

JOURNEYMAN EXAM WORKBOOK



By Tom Henry and Tim Henry

Based on the 2023 National Electrical Code®

This workbook is designed to help prepare the electrician for the Journeyman electrical examination.

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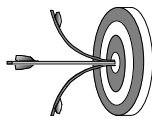
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**CODE ELECTRICAL
LEADER IN ELECTRICAL
EDUCATION WORLD WIDE**



***WE DIDN'T INVENT ELECTRICAL TRAINING
.... WE PERFECTED IT.***



HENRY PUBLICATIONS™ SINCE 1985

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PREPARING FOR AN OPEN BOOK EXAM

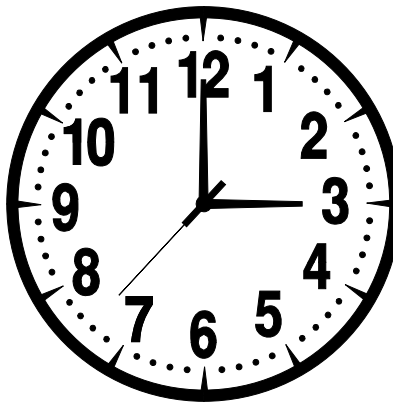
Open Book

Most applicants agree this is the most difficult part of an electrical exam. Time becomes such an important factor. 50 open book questions are to be answered in two hours or 100 questions in four hours on the Journeyman exam.

Open book is a test of your knowledge and use of the National Electrical Code. 86% of the open book Journeyman questions are from the Code book.

Your score on the open book exam depends on how familiar you are with the Code book. Most exam applicants run out of time and are not able to find all the answers to the questions within the limited time.

**Journeyman Exam
50 Questions
2 Hour Time Limit**



**That averages to
2.4 minutes
per question**

The key to an open book exam is not to spend too much time on one question. If the question does not contain a key word that you can find in the index, **skip this question**, and continue to the next question. If you spend 3 minutes, 5 minutes, 6 minutes on a question and never find the answer you are eating into the time that should be used for the answers you can find.

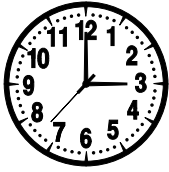
In general, there are usually 8 to 10 really difficult questions on an exam. The remaining questions after proper preparation, you will be able to find within the allotted time. Skip these 8 or 10 as you recognize them and move on finding the other answers. If you answer 40 questions correctly out of a total of 50 questions your score would be 80%! That's better than in some cases where the applicant hasn't even answered 20 questions and time has run out. You **can't** spend 5 or 6 minutes on a question. Never leave a question unanswered, unanswered is counted wrong. Always select a multiple choice answer before time runs out.

Proper preparation is so important in passing an open book exam. Don't be guilty of reading a question and feeling, "I know the answer so I won't bother looking in the Code book." The following pages will prove how this can be a big mistake. I teach by being properly prepared with how to find your way around in the Code book. You'll be able to look up all the answers within the time limit.



The difficulty occurs when you say Code book.

INTRODUCTION



Your score on the open book exam depends on how familiar you are with the **Code book**. Most exam applicants **run out of time** and are not able to find all the questions and select a choice of answer within the limited time.

Test question writers hope the question is never copied.

Their score is instantaneous but they **never know what questions were wrong** or where their weaknesses are.

The elusive license, is still unattainable at this point. How would the applicant ever find out what the **correct answer** is? They are not permitted to ever knowing the **correct answer**. How are you to be educated if you **never** know the correct answer?

The only time you will ever know the “**correct answer**” is when you read *Tom Henry Books* where from all the years of studying the intent of the NEC from the TCD, TCR giving the substantiation for each of the new safety rules or deletions from the NEC each three years.

At my age 84, I’ve been through 21 code cycles and written over 100 electrical books which will give you the **correct answer** in full detail.



- The Code is Truly a "National" Code. - The men who freely contribute their time and study to the writing of the Code come from all over the United States and thus the final document represents a nationwide cross-section of opinion.

