

Ohm's Law MCQs with Answers

KSEB Sub Engineer Exam | 30 Questions | Electrical Engineering | Prepared by Entri

Quick formulas to remember

$$V = I \times R \quad | \quad R = \rho \times l / A \quad | \quad G = 1 / R \quad | \quad P = V \times I = I^2 R = V^2 / R$$

$$R_2 = R_1 [1 + \alpha (t_2 - t_1)] \quad | \quad \text{Series: } R = R_1 + R_2 \quad | \quad \text{Parallel (two): } R = R_1 R_2 / (R_1 + R_2) \quad | \quad I = E / (R + r)$$

Instructions: Choose the correct option for each question. Attempt all 30 questions first, then check the answer key and explanations at the end. Try to finish within 20 minutes.

Section A: Questions

Q1. Ohm's law was proposed by:

- (a) Alessandro Volta
- (b) Georg Simon Ohm
- (c) Michael Faraday
- (d) Andre-Marie Ampere

Q2. At constant temperature, the current through a conductor is _____ the potential difference across it.

- (a) inversely proportional to
- (b) independent of
- (c) directly proportional to
- (d) proportional to the square of

Q3. The SI unit of electrical resistance is:

- (a) ohm
- (b) siemens
- (c) henry
- (d) farad

Q4. The SI unit of conductance is:

- (a) ohm
- (b) henry
- (c) siemens
- (d) weber

Q5. Which of the following is a non-ohmic device?

- (a) Copper wire
- (b) Nichrome wire
- (c) Constantan wire
- (d) Semiconductor diode

Q6. The V-I graph of an ohmic conductor is:

- (a) a parabola
- (b) a straight line through the origin
- (c) a hyperbola
- (d) a circle

Q7. In a V-I graph (V on the y-axis and I on the x-axis) of an ohmic conductor, the slope represents:

- (a) conductance
- (b) power
- (c) reactance
- (d) resistance

Q8. Ohm's law is NOT applicable to:

- (a) Manganin wire
- (b) Electric arc
- (c) Copper wire
- (d) Nichrome wire

Q9. The current through a $10\ \Omega$ resistor connected across 20 V is:

- (a) 2 A
- (b) 0.5 A
- (c) 1 A
- (d) 200 A

Q10. The voltage across a $5\ \Omega$ resistor carrying 3 A is:

- (a) 2 V
- (b) 8 V
- (c) 0.6 V
- (d) 15 V

Q11. A current of 4 A flows when 12 V is applied across a resistor. The resistance is:

- (a) 48 Ω
- (b) 8 Ω
- (c) 0.33 Ω
- (d) 3 Ω

Q12. If the voltage across a fixed resistor is doubled, the current becomes:

- (a) half
- (b) the same
- (c) double
- (d) four times

Q13. The conductance of a $4\ \Omega$ resistor is:

- (a) 4 S
- (b) 0.25 S
- (c) 16 S
- (d) 0.4 S

Q14. A conductor carries 0.5 A when 2 V is applied. The current when 6 V is applied is:

- (a) 3 A
- (b) 1.5 A
- (c) 0.17 A
- (d) 12 A

Q15. The SI unit of resistivity is:

- (a) ohm-metre
- (b) ohm per metre
- (c) siemens
- (d) volt per metre

Q16. A wire has a resistance of $8\ \Omega$. If its length is doubled (same area and material), the resistance becomes:

- (a) $4\ \Omega$
- (b) $8\ \Omega$
- (c) $16\ \Omega$
- (d) $32\ \Omega$

Q17. If the diameter of a wire is doubled (same length and material), its resistance becomes:

- (a) one-fourth
- (b) half
- (c) double
- (d) four times

Q18. A wire is stretched to double its length (volume remains constant). Its resistance becomes:

- (a) 2 times
- (b) 4 times
- (c) half
- (d) unchanged

Q19. When the temperature of a metallic conductor increases, its resistance:

