

**EVALUATING
ACADEMIC READINESS
FOR APPRENTICESHIP TRAINING**
Revised for
ACCESS TO APPRENTICESHIP

**COMMUNICATIONS SKILLS
SYNTHESIS OF INFORMATION**

AN ACADEMIC SKILLS MANUAL
for
The Construction Trades: Mechanical Systems

This trade group includes the following trades:
Electrician, Network Cabling, Painter & Decorator,
Plumber, Steamfitter, Sprinkler & Fire Protection, and
Refrigeration/Air Conditioning

*Workplace Support Services Branch
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In preparing these Academic Skills Manuals, we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or trade manual.

This trade related material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.

COMMUNICATIONS SKILLS

SYNTHESIS OF INFORMATION

*An academic skill required for the study of the
Construction Trades: Mechanical Systems*

INTRODUCTION

An *alloy* is a substance you get when you combine two or more metals, along with other elements such as carbon. This combination, or *synthesis*, produces a new metal. The new metal has different qualities such as corrosion resistance, toughness and hardness. Stainless steel and brass are examples of alloys. Using a synthesized alloy enables you to avoid unwanted weaknesses in the original metals, such as softness or brittleness.

Synthesis of information means combining pieces of information to arrive at an integrated whole. If you manage to synthesize all the complex parts of an assignment, you end up with a successfully completed project. In your training and in your work, you read texts, manuals, guides and handbooks to find out how and why you do things in specific ways. You learn skills and techniques working on the job. You synthesize all this information to see how it fits into the bigger picture – that is, how it fits into your metal trades work. By synthesizing your information, you get results you wouldn't get from one source alone.

Practical applications of *synthesis of information* range from writing clear and concise contract proposals, work orders and accident reports to selecting and applying information from mechanical, structural and architectural blueprints. You have to bring different types of information together to create working drawings or to outline the steps for a fabrication job. When you are in charge of a project, you have to bring together information, people and materials. It is your job to synthesize all the different aspects of the task.

In this skill sheet, we look at the following aspects of *synthesizing information*:

- ◆ Order of Synthesis
- ◆ Combining Information
- ◆ Using Synthesis

PART I

ORDER OF SYNTHESIS

In Part I, we look at the *order* and *language* of synthesis.

Where do I Start?

Often a good place to start your quest for information is to ask questions.

Example: When you learn about materials used for piping, you ask what the different materials are. You to ask about descriptions of each type, grades, how to identify each, and where they are best used. Once you have figured out what questions should be asked, the next step is to begin answering those questions

To answer these questions, you have to find and collect information from sources such as texts, tables, manuals, code books, teachers, and supervisors. You learn details about the physical properties and chemical composition of the different materials and how they are used. You also find about their uses for water supply, drainage or gas, and about their reactions to climate conditions.

Then, you have to organize all this material so it is available and useful. You synthesize it and you have a new understanding of which materials to choose in which circumstances.

1 Gathering Knowledge

When you begin to study your trade, you will probably learn information in the pattern set by instructors and your texts and manuals. Information is usually presented in a logical order. Texts and manuals start with general ideas and go on to more specific details and procedures. You proceed through the classes and texts systematically to cover all the relevant material.

Example: You are learning about metals in the same order that is set up in your textbook. You read about various types of sheet metal in chapter 3. In chapter 4 you find a table about gauges and measurement. Chapter 5 has information about characteristics along with drawings and photos that show you how to recognize different types of metals. The text tells you when to go to the different sections, chapters, tables or figures. Your instructor may add handouts or recommend a certain book for more information about a topic.

You learn this material by:

- ◆ reading,
- ◆ making notes,
- ◆ listening to your teachers and other students,
- ◆ discussing ideas
- ◆ answering questions.

You will use a number of strategies to help you learn and to organize the information so that you remember it and can use what you already know when you come across a new idea. You will gather pieces of knowledge about all the aspects of your trade.

You will learn:

- ◆ facts
- ◆ theories, and
- ◆ practice.