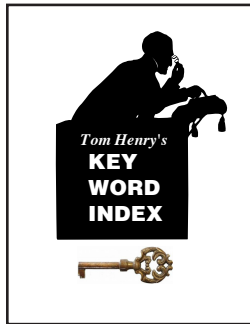
- The Code is an "American Standard." - The fact that the writers of the Code are organized under the procedure of the American Standards Association makes this possible. This simply means that the Code is officially recognized as representing standard American practice. It is a simple standard; there is no need for necessity for anyone to develop another code; the National Electrical Code is sufficient. Proof of this is the fact that cities and other governmental bodies all over the United States have adopted it as the *safety standard for electrical installations*, in spite of the fact that the Code itself, being written by a technical association, has no legal or mandatory status whatsoever.

The National Electrical Code is based on the fact that **to do less would be a hazard**. Many of the sections of the NEC are a result of known fire; incorporating corrections into the NEC each three years is an attempt to prevent similar occurrences.



Every rule in your safety manual is written in somebody's blood. The freedom and safety that you and I enjoy in our communities in large part is due to the sacrifice of others.

THE OPEN BOOK EXAM



The best reference book for locating words in the Code book is "The Key Word Index". This book contains every important word in the Code book with section number and page number. **Now you can find what you're looking for in seconds!** Now you'll be able to show them out on the job where it says that in the Code book. Try it once and you'll never be without it.



The "**ULTIMATE**" Code package includes the **2023** NEC, *Tom Henry* 68 TABS (installed), KEY WORD INDEX, REMINDER BOOK, 14 pages of FORMULA INSERTS, plus over 3,600 **KEY** Code references **HI-LITED!**

Will Rogers once said, "You can't come back from someplace you've never been." This book will take you there.

- If you focus first on figuring out what the answer is, **before looking at the options given**, it will force you to think back to the text or the lecture where you first heard this information.

This process helps to improve your concentration, and will exercise your memory.

- If you are really stuck on a question, make your best guess and put a question mark next to it. If you finish the test with time to spare, go back and reconsider the ones you marked.

If you do not want to guess, skip the question and put a mark beside it, so you can return to it if you have time at the end of the test.

- Skip answers when you are stuck, but try to get back to them if you can – **it's best to answer every question you can**, within the allotted time frame.

- Forget about always sticking to your first choice. Many people say that your first guess on a test question is usually right, so you should never change your answer. However, recent studies have shown that isn't the case – you're just as likely, or even more likely, to get it right if you change an answer you aren't sure about. So don't stress over whether to change an answer because it wasn't your first choice. **If you change your mind, change your answer.**

- Data collected from takers shows that test-takers who changed some of their answers tended to score higher than those who always stuck with their first choice.

Test takers in the study most often changed answers from wrong to right, which resulted in a higher score.

INTRODUCTION

To pass the exam is very simple, it takes work! Like with anything in life, you get out of it what you put into it. The more time you spend preparing for the exam, the easier it will become. As you work these exams and grade yourself, hi-lite the answers with a marking pen in your Code book, or better yet purchase the "Ultimate Code Book" which has the complete package for taking an electrical exam.

The key to the exam is that the student must first **understand** the question, which requires **careful reading of each word**.

Read this sentence:

FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS.

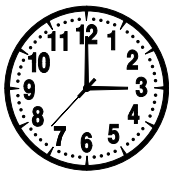
Now read it once more, and count the **F's** in the sentence. How many did you find?

(a) 3 (b) 4 (c) 5 (d) 6

If you are a careful reader, you will find all **6 F's**.



Most applicants taking an exam are not familiar enough with the Code book and it's easy to understand why only 30 out of 100 pass an electrical exam. Many are *unsuccessful* because they failed to *read* the question correctly.



Your score on the open book exam depends on how familiar you are with the **Code book**. Most exam applicants run out of time and are not able to find all the answers to the questions within the limited time.

Number skills can be tested with math problems or interpreting plans, charts and graphs. You may wonder whether to concentrate on improving your strong areas or on building some background in your fields of *weakness*. Working more practice exams, broader coverage, would be included for those subjects which are more important in your work. Now weigh your strengths and weaknesses against the job requirements and prepare accordingly.

