Government of Western Australia
North Metropolitan TAFE

UEE 11 Training Package Support Material

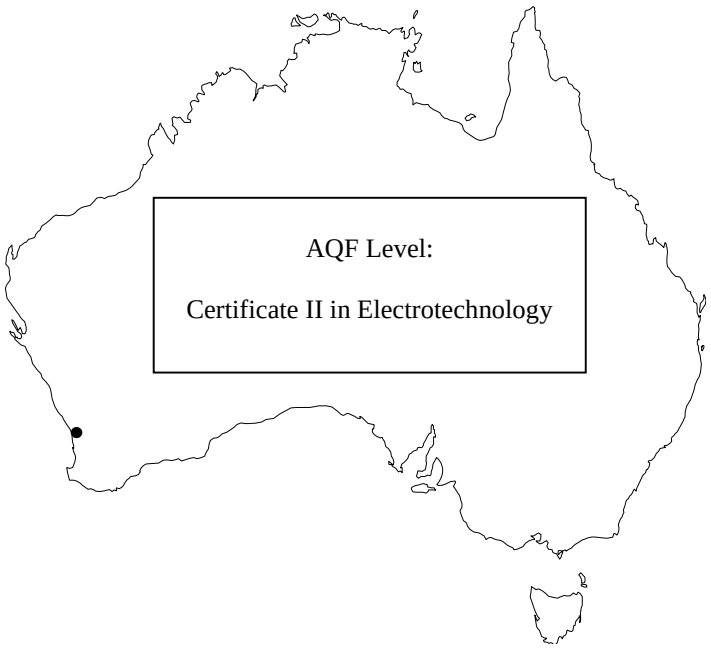
State Code: A114 – Pathway Code: WC20

Based on:
National Electrotechnology Standards

Resource Book

Cert II Units

UEENEEE148A
UEENEEE179A
UEENEEE141A



Compiled by B.L.Kinsella.
Revised by Terry O'Grady

North Metropolitan TAFE
June 2018

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Revisions: June 2018
Removal of Unit UEENEED101A – Use computer applications relevant to a workplace
This unit also forms part of the Cert III in Electro-technology and as such is treated as a stand-alone unit.
This unit is also better delivered using online platforms such as Blackboard rather than using Workbooks.
Review the Unit UEENEEE141A - Use of routine equipment/plant/technologies in an energy sector environment to include more relevant content and to align with the RSAK's in a more informed way.
Arrangement of resource book to better suit the usual order of delivery of each unit and to remove any reference to "Clustering" of units. Each unit shall be treated as "Stand-alone". Improve pagination and reference materials.

Part One

Unit of Competence – National ID -UEENEEE148A

Carry out routine work activities in an energy sector environment

This unit covers undertaking scheduled routine work activities in the energy sector within an agreed time, to an acceptable quality standard and with a minimum of waste. It encompasses working safely and applying knowledge of carrying out routine work activities in the electro-technology environment.

1. Pre-requisites, Elements and Performance Criteria
2. Required Skills and Knowledge
3. Employability Skills summary
4. Assignment Record Sheet
5. Careers, Roles and Responsibilities in the Electrotechnology Industry
6. Location of references
7. Conditions of Employment
8. Communication in Electrotechnology Industry
9. Training in the Electro-technology Industry
10. Preparing for a new workplace
11. Equal Employment Opportunity

References

- Electrical Wiring Practice Volume 1, Keith Pethebridge and Ian Neeson, McGraw-Hill Australia
- WA Electricity (Licensing) Regulations 1991
- Standards Australia – Wiring Rules AS/NZS 3000:2018
- Electrotechnology Training Package (UEE 11) (or extracts).
- www.Training.gov.au
- www.MySkills.gov.au
- www.Australianapprenticeships.gov.au

Prerequisite Unit(s)
Granting competency in these units shall be made only after competency in the following units has been confirmed.

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace.

Literacy and numeracy skills Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

RSAK: - KS01-EE148A

ELEMENT		PERFORMANCE CRITERIA	
1	Prepare to undertake routine work activities.	1.1	Instructions for preparing the work activity are communicated and confirmed to ensure clear understanding.
		1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply to the carrying out of the work.
		1.3	Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
		1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
		1.6	Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.
2	Carry out work as instructed.	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
		2.2	Schedule of work is followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
		2.3	Knowledge of electrotechnology practices and electrical principles are applied to routine work activities.
		2.4	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.5	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	Check results of the completed work.	3.1	Final checks are made to ensure the work conforms with instructions and to requirements.
		3.2	Appropriate personnel are notified of completion of the work.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

Required Skills and Knowledge: -

This describes the essential skills and knowledge and their level, required for this unit.
Evidence shall show that knowledge has been acquired of safe working practices and carrying out routine work activities in an electrotechnology environment.
All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE148A Energy sector organisations and practises

Evidence shall show an understanding of energy sector industry organisations and practices to an extent indicated by the following aspects:

T1 Energy sector vocations encompassing:

- Electrical
- Electronics and communications
- Computer Systems
- Data Communication
- Refrigeration and Air Conditioning
- Instrumentation and Control
- Rail signalling
- Lifts
- Electricity supply – generation, transmission and distribution
- Gas industry

T2 Career paths in energy sector encompassing:

- Australian Qualification Framework (AQF)
- Qualifications/Classifications
- Scope of work-installation, maintenance and servicing

T3 Training in energy sector vocations encompassing:

- Traineeships, apprenticeships
- Licensed Electrician minimum requirements
- Career advancements

T4 Industry Organisations encompassing:

- Employers – NECA, ECA, ME, ENA
- EE-Oz Training Standards and EE-Oz State/Territory Network
- Employee – Trade union group (CEPU, ETU)
- Government - ITABs, TAFE, RTO, ERAC
- Private providers

T5 Qualification Requirements encompassing:

- Unit of competency
- Qualification assessments

T6 Policies and Practices in energy sector industry encompassing:

- Licensing requirements
- OH&S requirements
- Awards

T7 Job application encompassing:

- Research
- Writing
- Methods of application

T8 Job interview encompassing:

- Preparation
- Presentation
- Evaluation

Note: This information and current details of critical aspects for each competency standard unit (CSU) in this qualification can be found at the EE-Oz Training Standards website www.ee-oz.com.au**.** .