2. Combining Knowledge

You will combine this information in several ways. In some instances, you add to information in the same order as it is presented in a textbook or other resource. In the same way you that you reassemble a piece of equipment you are repairing, you combine the pieces systematically, to get the complete picture.

Your job will be to put all of that information together, you will start to synthesize it. You will:

- ◆ compare ideas,
- ◆ classify products and procedures according to how similar and different they are
- ◆ evaluate the relevance and usefulness of a material
- ◆ summarize the information, and,
- ◆ draw conclusions from what you have found.

These strategies will help you organize and remember what you are learning. Each thing you learn will fit into the whole body of knowledge about your trade.

Example: When you understand the grade and classification of one type of material, you can relate it to a system of grading a different material.

- You can compare the way each material is used and understand why it is used that way.
- You can learn what you found out about grading systems to more easily learn about a third and then a fourth kind of grading system.

Each new piece of information adds to your knowledge. Just as importantly, it may change your understanding of a situation.

Example:

You are learning about conduit wiring systems in same the order set up in your textbook. You might start with definitions, general description, applications and sizes in chapter 2. In chapter 4 might learn about physical properties. Chapter 5 has terms, grades and special features. The text tells you when to go to the different sections, chapters, tables or figures. Your instructor may add handouts or recommend a certain book for more information about a topic.

As you develop an understanding of the uses and characteristics of various conduit types, you will move to an understanding of reactions to climate conditions, to uses in hazardous (or non-hazardous only) locations or acceptable and unacceptable runs. Then you can compare the way these materials are used. You compare new or unfamiliar products to older, familiar ones. You to read up on installation procedures of a new material so you can adjust your tools, practices and time estimates, and so you understand its advantages or disadvantages.

Using Knowledge

Once you have foundational knowledge, you will be asked to complete assignments or projects in the shop that require you to use a synthesis of that information. You will have to figure out

what procedures or tools to use to complete a task. You will have to plan the order. To do these things you will:

- think through what you already know about the subject,
- perhaps get more information to find solutions to problems
- ◆ talk to people who can help you clarify anything you are unsure about,
- ◆ set priorities and,
- ◆ finally, combine all this information to suit the situation.

Example: You use synthesis of information to help organize an assignment. Some steps you might take include:

1. Decide on what the job involves. It could be to select a drill bit, solve a power tool problem, develop a pattern, or understand a computer process.
2. Make a list of materials required and estimated costs.
3. Find and collect information from various sources: texts, manuals, charts, experts, sales people at the local store and your own experience.
4. Organize and compare this information to bring all the steps together.

Synthesizing information so that it is useful is a lifelong task. It requires relevant background information, and an ability to observe and learn from your experience. As you try out new ideas and procedures, you rate how they work in different situations. Gradually you build up a storehouse of ideas you know are good. You can pick which technique to use in which situation. You get to know who is a good resource to talk to for answers. Now you can *synthesize*, that is combine, all your sources of information until you have a complete picture.

After you have gathered and then combined the pieces of information, you should be ready to answer some questions about the topic. You will be tested on how well you have synthesized all this material through answering chapter questions, handing in assignments and writing tests.

Example: You have been learning about conduit and have been given some questions to answer:

1. What is rigid, or thickwall conduit?
2. How would I recognize it?
3. What is the difference between aluminum and steel thickwall?
4. Where is each used?
5. What do I need to know about normal installations or practice?
6. What codes govern installations?
7. What cautions do I need to be aware of when handling, bending installing or threading various types?

The first two questions are “What is it?” questions that ask you to identify, recognize or describe something.

The third question asks you to understand how the two materials differ and how they are similar.

Then you are asked to recognize applications.

The last question asks about the concerns of a specific situation?

Note: You could answer questions like these on any subject

4. Applying Knowledge

At some point you will take all of this information and apply it to a project, or a job. You will have to collect and organize information, not as it is set out in a text or in your training program, but *as you need it for that project*.