INTRODUCTION

NEC Code consists of **9 chapters** each dividing into four groupings: General Requirements; Specific Requirements; Communications Systems and Tables

Chapter 1: General
Chapter 2: Wiring and Protection
Chapter 3: Wiring Methods and Materials
Chapter 4: Equipment for General Use
Chapter 5: Special Occupancies
Chapter 6: Special Equipment
Chapter 7: Special Conditions
Chapter 8: Communications Systems
Chapter 9: Tables – Conductor and Raceway Specifications

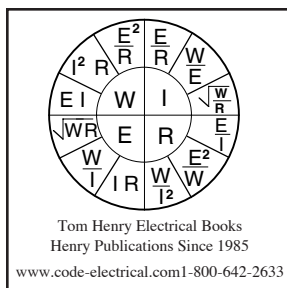


I agree with questions from theory-Ohm's law, voltage drop, ampacity, tools, plan reading.

But the difficulty for the applicant comes **from asking questions from all nine chapters** of the National Electrical Code.

The preparation for the exam should educate the dangers of the **behavior of electricity**, the overload, short circuit, the explosion, the fire, the injuries, the deaths.

For some electricians, it has been twenty years or more since they have used math formulas, theory, and calculations. For most, the last time was an apprenticeship class. Now, for the exam, we are required to be an expert in the reading of the Code and in applying all of the tables and demand factors to the calculations.



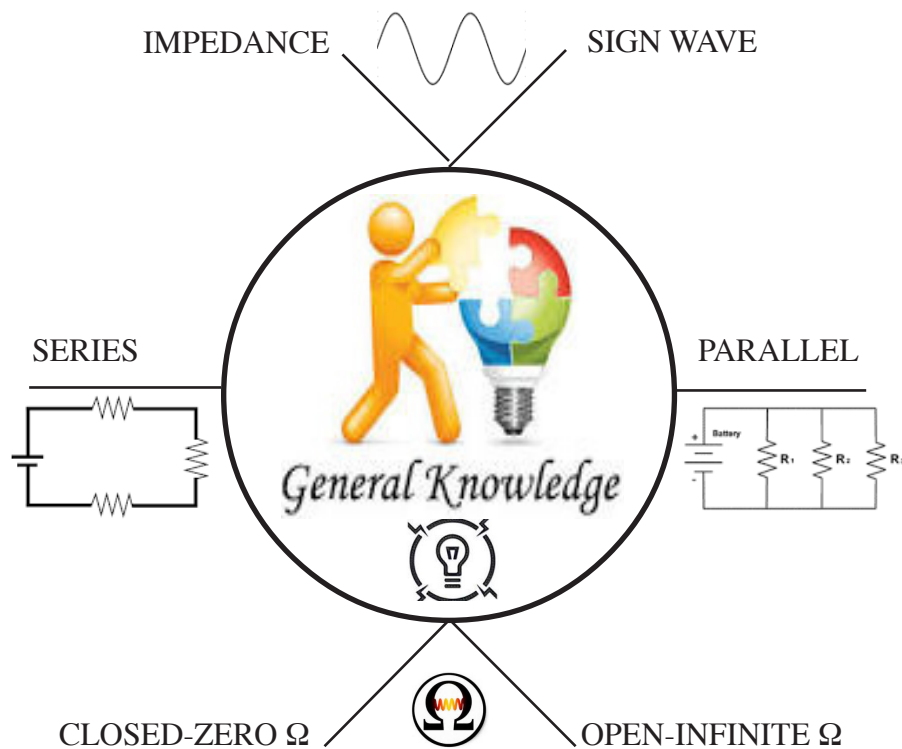
The most difficult task in preparing for the electrical exam is trying to "memorize" the formulas. You increase the strength of your memory by *overlearning the subject* and that's what our books are about. Our books will show an easier way to study. Study smarter, not harder.

Memorization is the process of committing something to memory. The act of memorization is often a deliberate mental process undertaken in order **to store in memory for later recall**. Memory is the "process of retaining information over time."

Memorization is a frontage road: It runs parallel to the best parts of learning, never intersecting. It's a detour around all the action, *a way of knowing without learning*. Only through sustained effort of **rehearsing information** are we able to **memorize data for longer than a short period of time**.

We tend to remember things that interest us or are made memorable to us.