- (a) decreases
- (b) remains constant
- (c) increases
- (d) becomes zero

Q20. When the temperature of a semiconductor increases, its resistance generally:

- (a) increases
- (b) decreases
- (c) remains constant
- (d) becomes infinite

Q21. A resistor has $10\ \Omega$ at $20\ ^\circ\text{C}$ and a temperature coefficient of 0.004 per $^\circ\text{C}$ at $20\ ^\circ\text{C}$. Its resistance at $70\ ^\circ\text{C}$ is:

- (a) $12\ \Omega$
- (b) $10\ \Omega$
- (c) $14\ \Omega$
- (d) $20\ \Omega$

Q22. Resistors of $6\ \Omega$ and $3\ \Omega$ are connected in series across an $18\ \text{V}$ supply. The current is:

- (a) $1\ \text{A}$
- (b) $2\ \text{A}$
- (c) $3\ \text{A}$
- (d) $6\ \text{A}$

Q23. In the same series circuit ($6\ \Omega$ and $3\ \Omega$ across 18 V), the voltage across the $6\ \Omega$ resistor is:

- (a) 6 V
- (b) 9 V
- (c) 12 V
- (d) 18 V

Q24. The effective resistance of $6\ \Omega$ and $3\ \Omega$ connected in parallel is:

- (a) $4.5\ \Omega$
- (b) $9\ \Omega$
- (c) $18\ \Omega$
- (d) $2\ \Omega$

Q25. A 12 V source is connected across $4\ \Omega$ and $6\ \Omega$ resistors in parallel. The current in the $4\ \Omega$ branch is:

- (a) 2 A
- (b) 3 A
- (c) 1.2 A
- (d) 5 A

Q26. The power dissipated in a $10\ \Omega$ resistor carrying 2 A is:

- (a) 20 W
- (b) 5 W
- (c) 40 W
- (d) 80 W

Q27. A lamp is rated 100 W , 200 V . Its resistance when working at rated values is:

- (a) $0.5\ \Omega$
- (b) $200\ \Omega$
- (c) $2\ \Omega$
- (d) $400\ \Omega$

Q28. A battery of EMF 12 V and internal resistance $1\ \Omega$ is connected to a $5\ \Omega$ external resistor. The current is:

- (a) 2.4 A
- (b) 2 A
- (c) 12 A
- (d) 1 A

Q29. For the same battery and load (12 V , internal resistance $1\ \Omega$, external $5\ \Omega$), the terminal voltage is:

- (a) 2 V
- (b) 12 V
- (c) 10 V
- (d) 6 V

Q30. Ohm's law in its vector (point) form, where $\mathbf{J}$ is current density, $\mathbf{E}$ is electric field and σ is conductivity, is:

- (a) $\mathbf{J} = \sigma\mathbf{E}$
- (b) $\mathbf{J} = \mathbf{E}/\sigma$
- (c) $\mathbf{J} = \sigma/\mathbf{E}$
- (d) $\mathbf{J} = \sigma\mathbf{E}^2$

Section B: Answer Key

1 - (b)	2 - (c)	3 - (a)	4 - (c)	5 - (d)
6 - (b)	7 - (d)	8 - (b)	9 - (a)	10 - (d)
11 - (d)	12 - (c)	13 - (b)	14 - (b)	15 - (a)
16 - (c)	17 - (a)	18 - (b)	19 - (c)	20 - (b)
21 - (a)	22 - (b)	23 - (c)	24 - (d)	25 - (b)
26 - (c)	27 - (d)	28 - (b)	29 - (c)	30 - (a)

Section C: Answers with Explanations

Q1. Answer: (b) Georg Simon Ohm

Ohm's law is named after the German physicist Georg Simon Ohm.

Q2. Answer: (c) directly proportional to

Ohm's law: $V = I \times R$, so I is directly proportional to V when R is constant.