Employability Skills Summary for all Qualifications at AQF Level 2

Communication
Collect, organise and understand information related to the work task and it's relevant safety procedures
Communicate ideas and information to enable confirmation of work requirement and specifications
Co-operate with other workers/customers and report outcomes and/or any problems
Access, read and comprehend safety instructions and procedures
Share information via speech and in writing
Prepare time sheets
Teamwork
Work with others to generate and review ideas
Work effectively as an individual and as a member of a team
Work with others and in a team to identify work needs and review ideas against those needs
Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities
Contribute to a positive culture of compliance within an organisation
Develop and maintain networks for the implementation and maintenance of industry knowledge, standards and requirements
Provide feedback
Problem Solving
Apply lateral thinking to generate solutions in response to work problems
Anticipate or clarify problems to avoid interruptions to work flows and processes
Identify, assess and prioritise work risks to maintain efficiency, quality, productivity and workplace safety at all times
Initiative & Enterprise
Identify and comply with all requirements and standards for work in the Electrotechnology industry
Apply enterprise best practice and quality systems
Interact effectively with both internal and external industry stakeholders
Initiate and follow through on the implementation of industry standards in the workplace
Planning & Organising
Plan and organise activities including the maintenance and layout of own worksite and obtain equipment and materials to avoid work flow interruptions or wastage
Identify related industry compliance requirements
Maintain relevant industry and work records
Establish clear goals and deliverables
Collect, analyse and organise work task information
Apply time management prioritising techniques
Self Management
Plan own work within given task parameters
Set, monitor and satisfy personal work goals
Accept responsibility for given tasks
Apply systematic and effective time management
Learning
Satisfy the competency requirements for the job
Maintain current knowledge of tools, devices, instruments, materials, work practices and systems
Seek learning opportunities
Take control of and manage own learning

Adopt a open approach to new ideas and techniques
Commit to and promote a culture of continuous learning
Set realistic learning goals for self development
Monitor and respond to learning process achievements
Technology
Use workplace technology related to particular work tasks including tools, devices, instruments and materials
Attain and maintain required technical accreditation/authority under the industry standards
Attain and maintain IT skills relevant to the Electrotechnology industry
Be willing to gain knowledge and skills relevant to new and emerging technologies

The Employability Skills described above are representative of the Electrotechnology Industry in general and may not reflect enterprise specific requirements or job roles.
Learning and assessment strategies for each qualification should be based on the requirements of the units of competency comprising the qualification and the Assessment Guidelines, Volume 1, Part 3.

There are two facets to employability skills: 'generic' skills and 'personal' attributes (for example, loyalty, enthusiasm, motivation and sense of humour). The key generic skills identified, and how they contribute to the enterprise, are:

- Communication - productive and harmonious relations between employees and customers;
- Team work - productive working relationships and outcomes;
- Problem-solving - productive enterprise outcomes;
- Initiative/enterprise - innovative ideas and outcomes;
- Planning and organisation - long-term and short-term strategic planning for the enterprise;
- Self-management - employee satisfaction and growth;
- Learning - improvement and expansion in employee and company operations and outcomes;
- Technology - more effective work practices

Assignment Record Sheet

Energy Sector Organisations and Practises

Name:	Student ID No:	Semester/ Year

Activity	Topic	Date	Lecturer	Required Skills & Knowledge E148A
Sheet 1-1	Careers, Roles and Responsibilities			T1,2,3,4,5&6
Activity 1-1	Location of References			T1,2,3,4,5&6
Activity 1-2	Conditions of Employment			T6
Sheet 2-1	Communication in Electrotechnology			T7&8
Activity 2-1	Verbal Communication Telephone			T7&8
Activity 2-2	Written Communication Resume			T7&8
Activity 2-3	Written Communication Covering Letter			T7&8
Activity 2-4	Verbal Communication Interview Techniques			T7&8
Sheet 3-1	Training in Electrotechnology			T3,5
Sheet 4-1	Preparing for a New Workplace			T7&8
Activity 4-1	New Workplace Checklist in Excel and Printing			T1,2,3,4,5&6
Sheet 5-1	Equal Employment Opportunities			T6
Activity 5-1	Equal Employment Opportunities			T6
Activity 5-2	Hand in Portfolio of all Activities and Worksheets			

Workplace Rules:

Rule 1 Follow the instructions
Rule 2 Tolerate ambiguity
Rule 3 Meet your obligations

Careers, Roles and Responsibilities in the Electrotechnology Industry

Task:

To describe the general structure of the electrotechnology industry, its processes and the organisations which influence its operation.

Why:

Knowledge of organisations within the electrotechnology industry and how those organisations operate is necessary so that those involved can be aware of their roles and responsibilities, and can take advantage of the opportunities that present themselves.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in an assessment testing your Skills and Knowledge on each (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must satisfactorily complete a final practical competency assessment.

Equipment:

Nil

References:

- Electrical Wiring Practice - Volume 1, Pethebridge and Neeson.(Chapter 3)
- WA Electricity Licensing Regulations
- UEE11 Training Package
- WA Electrical Requirements
- Australian/New Zealand Wiring Rules AS/NZS 3000:2018

Careers, Roles and Responsibilities in the Electrotechnology Industry

Suggested Self-Study Guide

1. Study the following sections in the recommended references:

Electrotechnology Practice:
Electrical Wiring Practice - Volume 1, Pethebridge and Neeson. (Chapter 3 Section 3.1 Electrical Licensing and 3.2 Standards)
WA Electrical Requirements Section 6
Australian/New Zealand Wiring Rules AS/NZS 3000:2018 (Scope and Application)
The following websites;
www.commerce.wa.gov.au/LabourRelations/PDF/Awards/E/ElectricalContractingAward.pdf
www.worksafe.wa.gov.au
www.apprenticentre.wa.gov.au
WA Electricity (Licensing) Regulations (Part 3 – Licensing of electrical workers, Part 4 – Licensing of Electrical Contractors)

2. Read the Summaries and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

Careers, Roles and Responsibilities in the Electrotechnology Industry

1. Electricity is used in some form in virtually all aspects of modern society. The scope of the electrotechnology industry is so vast that it is impossible for any single person to be expert in all areas, so it is customary to specialise in relatively few aspects.

2. The list below although not exhaustive shows typical types of disciplines covered in the electrotechnology industry:

Appliances
Business equipment
Computer Systems
Data Communications
Electrical
Electrical supply- generation, transmission and distribution
Electrical Machines
Electronics and Communications
Fire protection
Gas Industry
Instrumentation and Control
Lifts
Rail Signalling
Refrigeration and Air Conditioning
Renewable / sustainable energy
Security technology

These disciplines may require some or all of the following:

- Installation
- Running cable
- Connection
- Maintenance

It will be necessary for tradesmen working in any of these areas to have the required skills and knowledge particular to their area.

Australian Qualifications Framework

3. The Australian Qualifications Framework (AQF) is a system for arranging vocational qualifications and related documentation in six levels - Certificates I to IV, Diploma and Advanced Diploma.

4. Workers in the electrotechnology industry can be loosely classified under four general headings which can be related to qualifications within the Australian Qualifications Framework

- semi-skilled (Certificate I and II)
- skilled tradespersons (Certificate III)
- technicians (Certificate IV)
- engineers (Diploma and Advanced Diploma).

Workers at Certificate level are usually involved in the installation and repair of equipment, and workers at Diploma and Advanced Diploma level are usually involved in designing and commissioning of systems and equipment. Electrical work at the higher levels requires significant mathematical and analytical skills. The scope of electrical work at certificate level can be regarded as having three major components - installation, maintenance and servicing.

Careers in Electrotechnology

5. Entry to the electrical trade as an 'Electrician' in Australia is through completion of an indentured apprenticeship which includes the formal AQF qualification UEE30811 Certificate III in Electrotechnology Electrician. On completion of an apprenticeship and the Certificate III in WA, and a final 'Capstone' test, a person can apply to EnergySafety WA for an electrical worker's licence to work as an electrician. It is **illegal** to perform electrical work over **50 volts a.c. or 120 volts d.c**. without an appropriate licence in WA.