Example: You have been given a special fabricating project that involves welding. Before you start the project, you need information from several sources, and you need to do a little experimenting to be sure you meet the goal. The following might be required:

- Understand the design of the item to be built.
- Find the gauge of metal recommended and the measurements of the pattern to be followed.
- Understand what happens when joining (welding) the selected metal.
- Find and consult the right table with amperage figures for welding.
- Note whether the table gives adequate information or whether you need specifics from a supplier.
- Fine-tune amperage settings;
- Experiment with a scrap of the same thickness.
- Compare your results on the scrap with the expected results before proceeding.

The information you gather will relate to your purpose and the specific application. What will the finished product be used for? What stresses and conditions must it meet? What codes apply so that the final product meets industry standards? You need to ask all the questions that are relevant to the situation.

Each new piece of information adds to your knowledge. Synthesizing this information allows you to plan for factors such as shrinkage in metal and understand how designs for fittings serve their purpose.

As your experience grows, you are able to deal with more difficult situations as you meet them. You accumulate knowledge and you use that knowledge to acquire the *skills* of the trade. This process does not stop. You will update and upgrade both knowledge and skills throughout your career.

Tables

Table 1 is a synthesis of information. Someone has gathered details about the topic and organized them so you can quickly find information when you need it. It is usually easy to find details in the table format.

Example:

Table 1: System Testing Meters

Meters	Hook up	Results	Particulars
voltmeter	in parallel	high or low reading may indicate circuit problems	checks voltage at any point in circuit
ammeter	in series	a higher or lower than normal current reading may indicate problems	current must flow through both circuit and ammeter
ohmmeter	in series or in parallel		never connect to voltage or current

Note: When testing continuity of a wire, no resistance is wanted. When testing continuity in a coil, a certain amount of resistance is common. Compare tested resistance to the specifications in a service manual to determine circuit or component condition.

The headings in a table clearly and briefly direct you to the information. The heading at the top of Table 1 tells you what it covers. The headings in each column tells you exactly what information you will find in that column.

Footnotes offer more information. Did you read the note at the bottom of the table? If not, go back and read it now. It tells you that you need more information. It also directs you to the specifications in a service manual for this information.

The table is a summary, so it does have limitations.

Example: The table of hook up and uses of test meters may not give you enough information to understand the difference between “in series” or “in parallel”. Unless you have read about these testers in detail, you will not understand it completely.

Because information in tables is usually brief, a table may send you to other sources for further details. If you don’t know how to do something or don’t understand it, you will have to consult another manual or guide, or talk to an expert.

Taking your own notes

Just as you would gather all of the tools necessary to do a particular job, you also need to gather all of the information required to do the job, then apply it correctly. It is a challenge to your note-taking and organization skills to gather information and then find it when you need it.

Some information will be essential for *every job* you do, but, *it may not be repeated*.

Example: You find this instructions about safety procedures.

Find updated health and safety procedures in Section IV. Refer to these procedures when using hand and power tools, when welding, soldering or cutting.

You would have to find out what is in Section IV. *More importantly*, you have to apply the safety procedures.

Trades people use different methods to organize and file information under a topic. You might photocopy or write out the details and keep them in a notebook that is always with you. You might use a sticky note to mark the pages. You might examine this section before each job to prepare yourself. Whatever method you use, make sure you keep your information close at hand.

Problems?

Do not be discouraged by problems: When you have problems with a tool or an uneven weld, use it as an opportunity to learn more about your trade. Search for more information to find the reasons for the problem and the solutions to it.

Synthesized information contributes to your overall knowledge and skills. You understand *why* it is essential to follow correct bending procedures or use the right type of wire. You understand why the correct guides and tables are essential to getting you there.

In developing this knowledge, you will often search for answers from several sources sifting through one piece of information after another to compare and evaluate it. Synthesizing this information will help you do your job.

