



# Electrician

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## Practice Questions

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**1. Circuit breakers and switches containing fuses shall be located so that they may be operated from a readily accessible place. They shall be installed such that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than `<code>_____</code>` above the floor or working platform.**

- A. 6 feet 6 inches
- B. 6 feet
- C. 7 feet
- D. 6 feet 7 inches

**2. All 125-volt, single-phase receptacles not exceeding 30 amperes located at least within `<code>_____</code>` measured horizontally of the inside wall of a hydromassage tub shall be protected by a ground-fault circuit interrupter.**

- A. 5 feet
- B. 6 feet
- C. 10 feet
- D. 3 feet

**3. The NEC mandates specific branch circuits, receptacle outlets and utilization equipment to be provided with a ground-fault circuit interrupter (GFCI); this device is intended `<code>_____</code>`.**

- A. for the protection of devices from overloads
- B. to prevent overloading the conductors
- C. to prevent overloading the circuit breakers
- D. for the protection of personnel

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4. Circuit breakers used as switches in high-intensity discharge lighting circuits shall be listed and shall be marked as:

- A. SWD
- B. HID
- C. HWD
- D. SWP

5. Where an ac transformer arc welder has a 50-ampere rated primary current and a 60 percent duty cycle, determine the minimum size copper 60 deg. C rated conductors required to supply this welder.

- A. 4 AWG
- B. 10 AWG
- C. 8 AWG
- D. 6 AWG

6. Which of the following listed conductor insulations is oil resistant?

- A. TW
- B. TFE
- C. MTW
- D. THWN

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7. When a 2-wire circuit is derived from two ungrounded conductors of a multiwire circuit and is used with switched lampholders, the switching device required is to be:

- A. Either Double Pole or Single Pole Type
- B. Switch is not permitted
- C. Single Pole Type
- D. Double Pole Type

8. Determine the voltage drop on a branch circuit given the following related information:  

- current = 5 amperes
- conductor length = 300 ft.
- conductor resistance = 4 ohms per 1,000 feet

- A. 0.02 volts
- B. 1.2 volts
- C. 0.12 volts
- D. 6 volts



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9. The maximum approved electrical trade size for LFNC is `<code>_____</code>`:

- A. 5 inches
- B. 4 inches
- C. 6 inches
- D. 8 inches

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10. The branch-circuit conductors supplying fixed electric space-heating equipment and any associated motors shall be sized not smaller than `<code>_____</code>` of the load.

- A. 125%
- B. 115%
- C. 100%
- D. 150%

11. The ampacity of conductors that connect a capacitor to the terminals of a motor or to motor circuit conductors shall not be less than `<code>_____</code>` the ampacity of the motor circuit conductors and not less than `<code>_____</code>` % of the rated current of capacitors

- A. Half, 150%
- B. One-fourth, 150%
- C. One third, 135%
- D. Two-thirds, 150%

12. Which of these fixture wires may be used in an operating temperature of 180°C?

- A. TFFN
- B. HFF
- C. PGFF
- D. SF-1

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13. Splices and taps are permitted in a metal wireway provided they are accessible and do not fill the wireway to more than `<code>_____</code>` of its area at that point.

- A. 30 percent
- B. 20 percent
- C. 75 percent
- D. 40 percent

14. Where track lighting is installed in a continuous row, each individual section of not more than `<code>_____</code>` in length shall be securely supported.

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

15. An enclosure for an overcurrent device is 8 inches wide and 5 inches deep. The maximum allowable wiring space for conductors, splices, and taps at any cross-section of the enclosure is `<code>_____</code>`.

- A. 20 in<sup>2</sup>
- B. 36 in<sup>2</sup>
- C. 16 in<sup>2</sup>
- D. 30 in<sup>2</sup>

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16. Unless specifically identified for a higher percentage of fill, the cross-sectional area of the conductors or optical fiber tubes in a conduit seal, in Class I, Divisions 1 and 2 locations, shall not exceed `<code>_____</code>` of the cross-sectional area of a rigid metal conduit (RMC) of the same trade size.