6. People who work in the electrotechnology industry can be classified as
   A. semi-skilled *usually assists in the installation and repair of equipment*
   B. skilled tradespersons *usually involved in the installation and repair of equipment*
   C. technicians *usually involved in commissioning*
   D. engineers *usually involved in designing and commissioning of systems and equipment.*

Electrical work requires significant mathematical and analytical skills. The mathematical and analytical skills required become more significant the higher the qualification.

7. Electricians can advance their career by completing higher level qualifications such as a Certificate IV, Diploma and Advanced Diploma in their chosen field.

Organisations in Electrotechnology

8. There are several groups or organisations which contribute to the electrotechnology industry in Australia, including:

   a. **Employers of electrical workers** Employers also provide the on-job training for many AQF qualifications.

   b. **EE-OZ Training Standards** EE-OZ develops and publishes information relating to training in the electrotechnology industry (known as Training Package UEE11) - see the website www.ee-oz.com.au .

   c. **Trade Unions** Unions such as the Communications, Electrical and Plumbing Union of Western Australia http://www.cepuwa.com.au **(CEPU)** and Electrical Trades Union http://www.etu.org.au/ **(ETU)** are established to collectively represent the view of workers in an industry and present matters to employers such as those in relation to member's pay and conditions.

d. **Associations.** Associations such as the **National Electrical Contractor's Association (NECA)** http://wa.neca.asn.au/ , Electrical Contractors Association (ECA) and ME(Master Electricians) http://www.masterelectricians.com.au/ , ENA (Energy Networks Association) http://www.ena.asn.au/ are established to provide a forum for discussion of matters relevant to the members and engaging in activities intended to support members in their business activities.

e. **Industrial Tribunals**. Industrial tribunals such as the **Industrial Appeals Tribunal** http://www.wairc.wa.gov.au are usually a panel of relevant experts assembled for the purpose of resolving conflicts which may occur in the course of business.

f. **Workplace Committees.** Workplace committees such as an Occupational Safety and Health committee typically consist of representatives from various levels within an organisation (both from management and employees), and their role is to discuss relevant aspects of workplace conditions with a view to recommending future actions.

g. **Government Departments.** There are many government departments which have the responsibility of administering various aspects of state and federal laws and policies. All citizens have an obligation to comply with the law and follow directions issued by these departments. **Workers in a particular part of the electrotechnology industry are obliged to be aware of the special requirements which apply to them – ignorance is not a legitimate reason for non-compliance.** Government regulations of particular interest to workers in the electrotechnology industry include those associated with electrical licensing, occupational health and safety, health, mines and workplace discrimination. Typical government organisations include **ITABs** (Industrial Training Advisory Boards), **RTO** (Registered Training Organisation) (North Metro TAFE), Electrical Licensing Board (in WA) and **ERAC** (Electrical Regulatory Advisory Committee)

h. **Registered Training Organisation (RTO)** A Registered Training Organisation is one which has been formally recognised by State/Territory training and recognition authorities as being capable of providing quality outcomes for a specified area and range of services. The RTO is responsible for providing the training, assessment and workplace monitoring in accordance with the requirements of the Training Package and for issuing the relevant qualification.

i. **Private Training Providers** Private training providers can apply for registration to deliver and assess specific AQF qualifications as a registered training organisation (RTO). Qualifications issued by these registered RTOs have the same status and are recognised by publicly funded providers such as North Metro TAFE in Australia.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE148A Section 1	Work Sheet 1-1	BLK 04/2013 KS01-EE148A/SI/a

Careers, Roles and Responsibilities in the Electrotechnology Industry

1. What is a 'Training Package'?

2. List six types of disciplines covered in the electrotechnology industry. Arrange the disciplines in your own personal order of preference.

3. How many general types of formal qualifications are available under the Electrotechnology Training Package UEE11?

4. What general type of electrical work requires the worker to have a current electrical worker's licence?

5. List four general levels of worker in the electrotechnology industry.

6. If a worker chooses to train and then work in a particular area of the electrotechnology industry, can they change to another area at some later time?

7. What is the general function of a 'Union'?

8. What is the general function of an employer organisation? Give the name of a typical example in the electrotechnology industry.

9. What is the general function of an Industrial Tribunal?

10. What is the general function of a workplace committee and give a typical example.

11. State four examples of matters governed by government regulations which are of special interest to workers in the electrotechnology industry.

12. What is the general responsibility of all electrotechnology workers in relation to state or federal laws?

13. What is a 'Unit of Competence' in a Training Package?

14. After viewing the Department of Commerce website www.commerce.wa.gov.au/wageline list six conditions of employment that you should consider when deciding whether to accept a job offer.

15. Research all the websites provided to find out what if any type of equipment is normally supplied by an employer in the workplace?

16. List six general personal characteristics an employer would expect in a typical workplace.

17. What is the purpose of an industrial award?

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE148A Section 1	Activity Sheet 1-1	BLK 04/2013 KS01-EE148A/SI/a

Location of References

Objective

To locate the full name of government Acts or Regulations, or Australian Standards relating to specified matters. To locate the Government Department responsible for administering the Act or Regulation and make a presentation (to be determined by lecturer) relating to one of these Departments.

Equipment

Library resources
Folio (folder with plastic sleeves)
List of Electrotechnology Training Package Qualifications
Internet

Procedure

1. Look at the following headings and for each heading find:

   The full name of the Government Department that deals with it
   A library accession number where information about it can be found
   A website that relates to it
   A Government Act relating to it
   A Regulation or Australian Standard that deals with it

a. Occupational Health & Safety
b. Mining regulations
c. Electricity in public buildings
d. Workplace discrimination
e. Electrical licensing in WA
f. Installation of electrical equipment and wiring systems
g. Training in industry

2. Report your results in the form on the following page for inclusion in your Unit Folio.

3. Include the list of Electrotechnology Training Package Qualifications (UEE11) in your Unit Folio.

4. Submit your Unit Folio to your lecturer for comment.

	Govt Dept	Library Acc	Website	Govt Act	Regulation
Occupational Safety					
Mining Regulations					
Electricity in Public Buildings					
Workplace Discrimination					
Electrical Licensing					
Installation of electrical equipment and wiring systems					
Training in Industry					

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE148A Section 1	Activity Sheet 1-2	BLK 04/2013 KS01-EE148A/SI/a

Conditions of Employment

Objective

To identify the realistic conditions of employment you could expect in the workplace.

Equipment

Library resources
Unit Folio
http://www.commerce.wa.gov.au

Procedure

1. Prepare a list of the conditions of employment you would expect to find in a typical employment situation. Use points your group and lecturer listed in discussion as a guide, and include all relevant realistic details. List the advantages and disadvantages of each.

2. Present your list in the form provided for inclusion in your Unit Folio.

3. Submit your Unit Folio to your lecturer for comment.

Condition	Advantage	Disadvantage
Sick Leave		
Annual Leave		
Overtime		
Meal Allowance		
Long Service Leave		
Superannuation		
Public Holidays		
Travel Allowance		
Site Allowance		

Communication in the Electrotechnology Industry

Task:

To communicate effectively with co-workers and customers in the electrotechnology industry.

Why:

Communicating with co-workers and customers or clients is an essential part of the process of providing services in the electrotechnology industry in an efficient and productive manner.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in an assessment testing your Skills and Knowledge on each (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must satisfactorily complete a final practical competency assessment.

