



Master Electrician 2

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1. The NEC is organized into chapters. Which chapter covers wiring methods and materials?

- A. Chapter 3
- B. Chapter 1
- C. Chapter 5
- D. Chapter 7

2. What is the primary purpose of grounding an electrical system?

- A. To improve power factor
- B. To limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines
- C. To reduce line losses
- D. To balance phase currents

3. What unit load (VA per square foot) does NEC Table 220.12 assign to a dwelling unit for general lighting purposes?

- A. 3 VA/sq ft
- B. 2 VA/sq ft
- C. 4 VA/sq ft
- D. 5 VA/sq ft

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4. What principle causes a conductor carrying current in a magnetic field to experience a mechanical force?

- A. Motor action (Lorentz force)
- B. Lenz's law
- C. Faraday's law of induction
- D. Kirchhoff's voltage law



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5. Which fuse type is specifically designed to be time-delay (slow-blow) and is commonly used for motor branch-circuit protection?

- A. Dual-element time-delay fuse
- B. Fast-acting cartridge fuse
- C. One-time fuse
- D. Current-limiting fuse

6. Service-entrance conductors that are installed outdoors and run from the service point to the service equipment must comply with which NEC article?

- A. Article 230
- B. Article 215
- C. Article 225
- D. Article 240

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7. A circuit has a resistance of $20\ \Omega$ and a current of 3 A flowing through it. What is the voltage across the resistance?

- A. 30 V
- B. 40 V
- C. 60 V
- D. 80 V

8. Which wiring method consists of a metallic tube used to enclose and protect electrical conductors?

- A. Rigid metal conduit (RMC)
- B. Armored cable (AC)
- C. Metal-clad cable (MC)
- D. Surface metal raceway

9. NEC Article 100 is primarily dedicated to which of the following?

- A. Installation requirements
- B. Grounding rules
- C. Definitions
- D. Overcurrent protection



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10. Which conductor is intentionally connected to earth in a grounded AC electrical system?

- A. The ungrounded (hot) conductor
- B. The equipment grounding conductor
- C. The grounded (neutral) conductor
- D. The bonding jumper

11. A dwelling unit has 2,200 sq ft of floor area. Using the NEC Table 220.12 unit load of 3 VA/sq ft, what is the general lighting load?

- A. 5,500 VA
- B. 6,600 VA
- C. 7,200 VA
- D. 4,400 VA

12. Which quantity is the voltage generated within a motor that opposes the applied supply voltage?

- A. Terminal voltage
- B. Reactive voltage
- C. Back EMF (counter EMF)
- D. Drop voltage

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13. A Class RK5 fuse differs from a Class RK1 fuse primarily in that the RK5 fuse has:

- A. A higher interrupting rating
- B. A smaller physical size
- C. A lower degree of current limitation
- D. A built-in time-delay element



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14. What is the minimum clearance required for service-entrance conductors to pass over a residential roof that has a slope of 4 inches in 12 inches or greater?

- A. 8 feet
- B. 10 feet
- C. 3 feet
- D. 18 inches

15. If 120 V is applied across a 40 Ω resistor, what current flows?

- A. 3 A
- B. 4 A
- C. 6 A
- D. 8 A

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16. Electrical metallic tubing (EMT) is also commonly known as:

- A. Greenfield
- B. Thinwall conduit
- C. Rigid nonmetallic conduit
- D. Intermediate metal conduit

17. The NEC defines the Authority Having Jurisdiction (AHJ) as the organization, office, or individual responsible for what?

- A. Writing the NEC
- B. Enforcing and interpreting the code requirements
- C. Manufacturing listed equipment
- D. Issuing electrician licenses

18. What NEC article covers grounding and bonding?

- A. Article 250
- B. Article 300
- C. Article 200
- D. Article 480

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19. What unit load does NEC Table 220.12 specify for office buildings?

- A. 2 VA/sq ft
- B. 3 VA/sq ft
- C. 3.5 VA/sq ft
- D. 4 VA/sq ft

20. What is the synchronous speed of a 4-pole, 60 Hz induction motor?

- A. 900 RPM
- B. 1800 RPM
- C. 3600 RPM
- D. 1200 RPM

21. What is the standard ampere rating for the NEXT size up overcurrent protective device when the calculated load current falls between two standard ratings per NEC 240.6?