- A. 40 percent
- B. 60 percent
- C. 50 percent
- D. 25 percent



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17. Conduit or tubing nipples not over 24 inches in length may be filled to a maximum of `<code>_____</code>` of their cross-sectional area.

- A. 30 percent
- B. 54 percent
- C. 60 percent
- D. 40 percent

18. When conductors are installed in a conduit or tubing nipple of `<code>_____</code>` or less in length, the ampacity adjustment factors for more than three (3) current-carrying conductors in the raceway are not required to be applied.

- A. 30 inches
- B. 48 inches
- C. 36 inches
- D. 24 inches

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19. At buildings where communications systems are likely to be used, an intersystem bonding termination shall be provided for the communications systems at an accessible location at the service equipment.<br/><br/>It shall be an aluminum or copper busbar not less than ¼ in. thick x 2 in. wide and be of sufficient length to accommodate not less than `<code>_____</code>` terminations for communications systems in addition to other connections.

- A. two
- B. five
- C. four
- D. three

20. Recessed or surface-mounted luminaires and recessed exhaust fans may be located within 8 ft from vertically from the top of a bathtub rim:

- A. True
- B. False



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**21. Which of the following is not required to be marked on the nameplate of a transformer?**

- A. overcurrent protection
- B. voltage
- C. kVA rating
- D. manufacturer

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**22. Food waste disposer or dishwasher shall be connected to any of the required 20-ampere small appliance branch circuits in the kitchen.**

- A. True
- B. False

**23. For health care facilities, which of the following branches are not permitted to be arranged for delayed automatic connection to the alternate power source?**

- A. Central suction system serving medical and surgical functions
- B. Smoke control and stair pressurization systems
- C. Exit signs
- D. Compressed air systems serving medical and surgical functions

**24. Which term best describes the duty cycle of an appliance that, each hour, is on for 20 minutes at between 30% and 90% load, on for 20 minutes at no load, and off for 20 minutes?**

- A. Continuous
- B. Varying
- C. Short-time
- D. Periodic

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**25. A homeowner wants a new pendant luminaire installed in the ceiling over the middle of a bathtub. The bottom of the luminaire must be at least:**

- A. 8 feet above the top of the bathtub rim
- B. 3 feet above the floor
- C. 8 feet above the floor
- D. 3 feet above the top of the bathtub rim



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26. Which of these generators is allowed to have live parts exposed to accidental contact where accessible to unqualified persons?

- A. 65 V ac
- B. 30 V ac
- C. 65 V dc
- D. 90 V dc

27. The minimum size of an aluminum TW conductor required for connecting to a 15-hp 500-V DC motor is `_____` AWG.

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

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28. A driven ground rod or pipe electrode is required to be driven to a depth of at least `_____` into the earth.

- A. 10 feet
- B. 6 feet
- C. 4 feet
- D. 8 feet

29. Where a grounding ring consist of size 2 AWG bare copper wire encircling a building, buried 36 inches, in direct contact with the earth, what is the minimum length of the wire permitted for the grounding electrode in this ground ring?

- A. 20 feet
- B. 50 feet
- C. 25 feet
- D. 15 feet

30. The minimum cover required for 600 V nominal rated directly buried cable under streets, highways, roads and alleys shall be `_____`:

- A. 24 inches
- B. 18 inches
- C. 20 inches
- D. 26 inches



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## Answer Key & Explanations

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### 1. D — 6 feet 7 inches

240.24. The maximum height above the floor or the working platform that a switch or circuit breaker is allowed to be installed is 6 feet 7 inches. This is measured from the center of the grip of the operating handle when in its highest position.

### 2. B — 6 feet

The intent of this rule, addressed in Section 680.71, is to prevent a shock hazard in the area surrounding a hydromassage tub that may have the presence of water. Therefore, all 125-volt, single-phase receptacles of not more than 30 amperes and located within 6 ft. of the tub are to be GFCI protected.

### 3. D — for the protection of personnel

Article 100, where definitions are found, reveals a ground-fault circuit interrupter is a device intended for the protection of personnel that functions to de-energize a circuit when a ground-fault occurs.