Equipment:

Nil

Communication in the Electrotechnology Industry

Suggested Self Study Guide

1. Study the following sections in the recommended references:

   Library Resources – Communication

2. Go to www.gcflearnfree.org/topics/computers and do the tutorials related to Microsoft Word 7.

3. Read the Summaries and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

4. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

5. Complete the activities in this Section.

6. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

Communication in the Electrotechnology Industry

1. In any industry it is important that those working in the industry understand each other, this is especially important in the electrotechnology industry where information received incorrectly or misinterpreted can lead to serious injury or death. Information imparted and received must be both accurate and adequate. The electrotechnology industry is an industry where labour is a major component of the cost so clear and concise information must be imparted so that tasks can be completed within an allocated and quoted time frame.

2. Communication is an exchange of information between two or more people. The information given must be received so that the receiver understands the message as accurately as possible. This information transfer will be considerably enhanced if the person (originator) transmitting the information can place themselves in the position of the recipient (listener).

3. Whenever information is transferred from one person to another a five **W** one **H (5W1H**) technique should be used. That is **What, When, Where, Who, Why and How.** This technique if used effectively will reduce the possibility of omitting critical information necessary for the work task to be completed in accordance with regulations and customer requirements. It is also important that the information is both accurate and disseminated at an appropriate time. The originator should also be very careful not to make assumptions about the receiver's previous knowledge.

4. The **5W1H** technique can be used when you are receiving information. This will help considerably when determining what the message was and do you fully understand the instructions. This technique should immediately raise any doubts about the accuracy of what has been received and alert the receiver to seek further clarification. In other words did you understand the instructions? If not ask again.

5. The way the message is conveyed is very important. A clear voice with an appropriate tone will allow the receiver to concentrate on the message rather than trying to interpret the originator's mood. Appropriate tone and clarity are very important if the main intent of communication is not to be misconstrued resulting in costly and dangerous errors occurring.

6. Types of Workplace Communication

Typically like most other communication in the community, workplace communication can be:

a) Verbal – face to face
b) Verbal – over a landline or mobile telephone
c) Written – self initiated instructions or letters
d) Written – forms that need to be filled in
e) Written – job sheets, work orders and invoices
f) Technical specifications that relate to work to be done
g) Manufacturers' instructions that relate to components and parts
h) Technical literature – diagrams that need to be interpreted
i) Technical literature – information about installation
j) Body language – can convey emotions and mood
k) Electronic – email, texting, twitter, face book etc.
l) Signs and posters – information, advertising, safety instructions (danger tags)
m) Interaction between customers and clients
n) Signals from operating machines
o) Information transmitted by facsimile (fax) machine

7. Approach to Customers/Clients

The electrotechnology industry is a service industry and therefore requires customer – client interaction. This interaction can take many forms as listed previously. Service industries are critically reliant on the correct approach to customers and clients. The service person is the visible representative of the organisation (company) that they work for. This makes it very important for presentation with regard to attitude, language, manners, punctuality, conduct and dress to be of an appropriate standard. All these aspects need to be considered for each work site. What may be appropriate in one place may not be appropriate elsewhere.

8. The way a worksite is left after the job is completed is also an important aspect of communication. It conveys to the client/customer that their property and their business are important enough to clean up once a job is completed. Cleaning up after the job is completed reflects well on the individual, the company and others who work in the industry.

9. Approach to potential employers.

A personal résumé or curriculum vitae is a succinct record of your experience and qualifications. To make it relevant to your new employer it should contain a list of every job you have had, qualifications you have obtained and any personal experiences that emphasise your character and willingness.
Employers are busy people and do not want a document that rambles and is not easy to follow. To assist your prospective new employer, you should use a format and heading similar to the following:

Title

The title should be in the form of your name followed by your home address and contact phone numbers. Make sure you include both your home phone number and your mobile. If you have an email address include this as well.

Educational History

This is where you should date and describe your formal education at high school. You should follow up with any other qualifications you may have achieved at TAFE and university. Even if you didn't do well at school, it is worth listing the subjects that you achieved reasonable grades or liked, so that employers will know in which direction your interests and abilities lie.
Before listing your school achievements, remember that employers view the high school education with a wider angle than the focus on academic studies. Your high school education included other activities outside the classroom. Some questions that you should ask yourself that may help demonstrate your high school education:

- Were you a member of a sports team?
- Did you win any special prizes for sport?
- Did you have a position in the school such as councillor?
- Did you win prizes or distinctions for your school studies?
- If your left school before completing year 12, did you further your education at a technical college?

Work Placement

Include every job, casual or part time no matter how menial. Working at a fast food outlet as a kitchen hand may not seem relevant to gaining an electrical apprenticeship, but it will demonstrate to an employer that you can hold down a job and learned something of the rigours of the workplace. As a young person, all work experience is useful in gaining a full time job.

Extra-curricular Activities

Providing a list of activities, community groups and or hobbies that you take part in will provide a prospective employer a 'picture' of the person that you are. Being a member of a sports club or a volunteer in a community organisation, will demonstrate qualities such as personality, character, initiative and enthusiasm to a future employer.
When applying for a position with a company not only should you supply your résumé but also a well constructed covering letter.

Covering Letter

This letter is very important as it presents you to the company that you are hoping will employ you. The following format is an example of how this letter should be set out.

Your Name

Your Address

Company Name

Company Address

Company Contact

Date

Dear _____,

I would like to apply.....

I am currently studying.....

I am a.....

I look forward to discussing my qualifications further should I be granted an interview.

Yours Sincerely

Your Name

Sample Unsolicited Cover Letter

Your Name
Address
Suburb WA 6XXX
Phone: 04** *** ***

Date

Name of person in charge (if you can!!)
Company name
Address of Company
Suburb State Postcode

Dear Mr/Mrs xxxxxxx or (*Sir/Madam)*

I would like to apply for any position within (area of experience/skills) that may become available within your organisation in the near future.

The attached Résumé outlines my broad and varied background in the (area of experience/skills). My xxxxxxxx (qualifications), my xxxxxxxx (experience) provide the necessary background.

My practical/work encompasses a wide range of relevant knowledge and skills, such as (main points from résumé) gained over xxxx (time) relevant to this position/job (the job you are applying for).

Furthermore, I have knowledge, skill and experience in (other areas relevant to this job) Currently, I xxxxxx (describe you current position/duties/course/etc.)

Due to the above outline and my maturity, I believe I am will be a valuable asset within your company/organisation (include any relevant background info: progressive, expanding, etc).

Please allow me to contact you within the next 5 days to discuss my application and to answer any question(s) you may have. Thank you very much.

Yours sincerely (*if you use a name*)
Yours faithfully (*if you use Sir/Madam*)

Your name

enc

Referees

Your résumé needs to provide the contact details, usually a phone number, of at least two people that will act as your referees. Your referees will need to have known you for at least a year to provide a good impression of you to a future employer. Your best referees are previous employers, to provide work history, team coaches, to provide information on your personal qualities and teachers involved in your education.
You will need to first get permission from your prospective referee and second, to help them provide a positive impression of you, provide them with a copy of your résumé.

Remember, that a well written relevant résumé will demonstrate your ability to organise information to an employer. A résumé is a database about you. You can add, delete or change information at any time to suit a job application. The résumé you wrote at school needs to be continually updated. Information that was relevant then, may not be of any interest to a future employer.