- A. The next size down
- B. The next standard size up
- C. Exactly the calculated value
- D. Twice the calculated value

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22. The maximum number of disconnects permitted to serve as the service disconnecting means for a single set of service-entrance conductors is:

- A. 3
- B. 6
- C. 4
- D. 8

23. A 240 V supply drives 8 A through a resistive load. What is the resistance of the load?

- A. 20 Ω
- B. 30 Ω
- C. 40 Ω
- D. 48 Ω



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24. Which cable assembly has an interlocked steel or aluminum armor over the individual conductors and is covered by NEC Article 320?

- A. Metal-clad cable (MC)
- B. Nonmetallic-sheathed cable (NM)
- C. Armored cable (AC)
- D. Underground feeder cable (UF)

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25. Under NEC 90.4, if equipment or materials are not covered by the NEC, who is authorized to allow their use?

- A. The equipment manufacturer
- B. NFPA headquarters
- C. The installing electrician
- D. The Authority Having Jurisdiction

26. When must a second ground rod be installed at a service?

- A. Always, per NEC code
- B. When the soil resistivity exceeds 100 ohms
- C. When a single rod does not have a resistance to ground of 25 ohms or less
- D. When the service exceeds 200 amperes

27. NEC Table 220.12 assigns a unit lighting load of 0.25 VA/sq ft to which of the following occupancies?

- A. Offices
- B. Dwelling units
- C. Hotels
- D. Warehouses

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28. What is the synchronous speed of a 2-pole, 60 Hz induction motor?

- A. 900 RPM
- B. 1200 RPM
- C. 1800 RPM
- D. 3600 RPM



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29. What type of circuit breaker is required where the available fault current could exceed the breaker's standard interrupting rating?

- A. Standard molded-case breaker
- B. Ground-fault circuit interrupter
- C. Arc-fault circuit interrupter
- D. High-interrupting-capacity (HIC) or current-limiting breaker

30. Which of the following is NOT listed as a grounding electrode in NEC Article 250?

- A. Metal underground water pipe
- B. Ground ring
- C. Concrete-encased electrode
- D. Metallic gas piping system



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Answer Key & Explanations

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1. A — Chapter 3

NEC Chapter 3 covers Wiring Methods and Materials (Articles 300–392). Chapter 1 covers General Requirements, Chapter 5 covers Special Occupancies, and Chapter 7 covers Special Conditions.

2. B — To limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines

NEC 250.4(A)(1) states that grounding of electrical systems limits voltage from lightning, line surges, or accidental contact with higher-voltage lines, protecting equipment and personnel.

3. A — 3 VA/sq ft

NEC Table 220.12 specifies 3 VA per square foot for dwelling units. This base unit load covers general-purpose receptacle and lighting circuits.

4. A — Motor action (Lorentz force)

The Lorentz force (motor action) states that a current-carrying conductor in a magnetic field experiences a force proportional to the current, field strength, and conductor length. This is the fundamental principle behind all electric motors.

5. A — Dual-element time-delay fuse

Dual-element (time-delay) fuses have two separate fusible elements: one for sustained overloads and one for short circuits. This characteristic makes them ideal for motor circuits where high inrush currents occur at startup.

6. A — Article 230

NEC Article 230 covers services, including service-entrance conductors installed outdoors from the utility service point to the service equipment. Article 215 covers feeders, and Article 225 covers outside branch circuits.

7. C — 60 V

Ohm's Law: $V = I \times R = 3 \text{ A} \times 20 \text{ } \Omega = 60 \text{ V}$.

8. A — Rigid metal conduit (RMC)

Rigid metal conduit (RMC) is a metallic tube (raceway) that houses conductors. It provides the highest mechanical protection among conduit types and is covered under NEC Article 344.

9. C — Definitions

Article 100 contains definitions of terms used throughout the NEC. Understanding these definitions is essential because they govern how other code requirements are applied.