### 4. B — HID

Please Refer: NEC Code 240.83(D).

### 5. C — 8 AWG

The loads on transformer arc welders are considered intermittent. Therefore, the minimum ampacity of the branch-circuit conductors is permitted to be determined by applying the percentage values shown in Table 630.11(A). This calculation is done by selecting the appropriate factor from the table, based on the duty cycle and type of welder, then multiply by the value of the welder rated primary current. The conductors are to be selected from Table 310.16.  $.78$  (duty cycle factor)  $\times$  50 amperes (primary current) = 39 amperes Table 310.16 requires size 8 AWG 60°C rated conductors.

### 6. C — MTW

Table 310.4(1) shows conductors with MTW insulation to be oil resistant.

### 7. D — Double Pole Type

Please Refer: NEC Code 410.93.

### 8. D — 6 volts

To determine the voltage drop on this circuit, first find the resistance total with the information given in the question: Resistance = 4 ohms  $\div$  1000 ft. = .004 ohms per ft. .004 ohms  $\times$  300 ft. = 1.2 ohms total resistance Next, apply the voltage drop formula,  $VD = I \times R$ :  $VD = 5$  amperes  $\times$  1.2 ohms = 6 volts dropped.

### 9. B — 4 inches

Please Refer: NEC Code 356.20(B).

### 10. A — 125%

Fixed electric space-heating equipment is covered in Article 424. Section 424.4(B) specifically



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requires branch-circuit conductors for fixed electric space-heating equipment and any associated motors to be sized not smaller than 125% of the load. <br/><br/>This mandate is necessary to protect conductors and overcurrent devices, particularly those in panelboards and load centers, from overheating during periods of prolonged operation.

**11. C — One third, 135%**

Please Refer: NEC Code 460.8.

**12. D — SF-1**

NEC Table 402.3 specifies maximum operating temperatures for fixture wire materials. SF-1 is usable to 200°C. TFFN is usable up to 90°C. HFF and PGFF are usable up to 150°C.

**13. C — 75 percent**

As per Section 376.56, splices and taps are permitted within a wireway, provided they are accessible. The splices and taps shall not fill the wireway to more than 75 percent at that point. Conductors in wireways can be accessed through hinged or removable covers.

**14. C — 4 feet**

As per Section 410.154, where lighting track is installed in a continuous row, each section must be supported at least every 4 ft. to adequately support the lighting track and the weight of the luminaires that can be installed.

**15. D — 30 in<sup>2</sup>**

NEC 312.8 discusses wiring space within switch and overcurrent device enclosures. 312.8(A) says that the area for conductors, splices, and taps at any cross-section can be no more than 75% of the cross-sectional area of an enclosure for overcurrent devices. This translates to 75% of  $(8 \times 5) = 0.75 \times 40 = 30$  in<sup>2</sup>. <br/><br/>Choice A represents 40% of the cross-sectional area. <br/><br/>Choice B represents 50%. <br/><br/>Choice D represents 90%.

**16. D — 25 percent**

The intent of Section 501.15(C)(6) is to minimize the passage of gases from one portion of the electrical system to another and to ensure an adequate area is available for pouring the sealing compound. As per Table 1, Chapter 9, the maximum permitted fill area for conduit is 40%; the maximum fill area permitted for standard conduit seals is 25%. If the conduit fill exceeds 25% of the cross-sectional area of the sealing fitting, a larger trade size sealing fitting is required.

**17. C — 60 percent**

Chapter 9, Informational Note Number 4 to the tables allows a permitted conduit or tubing fill of 60% of their cross-sectional area where the conduit or tubing is not more than 24 inches in length. This is permitted because short sections of the raceways readily permit easy pulling of the conductors and abrasion will not likely occur.

**18. D — 24 inches**

Section 310.15(C)(1)(b) clarifies that adjustment factors for more than three (3) current-carrying conductors in raceways shall not apply where the raceway is not more than 24 inches in length. <br/><br/>Where more than 3 current-carrying conductors are installed in short lengths of conduit or tubing, the heating effect caused from the additional conductors is insignificant. <br/><br/>Therefore, the ampacity of the conductors is not greatly reduced.