PART II ***COMBINING INFORMATION***

In this section, we'll ask you to combine details from Passages 1 and 2 to understand and to compare information about electrical theory. **Answer the questions which follow. Answers are at the end of this skill manual.**

Passage 1 **Current**

A toy car provides a clear analogy of the basic elements of electricity. If you set the car on a flat tabletop (conductor), the speed (current) is zero because there is nothing to make it go. If you tilt one end of the table up, however, the car starts to roll down the hill. The steeper the slope, the faster the movement. What makes the car move is the difference between the highest point and the lowest point of the slope.

In electricity, the highest point is a point with a surplus of electrons or negative charge, and the lowest point is an electron shortage or positive charge. Because opposite charges attract, a stream of electrons flows from the most negative point to the most positive point. This is called *electricity* or *electron current*.

Current can be considered the speed of the electron flow because it specifies the number of electrons moving past a given point within a given time period.

The basic unit of measurement for electric current is the ampere (A). The word ampere is often abbreviated to amp, but mostly we use the symbol A. In electrical equations, current is usually represented by the letter *I*. The value of *I* is assumed to be in amperes unless otherwise stated.

Passage 2 Voltage

When current flows, its strength depends on the difference in charge between the most negative point and the most positive point in the circuit. This difference in electrical potential is referred to as *voltage* or *electromotive force*. Voltage is measured in units called *volts* (V). One volt pushes 1A of current through one *ohm* (Ω) of *resistance*. In electrical equations, voltage is usually represented by the letter *E* and *E* is given in volts unless otherwise stated.

Questions:

1. Define (briefly) electron current.
2. Why does current flow along a conductor?
3. Define (briefly) voltage?
4. How does voltage affect current?

Passage 1 and 2 provide information about current and voltage in electrical theory.

Passage 3 builds on this information and uses it to explain a law important to working with electrical circuits. Think about the various ways this information can be applied to your trade. Observe what this passage adds to your base of information.

Read Passage 3 and answer the questions that follow. Answers are at the end of this skill manual.

Passage 3 Resistance and Ohm's Law

If we return to the toy car analogy, it might seem that if you knew the slope of the table, you'd know how fast the car would roll. However, other factors also affect the speed, the most important being friction. Friction will resist the movement of the car and slow it down. The electrical equivalent to friction is *resistance* (R). Resistance works against the flow of current and although it might appear to be something to avoid, it is actually a useful factor in practical circuits. Resistance can limit the amount of current drawn from a battery or cell, and it can also reduce voltage in certain portions of a circuit.

The basic unit of resistance is the *ohm* (Ω). One volt can push 1A of current through 1 Ω of resistance. Ohm's law defines this relationship: voltage equals current times resistance or: $E = IR$. *E* is the voltage in volts, *I* is the current in amperes, and *R* is the resistance in ohms. Using algebraic manipulation, this formula can be rearranged to solve for current when the other values are known ($I = E/R$) or to solve for resistance $R = E/I$ if the other.

As an electrician, these equations are essential to your trade.

Questions:

1. Provided you had two of the three values, an electrician would be able to calculate current, voltage or resistance in a circuit, using the formulas defined by Ohm's law.

T F

2. You can predict solutions to circuit problems with Ohm's Law.

T F

The information in each passage will combine to give an explanation of current and voltage in electrical theory, to explain a law important to working with electrical circuits and provides you with formulas for calculating resistance, current and voltage in an electric circuit.

There are still questions you might want answered as to how these concepts and formulae apply to your work. You might want to know:

1. What types of circuits would have the highest resistance? Or, are they all basically the same?
2. How does temperature affect voltage, current or resistance?
3. If the voltage, current or resistance is too high, what problems can you predict?
4. What is the next course of action, once you find out the value of the resistance in a circuit?

These questions will send you on an information search. You will need to find and combine new details about electrical theory and circuits. The point is that you need good information before you can synthesize the details into a complete picture. You need the whole picture – a synthesis -before you can plan and then successfully complete a project.

Note: Use the index and table of contents when looking for information in your textbook and service manuals. This should save you time.