Reference

Windschuttle, K. & Windschuttle, E. (1988). *Writing, researching, communicating: communication skills for the information age.* McGraw Hill: Sydney

Employment Interviews

General Interview Skills.

Research:-
Company
Job
Interviewer (if possible)

First impressions:-
Count
Allow preparation
Appropriate clothes
Body language
Eye contact

Geographic Preparation:-
Trial run
Check time arrival

Telephone interview

10. Possible Interview Questions (write down a response you could give when asked the following questions)

1. What personal strengths have you got to offer this company/position?

2. What experience can you offer this company?

3. What did you get from the pre-apprentice course that you have just completed?

4. Why did you apply for a job with this particular company?

5. What experience have you had in the electrical field prior to attending work experience?

6. Are there any modules that you have failed during the pre apprentice course?

7. If you are successful in this interview, when could you be able to start work?

8. Do you have any other employment at this stage? Would this effect your employment with this company?

9. Do you have any commitments that would prevent you working away at short notice?

10. Do you have any problems working with members of the opposite gender?

11. How do you feel about doing tasks that are not directly linked to the electrical trade?

12. Do you have a driver's licence and your own transport? If not, how will you get to building sites or to the workshop?

13. Do you object to hard physical work sometimes in harsh conditions?

Pre Interview Checklist

Do you have a clean outfit with appropriate accessories ready to go?	
Is your hair neatly trimmed?	
Do you have your presentation folder and portfolio folder together?	
Do you know where the interview is, and have you planned how you are going to get there?	
Have you thought about and practised possible interview questions?	
Have you reviewed your resume and personal records, the advertisement, company information?	
Have you revised the interview protocol?	
Have you checked the 'Interview Do's and Don'ts' list recently?	
When given the opportunity, you must ask some questions about the organisation to show an interest in the position. Some general examples are:	
• Where will I be working?	
• Who will I be working with?	
• How many people will I be reporting to?	
• What equipment will I be using?	
• Will you review my performance?	
• Will you provide any training?	
• Do you promote from within?	
• Are there any gaps in my abilities?	
• What made the previous employee in this position successful or unsuccessful?	
And, if they have not told you beforehand, towards the end of the interview you should ask them:	
Your specific questions -	
• What are the hours and conditions of employment?	
• What is the salary range for this position?	
• What is the time frame for making a decision on this position?	
• Is there anything in my background or experience to prevent you from considering me as a viable applicant?	

11. The Do's of Interviews

Switch your phone off or put on silent.
Give a firm handshake.
Wait to be asked to sit down.
If asked if you would like a coffee or tea, politely refuse but say a glass of water would be fine thank you.
Limit your nervous gestures.
Be polite and avoid slang.
Give eye contact.
Make your answers relevant to the job.
Leave the interview confident that the employer thinks you can do the job.
Tell the employer you have the necessary skills, training and experience for the job - turn negatives into positives.
Make up for lack of experience by drawing from study, part-time work and extra-curricular activities, and express them as transferable skills.
Think clearly before you answer the questions; don't blurt out the first thing that comes into your head.
Really listen to what the interviewer is saying.
If you do not understand a question, ask for clarification. For example: 'Do you mean...?' or 'Could you please explain what you mean by....?'
Never answer questions with only a 'Yes' or 'No', or 'I don't know', as this puts a barrier between you and the interviewer. You must elaborate on your answers. Try to get a balance between talking too much and talking too little.
Speak slowly and clearly.

The Don'ts of Interviews

Don't shrug your shoulders.
Don't slouch or show bad posture.
Don't fold your arms.
Don't chew gum.
Don't smoke for at least an hour before an interview.
Don't talk too much.
Don't talk too little.
Don't 'big note' yourself.
Don't belittle yourself.
Don't glance at your watch.
Don't wear sunglasses to an interview.
Don't smell of alcohol, smoke, strong perfume or foods.
Don't interrupt the interviewer.
Don't lie.
Don't ask for the job (no-one owes you a job).
Don't 'bad mouth' your school, college or a past employer.
Don't make rude comments about the surroundings.
Don't suggest how things should be done.
Don't show how desperate you are for a job.
Don't whinge or talk about personal problems.
Don't make jokes.
Don't answer a question that you don't understand: ask for clarification.
Don't take your boyfriend or girlfriend with you to an interview.
Don't stay at an interview where an interviewer is rude or insulting or sexually suggestive (no-one has to put up with that and no job is worth that much).
Don't mumble.
Don't speak too quickly.

The Employer's Viewpoint

An employer conducting an interview will use a format similar to the following:

The Beginning

Greeting

Thank the applicant for attending the interview.

Introduce the panel members and explain the purpose and structure of the interview, and that notes may be taken by the panel.

Tell the applicant he/she will have the opportunity to ask questions.

The Middle

Questions

The End

Tell the applicant that the questions are finished.

Advise the applicant about the conditions of selection.

Invite questions.

Advise the applicant of when contact can be expected (within 1 week).

Thank the applicant for attending.

Escort the applicant to the reception area and farewell.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE148A Section 2	Work Sheet 2-1	BLK 04/2013 KS01-EE148A/S/b

Communication in the Electro-technology Industry

1. Give three words which could be used to describe the essential characteristics of effective workplace communication.

2. What are three of the possible consequences of giving a customer or client incorrect information on a work site?

3. What is one mental technique which can be used to ensure that a particular workplace communication is understood?

4. Give an example of where making an incorrect assumption about a workplace instruction could result in inconvenience to the client.

5. List ten types of communication which may be used by a tradesperson in an electrotechnology workplace.

6. List five essential factors which must be considered in a tradesperson's approach to dealing with a customer.

7. Give an example of how ‘body language’ can have an adverse effect on communication with your employer.

8. List three questions you would ask an interviewer at the end of an interview to show that you are interested in the position.

9. List four (4) personal characteristics an employer would expect in a typical applicant.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE148A Section 2	Activity 2-1	BLK 04/2013 KS01-EE148A/S/b

Verbal Communication

Telephone Communication

Objective

Give an example of how to answer a telephone call from a client, what to ask and what information is required from the customer and how to record that information for future reference.

Equipment

Pen and paper

Procedure

Construct a prepared list of ten points that should be used when speaking to a client on business matters. Things to consider: how to start, identifying yourself, a greeting, finding out who you are speaking to, how do you find out the information you are after, confirming the message, how to end conversation.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Present your work to your lecturer for comment and signing off. Be prepared to use your list in a simulated task.

North Metro TAFE	**Electrotechnology Industry**		Activity 2-2	BLK 04/2013
Electrical Trades	EKAS 2.2.40	Section 2		KS01-EE148A/S/b

Written Communication Resume

Objective

To communicate in writing with a prospective employer.

Equipment

Pen and paper
Computer with a suitable word processing package

Procedure

1. Prepare an up to date resume that would be suitable to present to an Electrical Contracting Company. You may provide a previously prepared copy of your resume.

2. You can use Microsoft Word or similar and print off your completed resume or simply present it on a computer. **It is not necessary to disclose your personal details other than your name.**

3. Present your completed resume to your lecturer for comment and signing off as complete.

4. Include your resume in your folio for this module.

Written Communication Covering Letter

Objective

To communicate in writing with a prospective employer.