GENERAL KNOWLEDGE CATEGORIES



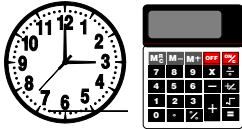
General knowledge is information that has been accumulated over time through various mediums, sources. It excludes specialized learning that can only be obtained with extensive training and information confined to a single medium.

General Knowledge or General Awareness is an important and common section in all competitive and government recruitment examinations.

INTRODUCTION

Hand-writing is a powerful tool for memorization, and it is even more effective if you do it repeatedly. **Get out a pen and paper and start hand-writing what you need to memorize.**

The **General Knowledge** exam questions your knowledge on “Other than Code questions.” Some questions may seem difficult for you, but they represent every conceivable type of question encountered on previous electrical exams.



Instead of marking your choice of answer in the book, write it on a separate paper, that way you can retake the exam over until you feel you understand the question and answer.

The exams are ***timed based***, so write down the time you start and finish the practice exam.

25 questions at 2.4 minutes per question = 60 minutes. **Spend an hour a day** working a practice exam and see your scoring increase!

Start now by *reading the question carefully* using your formula sheets and calculator.

To grade your exam:

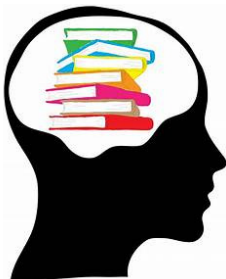
**Count the number of correct answers
and divide by the number of questions 25.**

Example: 19 correct answers ÷ 25 questions = 76%

General knowledge categories such as the behavior of electricity, theory, Ohm’s Law, ac-dc power, voltage drop, power factor, efficiency, cost, tools, safety, plan reading, specifications, etc.

The **general knowledge** categories test your knowledge of what you have learned from the years spent in the electrical field to **qualify** to take the exam. How much can you remember from your training?

The NEC is updated every 3 years, **general knowledge** categories remain the same over the years in most cases.



There is no NEC section to locate for **general knowledge** questions, you must select the correct answer by **memory**. These are the questions where **formulas** come into play.

JOURNEYMAN OPEN BOOK EXAM #10 25 Questions One Hour Time Limit

1. Motors and other rotating electrical machinery shall be totally enclosed or designed so as to minimize the entrance of ____.

- (a) moisture (b) dust (c) corrosive particles (d) all of these**

2. For the purpose of load calculations, the square footage of a dwelling unit includes ____.

- (a) open porches
(b) garages
(c) areas not adaptable as future occupiable space
(d) all of these**

3. A receptacle's grounding terminal shall only be used for connection to the ____ conductor.

- (a) grounded (b) equipment grounding (c) ungrounded (d) grounding electrode**

4. Where overcurrent protection is provided as part of the industrial control panel, the supply conductors shall be considered as either feeders or ____ as covered by 240.21.

- (a) taps (b) branch circuits (c) shunts (d) isolated**

5. Backfill that contains large rocks, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed in an excavation where materials may damage raceways, cables, conductors, or other structures or prevent adequate compaction of fill or contribute to the ____ of raceways, cables, or other substructures.

- (a) damage (b) deterioration (c) aging (d) corrosion**

6. _____. An electric device and circuit that controls a disconnecting means through a relay or equivalent device.

- (a) Remote Disconnect Control (b) Safety Switch (c) Knief Switch (d) Shunt Trip**

7. Which of the following statements is **false**?

- (a) For isolated ground receptacles, the receptacle grounding terminal is required to be connected to an insulated equipment grounding conductor run with the circuit conductors.
(b) Round boxes are required to be used where conduits or connectors requiring the use of locknuts or bushings are to be connected to the side of the box.
(c) Control circuit devices with screw-type pressure terminals used with #14 or smaller copper conductors are required to be torqued to a minimum of 7 lb-in.
(d) Type MC cable is permitted to be manufactured as a single-conductor cable.**

8. A permanent sign shall be attached to the cable tray at intervals not greater than 20 feet. The sign shall read as follows:

- (a) CABLE TRAY FOR WELDING CABLES ONLY**
- (b) CABLE TRAY MAXIMUM VOLTAGE 300**
- (c) THE CABLE TRAY PROVIDES SUPPORT AT 6" INTERVALS**
- (d) CABLES SHALL BE LOW VOLTAGE**

9. _____. The individual responsible for starting, stopping, and controlling an amusement or supervising a concession.