Keep an open mind

Sometimes when you read several sources or different passages, you may get reasons or explanations that differ from each other. As you read, keep an open mind. Often new details force you to rethink what you already know. Sometimes, what you read conflicts with what you have already learned. Look at this positively; maybe you are being offered information you hadn't considered before or something more up to date.

Check other reliable sources and continue to learn. Use all sources available to find the right guides, to understand equipment, safety and principles of concepts such as load and stress, and to find causes of problems. As you add information from a variety of sources and combine this with your experience, your understanding of the whole picture will continue to grow.

However, you do have to eventually decide what information to use in order to get started. When you understand scientific theory such as stress or compression, it can help you understand what

is correct and what is misleading. If you understand *how* something works, you can understand *how* it will withstand a load or when it requires a different construction. When you see the relationship between what you do and the consequences to the structure, you understand how to proceed. When you combine all the details and guides at hand, you can get on with the job.

Fact or Opinion

Synthesis will help you deal with information that isn't directly stated. Sometimes, you get a sense of a writer's attitude – whether he or she has a dislike for a certain method or a preference for a particular tool. You may pick up from a construction worker that a certain way of doing something is the best. Another worker might suggest that the same procedure is not so important.

Here you will need to bring together all your information to make your own evaluation. It's a good habit to ask the question "why" a lot. First, you will find out why something is done a certain way. Second, you can give clear explanations to clients so they understand what you are doing and what they are paying for.

It's important to know the source of any information and be aware of the differences between trade tips that may not be backed up by reliable data and advice that is backed up by facts. An up to date, approved trade text, an expert in the field, a manufacturer's guide and a shop manual are examples of reliable sources. Check your sources routinely to see that they are dependable and current. Check with trade experts to ensure that your trade approves any Internet source.

You do all this information searching and source checking so that you have reliable material to gather into a synthesis. Before you combine details into a comprehensive picture, you need to be sure that you can count on their validity. Then you can use the synthesis as a base from which you make your decisions about the different aspect of your metal trade work.

PART III ***USING SYNTHESIS***

Setting priorities

A *priority* is something that is first in importance. When you *set a priority*, you decide on the importance of something by comparing it to something else. You also decide on the sequence in which different steps are ordered. Rating or setting priorities is important on the job. Synthesizing information helps you do this successfully. When you prioritize, you decide on questions such as the following:

- ◆ In what order should I plan out the steps of the job?
- ◆ What needs to be done first?
- ◆ What safety and code issues should I be aware of before I start?
- ◆ Which client's needs are most pressing?
- ◆ What time commitments have I made to clients?

Safety first

A caution or warning indicates the information is essential to your safety on the job, so find out about it before you proceed. It also helps you set a priority in your planning for a project.

Example:

Warning: If suppliers or employers do not supply details on ingredients, health effects, handling or other aspects of this and other hazardous products call the Construction Safety Association of Ontario at 1-800- .

Example:

Caution! Do not pour near open flame or combustible materials.

You might need to know if a container which once held a flammable material is considered a *combustible material*.

You might need to know the general reactions of combustible materials and products, so you handle and use these products safely in all situations. You could ask:

- How do they behave in confined or poorly ventilated spaces?
- Near pilot lights or switches?

You will need *all* the details and you need to get them from the correct source so you are safe on the job. Track directions that send you to a different source. Of course, you will follow these directions, but it's important to understand them completely as they will apply in other situations.

Answer all the relevant questions so you understand the caution fully and can apply it properly in all situations.

Example:

If *any* amount of cadmium (Cd) is present in the brazing alloy, consult the safety manual. Follow the procedures exactly as listed. Carefully check the specifications of the brazing alloy before starting.

In this situation:

- Check the specifications of the brazing alloy.
- If cadmium is present *in any amount*, find the safety manual.
- Follow all the directions *exactly*.

You will be referred to safety details.

Example:

Electric drills should be grounded for safety.
Grounding is covered in detail in Section 6.