Equipment

Pen and paper
Computer with a suitable word processing package

Procedure

1. Prepare a covering letter that seeks an interview with an Electrical Contracting Company.

2. Use Microsoft Word or similar and print your completed letter. You may submit a previously drafted letter to your lecturer for marking. You may omit personal details but just leave your name on the document.

3. Present your completed letter to your lecturer for comment and signing off as completed.

4. Include your letter in your folio for this module.

North Metro TAFE	**Electrotechnology Industry**		Group Activity 2-4	BLK 04/2013
Electrical Trades	EKAS 2.2.40	Section 2		KS01-EE148A/S/b

Verbal Communication

Objective

To role play an interview between a pre-apprentice and a prospective employer.
Students work in pairs, one being the interviewer while the other being the interviewee, and then vice-versa.

Time allowed – Two Hours

Procedure

1. Find a suitable job advertisement either online or in print.

2. Working in pairs, prepare for the upcoming interview as an employer and as an employee.

3. Prepare a list of questions/ responses that you wish to ask during the interview.

4. Undertake the interview process with your fellow classmate.

5. Write down notes on how you felt you went in the interview as the prospective employee and two questions you think you answered well and two questions you think you could have answered better.

Training in the Electrotechnology Industry

Task:

To describe the training opportunities available in the electrotechnology industry.

Why:

The wide scope of the electrotechnology industry and the rapid rate of technological change means that worker in the electrotechnology industry will almost certainly have to undertake further training upon completion of their apprenticeship. Advancement in the industry will depend on being able to recognise opportunities when they become available and having the prerequisite qualifications to take advantage of these opportunities.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in an assessment testing your Skills and Knowledge on each (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must satisfactorily complete a final practical competency assessment.

Equipment:

Nil

References:

- Electrical Wiring Practice - Volume 1, Pethebridge and Neeson.
- Apprentice Safety Assessment Guidelines Pages 4-6
- WA Electricity Licensing Regulations Part 3
- UEE11 Training Package
- Safety Guidelines for Electrical Workers Pages 5-9

Training in the Electrotechnology Industry

Suggested Self Study Guide

1. Study the following sections in the recommended references:

Library Resources
Full details of all electrotechnology qualifications are available at the training.gov.au (www.training.gov.au) and or the EE-OZ website www.ee-oz.com.au
http://www.commerce.wa.gov.au
Go to **labour relations** then **pay rates and award summaries** then alphabet list **E** Then **Electrical Contracting Industry Award**
Western Australian Industrial Commission's website: www.wairc.wa.gov.au.

2. Read the Summaries and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

Training in Electrotechnology

Training Packages

1. The main vocational training system in Australia is based on what are known as: 'Training Packages'.
2. The Electrotechnology Training Package (UEE11) is a document which specifies the training and assessment requirements for a range of qualifications in the electrotechnology industry in Australia, and is one of many different packages available for other types of industry in Australia.
3. The qualifications are arranged in the six AQF levels ranging from Certificate I to Advanced Diploma. The qualifications that are of immediate concern to someone undertaking this course are highlighted in the following list.
4. Note how the numbering system works to identify each qualification level i.e. the 1st number indicates the AQF level, the three letters indicate the training package the qualification belongs to and then the final numbers indicate the stream of work the training applies to.

Sample List of UEE11 Training Package Qualifications

Certificate I Qualification

UEE10111 Certificate I in ElectroComms Skills

Certificate II Qualifications

UEE20111 Certificate II in Split Air-conditioning and Heat Pump Systems
UEE20411 Certificate II in Winding and Assembly
UEE20511 Certificate II in Computer Assembly and Repair
UEE20711 Certificate II in Data and Voice Communications
UEE20811 Certificate II in Electrical Wholesaling
UEE20911 Certificate II in Electronic Assembly
UEE21011 Certificate II in Fire Alarms Servicing
UEE21211 Certificate II in Antennae Equipment
UEE21311 Certificate II in Remote Area Essential Service
UEE20111 Certificate II in Split Air-conditioning and Heat Pump Systems
UEE20411 Certificate II in Winding and Assembly
UEE20511 Certificate II in Computer Assembly and Repair
UEE20711 Certificate II in Data and Voice Communications
UEE20811 Certificate II in Electrical Wholesaling
UEE20911 Certificate II in Electronic Assembly
UEE21011 Certificate II in Fire Alarms Servicing
UEE21211 Certificate II in Antennae Equipment
UEE21311 Certificate II in Remote Area Essential Service
UEE21411 Certificate II in Remote Area Power Supply Maintenance
UEE21611 Certificate II in Security Assembly and Set-up
UEE21711 Certificate II in Technical Support
UEE21911 Certificate II in Electronics
UEE22011 Certificate II in Electrotechnology (Career Start)
UEE22111 Certificate II in Sustainable Energy (Career Start)

Certificate III Qualifications

UEE30111 Certificate III in Business Equipment
UEE30211 Certificate III in Computer Systems Equipment
UEE30311 Certificate III in Custom Electronics Installations
UEE30411 Certificate III in Data and Voice Communications
UEE30611 Certificate III in Electrical Machine Repair
UEE30711 Certificate III in Switchgear and Controlgear
UEE30811 Certificate III in Electrotechnology Electrician 762
UEE30911 Certificate III in Electronics and Communications
UEE31011 Certificate III in Fire Protection Control
UEE31111 Certificate III in Gaming Electronics
UEE31211 Certificate III in Instrumentation and Control
UEE31411 Certificate III in Security Equipment
UEE31511 Certificate III in Rail - Communications and Networks
UEE32011 Certificate III in Renewable Energy - ELV
UEE32111 Certificate III in Appliance Service
UEE32211 Certificate III in Air-conditioning and Refrigeration
UEE33011 Certificate III in Electrical Fitting

Certificate IV Qualifications

UEE40111 Certificate IV in Computer Systems
UEE40211 Certificate IV in Electrical - Data and Voice Communications
UEE40311 Certificate IV in Installation Inspection and Audits
UEE40411 Certificate IV in Electrical - Instrumentation
UEE40511 Certificate IV in Electrical - Air-conditioning Split Systems
UEE40611 Certificate IV in Electrotechnology - Systems Electrician
UEE40711 Certificate IV in Electronics and Communications
UEE40811 Certificate IV in Electrical - Fire Protection Control Systems
UEE40911 Certificate IV in Industrial Electronics and Control
UEE41011 Certificate IV in Energy Management and Control
UEE41111 Certificate IV in Electrical - Lift Systems
UEE41211 Certificate IV in Electrical - Rail Signalling
UEE41511 Certificate IV in Video and Audio Systems
UEE41611 Certificate IV in Renewable Energy
UEE41711 Certificate IV in Rail - Communications and Network Systems
UEE41911 Certificate IV in Electrical - Renewable Energy
UEE42011 Certificate IV in Electrical - Photovoltaic systems
UEE42111 Certificate IV in Electrotechnology - Electrical Contracting
UEE42211 Certificate IV in Instrumentation and Control
UEE42611 Certificate IV in Hazardous areas - Electrical
UEE42711 Certificate IV in Air-conditioning and Refrigeration Servicing
UEE42811 Certificate IV in Air-conditioning Systems Energy Management and Control
UEE42911 Certificate IV in Refrigeration and Air-conditioning Systems
UEE43011 Certificate IV in Electrical Equipment and Systems
UEE43111 Certificate IV in Energy Efficiency and Assessment
UEE43211 Certificate IV in Industrial Automation and Control