- (a) Ticket Taker (b) Assistant (c) Operator (d) Manager**

10. A commercial building has an opening door in the wall on the second floor through which materials are moved into and out of a storage area located on the second floor. An overhead 120v branch circuit is to be installed from the second floor area of the building to a pole on which a flood-light will be mounted. Which of the following best describes Code requirements for the installation of this branch-circuit?

- (a) It is not permitted to be installed overhead.**
- (b) It must be at least 3' from the side of the door.**
- (c) It must be at least 3' above the bottom of the door.**
- (d) It must not obstruct entrance to the material handling door and be 3' from the door.**

11. Outdoor self-supporting radio and television receiving antennas, such as vertical rods, dishes, etc., shall be located well away from overhead conductors of electric light and power circuits of over ____ volts to ground.

- (a) 30 (b) 120 (c) 150 (d) 300**

12. A Class 1 power-limited circuit shall be supplied from a source having a rated output of not more than 30 volts and ____ volt amperes.

- (a) 1000 (b) 1200 (c) 1500 (d) 2000**

13. Enclosures that are not over 100 cubic inches in size and which have two conduits supported within three feet on either side of the enclosure and the enclosure does not contain devices or support fixtures shall not be required to have the enclosure supported if the conduits are ____.

- (a) rigid nonmetallic conduits**
- (b) threaded into hubs identified for the purpose**
- (c) installed with locknuts inside and outside enclosure**
- (d) shoulders of fittings outside and locknuts inside the box**

14. Size #18 or #16 fixture wires, and flexible cords shall be permitted for the control and operating circuits of X-ray and auxiliary equipment where protected by not larger than ____ ampere overcurrent devices.

(a) 6 (b) 15 (c) 20 (d) 30

15. Conductors drawn from a copper-clad aluminum rod with the copper metallurgically bonded to an aluminum core. The copper forms a minimum of ____ percent of the csa.

(a) 10 (b) 20 (c) 40 (d) 70

16. Concrete, brick or tile walls are considered as being ____.

(a) isolated (b) insulators (c) grounded (d) dry locations

17. ____ locations are those that are hazardous because of the presence of easily ignitable fibers or flyings.

(a) Class I (b) Class II (c) Class III (d) Class II, division II

18. An isolated ground receptacle shall be identified by ____.

**(a) CO/ALR orange marking on the face of the receptacle
(b) a metal faceplate not less than 0.030 inches in thickness
(c) a reset type test button on the face of the receptacle
(d) an orange triangle located on the face of the receptacle**

19. In a hospital General Care Area, each patient bed location shall be provided with a minimum of ____ receptacles.

(a) 3 single (b) 2 single or 1 duplex (c) 2 duplex or 4 single (d) 4 duplex or 8 single

20. Balconies, decks, and porches that are attached to the dwelling unit and are accessible from inside the dwelling unit shall have at least one receptacle outlet accessible from the balcony, deck, or porch. The receptacle outlet shall not be located more than ____ above the balcony, deck, or porch walking surface.

(a) 6' (b) 6' 6" (c) 7' (d) 8'

21. Energized equipment parts for fire pump installations are required to be located at least ____ inches above floor level.

(a) 6" (b) 8" (c) 10" (d) 12"

22. Conductors having ____ insulation and operating at different voltage levels shall not occupy the same enclosure, cable, or raceway.

(a) thermoset (b) flame-retardant (c) nonshielded (d) silicone rubber

23. In a recreational vehicle park with electrical supply, at least ____ % of the sites shall be equipped with 30 ampere, 125 volt receptacles.

(a) 25 (b) 30 (c) 40 (d) 70

24. The conductor used to connect the grounded circuit of a wiring system to a grounding electrode is the ____.

(a) grounded conductor (b) bonding jumper
(c) main bonding jumper (d) grounding conductor

25. Backfill that contains large rocks, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed in an excavation where materials can ____ raceways, cables, or other structures or prevent adequate compaction of fill or contribute to the corrosion of raceways, cables, or other substructures over 1000v.

(a) damage (b) deteriorate (c) age (d) corrode