B
3. D
4. D
5. A
6. C
7. B
8. A
9. A
10. C
11. D
12. B
13. B
14. C
15. D
16. C
17. C
18. A
19. B