Diploma

UEE50111 Diploma of Computer Systems Engineering
UEE50211 Diploma of Electrical and Instrumentation
UEE50311 Diploma of Electrical and Refrigeration and Air-conditioning
UEE50411 Diploma of Electrical Engineering
UEE50511 Diploma of Electronics and Communications Engineering
UEE50711 Diploma of Renewable Energy Engineering
UEE50811 Diploma of Research and Development
UEE50911 Diploma of Industrial Electronics and Control Engineering
UEE51011 Diploma of Instrumentation and Control Engineering
UEE51111 Diploma of Engineering Technology - Refrigeration and Air-conditioning
UEE51211 Diploma of Air-conditioning and Refrigeration Engineering
UEE53011 Diploma of Electrical Systems Engineering

Advanced Diploma

UEE60211 Advanced Diploma of Electronics and Communications Engineering
UEE60411 Advanced Diploma of Computer Systems Engineering
UEE60611 Advanced Diploma of Industrial Electronics and Control Engineering
UEE60911 Advanced Diploma of Renewable Energy Engineering
UEE61111 Advanced Diploma of Automated Systems Maintenance Engineering
UEE61211 Advanced Diploma of Engineering - Explosion protection
UEE61511 Advanced Diploma of Instrumentation and Control Engineering
UEE61711 Advanced Diploma of Engineering Technology - Electronics
UEE61811 Advanced Diploma of Engineering Technology - Computer Systems
UEE62011 Advanced Diploma of Engineering Technology - Renewable Energy
UEE62111 Advanced Diploma of Engineering Technology - Electrical
UEE62211 Advanced Diploma of Electrical - Engineering
UEE62311 Advanced Diploma of Electrical Engineering - Coal Mining
UEE62411 Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration

Units of Competence

5. The basic unit of training in any Training Package course is the Unit of Competence or Competency Standard Unit (CSU), and each qualification consists of one or more units of competence.

The units of competence are divided into elements and performance criteria to reflect a workplace activity, and supplementary information to indicate the required level and assessment conditions.

An excerpt taken from a unit of competence is shown below, the elements and performance criteria are detailed.

Full details of all Electro-technology **Units of Competence** can be located by using the search function located at www.training.gov.au

Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.
ELEMENT	**PERFORMANCE CRITERIA**
1 Prepare to use computer applications.	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2 Established OHS risk control measures and procedures in relation to computer and keyboard use are followed.
	1.3 Information required for the use of the application is obtained from appropriate sources.
	1.4 Computer is started up and desktop icons are manipulated to access desired application, directories and files.
	1.5 On-screen instructions in relation to any anomaly such as a virus warning are followed.
	1.6 Help directory is used to resolve any straightforward start up or access issues or anomalies.
2 Use computer basic application.	2.1 Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Information is added, altered or deleted as needed in accordance with application user instructions.
	2.3 Routine checks are made to ensure accuracy of information in accordance with quality requirements.

6. Units of Competence also detail the required Skills and Knowledge that the training must provide. Below is an excerpt from the same unit used above.

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level, required for this unit.
Evidence shall show that knowledge has been acquired of safe working practices using basic computer applications relevant to a workplace.
All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.
KS01-ED101A Basic Computer Applications
Evidence shall show an understanding of computer use basics to an extent indicated by the following aspects:
T1 Starting up
T2 Selecting application
T3 Entering information
T4 Saving
T5 Printing

7. To begin working in the electrotechnology industry a person needs to undergo a period of training involving basic electrical principles, devices and safe working processes.

This is followed by specialised training in the field of their choice, with appropriate experience in the workplace. If, at some later time, the person decides to change to another area of specialisation, he or she can do so by undertaking further training in the new area.

Areas of specialisation include:

- Control
- Energy Supply
- Installation and Servicing
- Plant Servicing
- Security
- Mining
- Fire Protection
- Maritime Installation
- Process
- Signalling

Registered Training Organisation (RTO)

8. A registered Training Organisation is one which has been formally recognised as being capable of providing the required training structure and assessment. The RTO is responsible for providing the training, assessment and workplace monitoring in accordance with the requirements of the Training Package and issuing the relevant qualification.

Other Training Opportunities

9. Many organisations such as equipment manufacturers offer specialised training on equipment they supply or service. These courses do not usually lead to a formal qualification, but evidence of having done the training may be required or preferred for particular activities. An example is the 'White Card' required to provide evidence of safety training on most construction sites.

Conditions of Employment

10. When a person accepts employment he or she does so under certain negotiated conditions. In some cases the employment conditions are negotiated between the individual parties, but in most large organisations the conditions are specified collectively in what is known as an 'Award'. Awards are usually negotiated between governments (state or federal) and relevant unions, and if employment is accepted under an award the conditions of employment are legally binding on the employer and the employee. A copy of the Electrical Contracting Industry Award is available from the Western Australian Industrial Commission's website www.commerce.wa.gov.au

11. Awards and other negotiated workplace agreements typically specify employment conditions such as:

- Wages & related matters
- Hours of work and overtime
- Annual and sick leave
- Long service leave
- Public holidays
- allowances
- Dispute resolution procedures
- Employee duties
- Holiday entitlements
- Special leave

12. Employers are usually required to supply the tools and equipment to perform all required tasks, including personal protective equipment, but in some cases a tool allowance is paid in lieu of providing smaller hand tools. Apprentices should check current Government web sites as there are often packages available to help in the purchase of tools and equipment.

13. A fundamental condition of employment is that employees must always make themselves familiar with all relevant occupational safety and health requirements, and observe them at all times during their employment.

14. Electrical contractors like all other employers have a reasonable expectation that employees should behave in a commonly acceptable manner. Competence, politeness, punctuality, loyalty, diligence, sobriety, honesty and efficiency are all qualities that come within these expectations.

Training in Electro-technology Industry

1. What is an RTO and what its purpose?

2. List four possible career paths that may be available to you within the electro-technology industry.

3. State three training opportunities of which may be available to you.

4. Research and write down an Electro-technology qualification for each of the following levels:
    a. Certificate III
    b. Certificate IV
    c. Diploma
    d. Advanced Diploma

5. What is a 'Unit of Competence' in a training package?

6. List six conditions of employment you would need to consider when deciding whether to accept a job offer.

7. What type of equipment is normally supplied by an employer in the workplace?

8. List six general personal characteristics an employer would expect from an employee in a typical workplace.

9. What is the purpose of an industrial award?

10. What is the current minimum wage for an employee under the electrical award if they are over twenty one years of age?

Preparing for a New Workplace

Task:

To describe the preparation that should be untaken prior to starting with a new employer in the electrotechnology industry.

Why:

There are procedures that should be observed when preparing for a new place of employment. The first day is important in the process of creating a favourable impression and making a great start with your new employer.

Equipment:

Pen and Paper
Computer and appropriate computer software

References:

- www.Myskills.gov.au
- www.training.gov.au
- www.commerce.wa.gov.au/LabourRelations/PDF/Awards/E/ElectricalContractingAward.pdf
- Western Australian Industrial Commission's website: www.wairc.wa.gov.au.