Q3. Answer: (a) ohm

Resistance is measured in ohms. Siemens is the unit of conductance.

Q4. Answer: (c) siemens

Conductance $G = 1/R$ and its unit is the siemens (S), earlier called mho.

Q5. Answer: (d) Semiconductor diode

A diode does not have a constant V/I ratio, so its $V-I$ curve is non-linear.

Q6. Answer: (b) a straight line through the origin

For an ohmic conductor, V is proportional to I , giving a straight line through the origin.

Q7. Answer: (d) resistance

Slope = $V / I = R$.

Q8. Answer: (b) Electric arc

An electric arc is a non-linear conductor, so V is not proportional to I .

Q9. Answer: (a) 2 A

$I = V / R = 20 / 10 = 2 \text{ A}$.

Q10. Answer: (d) 15 V

$V = I \times R = 3 \times 5 = 15 \text{ V}$.

Q11. Answer: (d) 3 Ω

$R = V / I = 12 / 4 = 3 \Omega$.

Q12. Answer: (c) double

$I = V / R$. With R fixed, doubling V doubles I .

Q13. Answer: (b) 0.25 S

$G = 1 / R = 1 / 4 = 0.25 \text{ S}$.

Q14. Answer: (b) 1.5 A

$R = 2 / 0.5 = 4 \Omega$. At 6 V, $I = 6 / 4 = 1.5 \text{ A}$. (Current triples when voltage triples.)

Q15. Answer: (a) ohm-metre

$R = \rho \times l / A$, so $\rho = R \times A / l$, which has the unit ohm $\times$ m squared / m = ohm-metre.

Q16. Answer: (c) 16 Ω

R is proportional to length, so $R = 2 \times 8 = 16 \Omega$.

Q17. Answer: (a) one-fourth

Area is proportional to diameter squared, so area becomes 4 times and resistance becomes one-fourth.

Q18. Answer: (b) 4 times

Length doubles and area halves, so $R = \rho l / A$ increases by $2 \times 2 = 4$ times.

Q19. Answer: (c) increases

Metals have a positive temperature coefficient of resistance.

Q20. Answer: (b) decreases

Semiconductors have a negative temperature coefficient because more charge carriers are generated.

Q21. Answer: (a) 12 Ω

$R_2 = R_1 [1 + \alpha (t_2 - t_1)] = 10 [1 + 0.004 \times 50] = 10 \times 1.2 = 12 \Omega$.

Q22. Answer: (b) 2 A

$R_{\text{total}} = 9 \Omega$, so $I = 18 / 9 = 2 \text{ A}$.

Q23. Answer: (c) 12 V

$V = I \times R = 2 \times 6 = 12 \text{ V}$ (the remaining 6 V is across the 3 Ω resistor).

Q24. Answer: (d) 2 Ω

$R = (6 \times 3) / (6 + 3) = 18 / 9 = 2 \Omega$.

Q25. Answer: (b) 3 A

In parallel, each branch has 12 V. $I = 12 / 4 = 3 \text{ A}$.

Q26. Answer: (c) 40 W

$P = I^2 \times R = 4 \times 10 = 40 \text{ W}$.

Q27. Answer: (d) 400 Ω

$R = V^2 / P = 200 \times 200 / 100 = 400 \Omega$.

Q28. Answer: (b) 2 A

$I = E / (R + r) = 12 / (5 + 1) = 2 \text{ A}$.

Q29. Answer: (c) 10 V

Terminal voltage = $I \times R = 2 \times 5 = 10 \text{ V}$ (or $E - I r = 12 - 2 = 10 \text{ V}$).

Q30. Answer: (a) $J = \sigma E$

$J = \sigma \times E$. This is the field form of $V = I \times R$.

Score check: 26 to 30 - Excellent | 20 to 25 - Good, revise weak topics | Below 20 - Revise Ohm's law, series-parallel circuits and resistance basics, then retry.

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