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### 19. D — three

According to Article 100 - Definitions, an intersystem bonding termination is a dedicated location that provides a means to connect communications systems (telephone cable, coaxial cable, satellite dishes, and antennas) to the building grounding electrode system. The intersystem bonding termination device minimizes damage from induced voltage differences between the systems in the event of lightning occurring or a ground-fault. This bonding termination provides the communications installer an accessible location to bond the systems together without the need to open and work on energized equipment. Section 250.94(A)(2) tells us that at least three (3) terminations are to be provided for the communications systems.

### 20. A — True

Please Refer: NEC Code 410.10(D).

### 21. A — overcurrent protection

The information given on a transformer nameplate is necessary to determine the overcurrent protection, but the overcurrent protection value is not indicated on the nameplate. Refer to Section 450.11(A). The overcurrent protection is to be determined in accordance with the values given in Tables 430.3(A) and 430.3(B).

### 22. B — False

Please Refer: NEC Code 210.52(B).

### 23. C — Exit signs

517.32, 517.35(A). Many equipment branches are required to be automatically connected to an alternate source of power. The branches in 517.35(A) shall be permitted to do so with a delay. Exit signs must be arranged to have an automatic, non-delayed connection to an alternate source of power. This is most commonly done through an internal battery.

### 24. D — Periodic

NEC 100 defines each of the terms listed in the answer choices. Duty, Periodic is "intermittent operation in which the load conditions are regularly recurrent." Even though the 20-minute load period varies in load, the variation (and the other 40 minutes) are "regularly recurrent." Duty, Short-time (choice B) is a substantially constant load, which does not describe a 30-90% range. Duty, Continuous (choice C) is when the appliance is at a constant load for an indefinitely long time. Duty, Varying (choice D) requires both the load and time interval to vary widely; though the load here can vary widely, the time interval does not.

### 25. A — 8 feet above the top of the bathtub rim

NEC 410.10(D)(1), which discusses luminaire locations in bathtub and shower areas, requires all parts of a pendant luminaire to be at least 8 feet above the bathtub rim. The 3-foot requirement is for luminaires to be 3 feet horizontally from the top of the bathtub rim.

### 26. B — 30 V ac

NEC 445 discusses generators, with 445.14 discussing protection of a generator's live parts. Live parts can be exposed to accidental contact where accessible to unqualified persons if a generator is less than 50 volts ac or 60 volts dc. Choices A, B, and C are larger than this.

### 27. A — 8

NEC Table 430.247 specifies full-load current for DC motors of various horsepowers and armature voltage



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ratings.  
Go down to the row for 15 horsepower and then go across to 500 volts to find the full-load current for this combination as 27 A.  
NEC 430.22 requires conductors supplying a single motor in continuous duty to have an ampacity of at least 125% of the motor's full-load current rating, so the conductor must be rated for  $27 \times 1.25 = 33.8$  A.  
Now look at Table 310.16 to find the smallest aluminum TW conductor size with an ampacity of at least 33.8 A.  
Go down the fourth column for aluminum size TW until you find 35 A, which corresponds to 8 AWG.  
The other choices are larger conductor sizes than what is needed.  
Ensure that you understand how the tables in this question are used together, as finding the minimum conductor size is a common exam problem.

**28. D — 8 feet**

To ensure an adequate grounding system and qualify as an effective grounding electrode, according to Section 250.53(A)(4), all rod and pipe electrodes have at least 8 ft. of length in contact with the soil.

**29. A — 20 feet**

To qualify as a grounding electrode, the size 2 AWG bare copper conductor is to be in one continuous 20 ft. length. Refer to Section 250.52(A)(4). This type of grounding method is commonly used in sandy areas, such as West Texas, Eastern New Mexico, Arizona, and Southern California.

**30. A — 24 inches**

Please Refer: NEC Code – Table 300.5.



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