- It is your job to find Section 6, read it and apply the information *before* you use this or any other tools of this type.

Pay attention to directions that send you somewhere else - to a different chapter or source. The information in a *warning* will be essential to the operation you are performing right now, so follow up before you proceed. Just as you gather all the correct materials and equipment to do a job, gather all the information required and apply it correctly.

Set priorities for the tasks

You set priorities when you plan your work. If you have four jobs to do, which one comes first? Maybe you always do jobs in the order they come in or as materials become available. Maybe you start with the easiest and work through to the hardest. Other factors also play a part. Before you draw a conclusion about a task, collect information. Examine the information detail-by-detail. Consider this the sorting stage.

Example: Before you decide how to proceed with a job you need to consider some of the following:

1. Do certain stages of the job require a drywaller?
2. Do we need/have drawings?
3. Do we need to schedule an inspection before, during and/or after the job.?
4. What unusual situations are in this job?
5. Which is more important to the customer, cost or productivity?

You are sorting through information to make decisions. As you synthesize and assess the collected facts, you may make new predictions or conclusions about how to approach the job. On the other hand, you may reach the same conclusions, just with a clearer picture of the task.

Set priorities for the details

As you assess and arrange these collected facts in priority, you may reach a new synthesis. This may lead to new predictions or conclusions about the difficulty or success of this job.

Example: Before you make decisions about the job you are doing, assess what you have. Are all the details of the information equally important? Are some your responsibility, such as arranging for drywallers and inspections, and others out of your control, such as the materials and schematic drawings? What is most important to the success of this job? Does anything warn you of problems or unusual situations to watch for? These questions direct you to find details, compare them and rate their importance to the situation.

Problem areas

Suppose you need to solve a problem with a control circuit. Find information from your texts, manuals and your own experience. Add notes from more experienced workers and then organize what you've read. You can guide yourself with a series of questions:

- What are the general causes of control circuit problems?
- Which is the most likely cause?
- What other causes should I look for?

Then go on:

1. Find the details about problem.
2. Put the details into groups or categories.
3. Compare the details to the problem.
4. Bring the information together to make some conclusions about the problem.

You can usually determine the priority *before* starting your search. For example, codes, safety and industry standards are essential, but how important is cost? Is it also a priority? As new questions arise during your research, you may have to go to other sources to answer the questions or retrace your steps through the same material. Whichever you do, make sure you understand everything thoroughly so you can meet *all* the conditions of the job?

You can generally apply this approach when considering the consequences of your actions. This applies whether the job is complicated or straightforward. Ask questions and assess actions as you go.

Evaluating the information

Sometimes you have to carefully read and then assess whether it is clear to you, or whether it is useful to you.

Example:

An advantage to digital meters is that they are easy to read as they require no estimation. Many electricians use digital meters.

Is it clear? Is it useful? Does this mean you should choose a digital over an analogue meter? Does it mean you should throw out your analog and replace it with digital? To answer this, you need to assess how these meters are used in your trade to make a decision.

Sometimes information leaves is no room for questions.

Example:

This type of conduit must not be used in hazardous locations. It must not be buried in earth, exposed to mechanical injury or enclosed in thermal insulation materials.

Be sure you recognize *warnings*, *cautions*, health and safety directions that are matters of fact and governed by codes. These are areas and issues that you have no choices about.

Some information may make you want to review what you already know. You may also need to check a manual and get a professional's opinion.

Example:

Carelessness in applying flux ruins many soldering jobs. Care should be exercised to avoid dropping flux anywhere except where the soldering is to be done.

What does “carelessness” mean exactly? Are there types of “carelessness” that ruin work? Does it apply only to “dropping flux” where it’s not wanted? What are the consequences of dropping flux? At what point is poor work different from ruined work?

It is clear in the example that a soldering that meets a standard is possible with the right care. However, you need to understand what the words mean. How do you know if you have the required skill and care? When you solder a fitting, will others in your trade rate this job as up to trade standards. If not, you need to develop the skill and care to meet or exceed the standard.