10. C — The grounded (neutral) conductor

In a grounded AC system, the grounded conductor (neutral) is intentionally connected to earth at the service or system, per NEC Article 250.



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11. B — 6,600 VA

$2,200 \text{ sq ft} \times 3 \text{ VA/sq ft} = 6,600 \text{ VA}$. This forms the base before applying demand factors from Table 220.42.

12. C — Back EMF (counter EMF)

Back EMF (counter EMF) is generated by the rotating armature and opposes the supply voltage, limiting current draw. The larger the back EMF, the less current the motor draws, making it an important self-regulating mechanism.

13. C — A lower degree of current limitation

Both RK1 and RK5 fuses fit the same rejection-style fuseholder, but RK1 fuses offer greater current-limiting performance (lower let-through energy) than RK5. RK5 fuses are less current-limiting, making RK1 the superior choice for equipment protection.

14. C — 3 feet

Per NEC 230.24(A), service conductors over a residential roof with a slope of 4-in-12 or greater require only 3 feet of clearance. Steeper roofs reduce the risk of pedestrian contact.

15. A — 3 A

Ohm's Law: $I = V / R = 120 / 40 = 3 \text{ A}$.

16. B — Thinwall conduit

EMT is nicknamed 'thinwall' because its walls are thinner than RMC or IMC, making it lighter and easier to bend. It is covered by NEC Article 358.

17. B — Enforcing and interpreting the code requirements

The AHJ is the entity empowered to enforce the NEC — typically the local building or electrical inspector. They interpret requirements and can approve or reject installations.

18. A — Article 250

NEC Article 250 is the primary article that covers all requirements for grounding and bonding of electrical systems and equipment.

19. C — 3.5 VA/sq ft

NEC Table 220.12 specifies 3.5 VA per square foot for office buildings, reflecting their higher general illumination needs compared to dwellings.

20. B — 1800 RPM

Synchronous speed = $(120 \times \text{frequency}) / \text{number of poles} = (120 \times 60) / 4 = 1800 \text{ RPM}$. This formula gives the speed of the rotating magnetic field in the stator.

21. B — The next standard size up

NEC 240.6(A) lists standard ampere ratings for fuses and circuit breakers. When the calculated load current does not correspond to a standard rating, the next standard size up is permitted, provided it does not exceed the conductor ampacity.

22. B — 6

NEC 230.71 limits the service disconnecting means to a maximum of six switches or circuit breakers grouped in one location. This 'six-handle rule' allows de-energizing all loads with six or fewer hand operations.



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23. B — 30 Ω

$$R = V / I = 240 / 8 = 30 \Omega.$$

24. C — Armored cable (AC)

Armored cable (AC), also called BX, has interlocked steel or aluminum armor and is covered under NEC Article 320. It differs from MC cable in that it requires an internal anti-short bushing.

25. D — The Authority Having Jurisdiction

NEC 90.4 gives the AHJ authority to approve equipment or installations not specifically addressed by the Code, provided the installation is judged to be safe.

26. C — When a single rod does not have a resistance to ground of 25 ohms or less

NEC 250.56 requires that if a single ground rod has a resistance to earth exceeding 25 ohms, an additional electrode must be installed to achieve the required resistance.

27. D — Warehouses

NEC Table 220.12 assigns only 0.25 VA/sq ft to warehouses, reflecting minimal lighting requirements in storage areas compared to commercial or residential occupancies.

28. D — 3600 RPM

Synchronous speed = $(120 \times 60) / 2 = 3600$ RPM. A 2-pole motor has the highest synchronous speed for a given frequency. The actual rotor speed will be slightly less due to slip.

29. D — High-interrupting-capacity (HIC) or current-limiting breaker

When fault current levels exceed a standard breaker's interrupting rating, a high-interrupting-capacity or current-limiting breaker must be used to safely clear the fault without breaker failure or damage.

30. D — Metallic gas piping system

Metallic gas piping is explicitly prohibited from being used as a grounding electrode per NEC 250.52(B)(1). The other options—water pipe, ground ring, and concrete-encased electrodes—are all recognized grounding electrodes.



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