Be very sure you recognize when information does not offer you choices.

Example:

Never, under any circumstances use a steel rule except as a precision measuring tool. It will nick, mar and become damaged.

Passage 4 below offers guidelines about the correct installation of conduit. Observe when you need another set of instructions, and where you would find them.

Passage 4

Some references are taken from ANSI/TIA/EIA-607, July 1997. On course and on the job, use standards reference guides and codes that are up to date. Check for dates and for revised editions.

Conduit Installation

Conduit should be designed and installed in compliance with prevailing codes and standards. It must withstand the environment to which it is exposed. Conduit runs should be installed at right angles and parallel to building grids – in the most direct route possible. 90° condulets (or LBs) should **not** be installed anywhere. Continuous sections between two pull boxes should be a maximum of 30 metres (98ft). Conduit runs must be bonded to the ground on one or both ends in compliance with ANSI/TIA/EIA-607.

All electrical work must also comply with the most recent safety and building codes, electrical and cabling standards.

Note: Before any installation, submit interference drawings. Drawings should indicate conduit routing and pull box locations with reference measurements from two walls or permanent fixtures. Include elevation changes, wall penetration and impact on any existing fixtures.

This passage advises you to consider a number of factors *before* you start on a job. If you read Passage 4 again, you will find what the writer asks you to be warned about and why. You don’t want to find yourself on the job with an outdated reference guide, with continuous sections which exceed the maximums, with no plans for getting through or around permanent fixtures.

CONCLUSION

Synthesis of information involves combining different pieces of information to compare and evaluate information, to set priorities or to solve problems. Your ultimate purpose is to produce the best results on the job.

Summary

1. **Ask questions** directly related to the assignment or job.
2. **Research and collect information** from all sources. Note and follow any directions that tell you to look somewhere else for information.
3. **Organize, compare, prioritize, and evaluate information** in relation to the questions you need to answer.
4. **Find answers to all questions** and be prepared to review your steps to answer new questions that arise.
5. **Notice the difference between fact and opinion** when searching for answers.
6. **Combine information from several sources** to provide answers or instructions that you would not find using one source only.

ANSWER PAGE

PART II **Passage 1, Current** **Passage 2, Voltage**

1. Define (briefly) electron current.

The car analogy in passage 1 helps your understanding of what electron current is. It makes it easier to understand the definition in paragraphs 2 and 3: Electricity or electron current is the movement of electrons in a stream along a conductor from the most negative point, to the most positive point. Current can be considered the speed at which the electrons flow. It specifies the number of electrons moving past a given point within a given period of time.

2. Why does current flow along a conductor?

This answer is in passage 1, paragraph 2. Current flows along a conductor because opposite charges attract. This causes the surplus of electrons (negative charge) to flow toward the lowest point where there is a shortage of electrons (positive charge).

3. Define (briefly) voltage.

Voltage is defined in the first two sentences of passage 2: Voltage (also referred to as electromotive force) is the difference in charge between the most negative point in the circuit and the most positive point (electrical potential).

4. How does voltage affect current?

The answer is found in the middle of passage 2: Voltage affects current in the following manner: *one volt pushes 1A of current through one ohm (Ω) of resistance*. This means that voltage provides the surplus of electrons that allows a current to flow toward the shortage.

PART II **Passage 3, Resistance and Ohm's Law**

1. Provided you had two of the three values, an electrician would be able to calculate current, voltage or resistance in a circuit, using the formulas defined by Ohm's law.

T The last sentence in paragraph two tells us that this is true. Ohm's law can be manipulated to solve for any of the three, as long as you have a value for two.

2. You can predict solutions to circuit problems with the Ohm's Law.

F Unfortunately, the passage does not give you enough information to be able to answer this question. You are told that using Ohm's law is essential to your trade (last sentence), but you are not given reasons for this. This is an example of where you would need more information in order to fully understand how resistance and Ohm's law effect the work you do as an electrician.