Preparing for a New Workplace

Suggested Self Study Guide

1. Study the following sections in the recommended references:

Library Resources
EE-OZ website www.ee-oz.com.au
http://www.commerce.wa.gov.au/LabourRelations
Western Australian Industrial Commission's website: www.wairc.wa.gov.au.

2. Read the Summaries and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

Preparing for a New Workplace

1. Upon gaining employment with a new company there are certain things that must be organised so that your transition to employment runs as smoothly as possible. Arriving on time at the right place and with the necessary equipment is very important on any working day but more so on the first day with the new company. It will set the tone for your future employment with the company and enhance your prospects for future advancement.

2. Some planning that can be done prior to the start date will help considerably with smooth operation of your first day at your new job. A typical checklist like the one following would be advantageous:

	Things to find out	Note
1	Name of the company	
2	Business phone number & Fax	
3	Business address	
4	Name of my supervisor	
5	Name and Position of contact person	
6	Telephone number and email of contact	
7	Reporting site address	
8	My transport arrangements	
9	Documents I require e.g. tax file number	
10	Tools & safety equipment I need to bring	
11	Start Time	
12	Finish Time	
13	Clothing	
14	White Card	
15	Training Licence	
16	Identification/Driver's Licence	
17	Contract details	
18	Personal Requirements e.g. lunch, medication	

North Metro TAFE Electrical Trades	Electrotechnology Industry RSAK KSO1- EE148A Section 4	Work Sheet 4-1	BLK 12/2012 KSO1-EE148A/AS/b

Preparing for a New Workplace

1. Why is it important to arrive on time and at the right place with all the right equipment?

2. List five important preparations that should be made prior to starting with a new employer. Give specific detail about each of these preparations.

3. What personal protective equipment would be required by a new employer when you are starting a new job?

North Metro TAFE Electrical Trades	Electrotechnology Industry RSAK KSO1- EE148A Section 5	Activity 4-1	BLK 12/2012 KSO1-EE148A/AS/b

Preparing for a New Workplace

Objective

To prepare a checklist for use when making arrangements to report to a new job or a new work site.

Equipment

Pen and paper
Computer

Procedure

1. Prepare a personal list using appropriate computer software (Microsoft 'excel') to prepare for a new work place. This is all the planning you would need to consider when planning to report to a new job that is in an unfamiliar area and a long way from where you currently live. Your list should include all the things relevant even a fictitious or real company name.

2. The list should be suitable for inclusion in your folio. Once completed print the list.

3. Include your list in your unit folio and present it to your lecturer for comment and assessment.

Equal Employment Opportunities (EEO)

Task:

Describe the general principles of an Equal Employment Opportunity policy and its implications in the workplace.

Why:

Knowledge of EEO is required in the workplace to ensure that you are aware of your rights and obligations and the rights and obligations of others. There are laws that everyone should be aware of.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in an assessment testing your Skills and Knowledge on each (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must satisfactorily complete a final practical competency assessment.

Equipment:

Nil

References:

- Equal Opportunity Act 1984 (WA)
- http://www.austlii.edu.au/au/legis/wa/consol_act/eoa1984250/

Equal Employment Opportunities (EEO)

Suggested Self Study Guide

1. Study the following sections in the recommended references:

Library Resources
Equal Opportunity Act 1984 (WA)

2. Read the Summaries and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

Equal Employment Opportunities (EEO)

1. The Equal Opportunity Act 1984 (WA) and the subsequent amendments make it unlawful to discriminate against people in the areas of employment, education, provision of goods, services and facilities, access to places and the activity of clubs on the grounds of:

a. Race
b. Sex
c. Marital Status
d. Pregnancy
e. Religious conviction
f. Political conviction
g. Impairment
h. Family status
i. Family responsibility
j. Age

2. The Equal Opportunity Act also makes sexual and racial harassment unlawful in employment, education and in relation to accommodation and makes it illegal to victimise anyone who makes a complaint on any of these grounds.

3. Therefore all employers and employees have a personal and organisational obligation to:

a. Demonstrate principles of fairness
b. Act in accordance with EEO policy
c. Support the practical application of any local EEO management plan

4. If you consider that you have been discriminated against in a manner which contravenes the Equal Opportunity Act you may appeal in writing to the Equal Opportunity Tribunal.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KSO1- EE148A Section 5	Work Sheet 5-1	BLK 12/2012 KSO1- EE148A/AS/b

Equal Employment Opportunities (EEO)

1. How does a satisfactory EEO policy benefit you as an employee in the electro-technology industry?

2. What action/s can you take if you consider that you are being discriminated against in the course of your employment or seeking of employment?

3. List five possible areas of unlawful discrimination under EEO legislation in WA.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KSO1- EE148A Section 5	Activity 5-1	BLK 12/2012 KSO1-EE148A/AS/b

Equal Employment Opportunities (EEO)

Objective

To locate a copy of the Equal Opportunity Act 1984 (WA) either in the Library or on the WA Government website and to identify one area of discrimination which may have a special interest for you.
Your task is to summarise two possible scenarios where this type of discrimination could have an effect on any workplace.
Each scenario is to define the type of discrimination, what steps were taken to prevent further discrimination and the possible effects it had on the person who was subjected to this this type of discrimination
These scenarios can be real or fictitious. Care should be taken if you are referencing a real situation **not to identify any of the person/s and/or company names involved**.

Equipment

Pen and paper
Computer

Procedure

1. Locate the act.

2. Identify a section of the act that you may have an interest in.

3. Detail the two real or fictitious scenarios related to the section of the act chosen.

4. In each scenario describe the type of discrimination that took place.

5. In each scenario describe how the situation was lawfully responded to under the act.

6. Indicate how in each scenario the situation was lawfully resolved within the framework of the act.

7. Present your work to your lecturer for comment and signing off as completed.

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Part Two

Unit of Competence – National ID - UEENEEE179A

Identify and select components, accessories and materials for energy sector work activities

This unit covers developing a schedule of work for appropriately selecting and identifying components, accessories or materials within an agreed time, to an acceptable quality standard and with a minimum of waste, using appropriate technology mediums where required.

1. Pre-requisites, Elements and Performance Criteria
2. Required Skills and Knowledge
3. Assignment Record Sheet
4. Ordering a New or Replacement Part
5. Identification of Electro-technology Accessories
6. Obtaining Information from a Catalogue or Online Search
7. Using online tools to purchase electro-technology equipment
8. Using a Workshop or Owner's Manual
9. Ordering Replacement Parts

References

* Catalogues provided by manufacturers and suppliers.
* CD ROMs provided by manufacturers and suppliers.
* Online Searches.
* Advertisements.
* Brochures and descriptive literature.
* Workshop and service manuals for designated equipment.
* Parts Lists/ Schedules

Prerequisite Unit(s)

Granting competency in this unit shall be made only after competency in the following units has been confirmed.

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace.

UEENEEE148A Carry out routine work activities in an energy sector environment.

Literacy and numeracy skills Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

ELEMENT		PERFORMANCE CRITERIA	
1	**Prepare to identify components, accessories and materials.**	1.1	Instructions for preparing components, accessories or materials identification is communicated and confirmed to ensure clear understanding.
		1.2	OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply in the carrying out of the work.
		1.3	Necessary tools, equipment and personnel protective equipment are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
		1.5	Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
		1.6	Schedule(s) for identifying components, accessories or materials including practices for working safely are confirmed in accordance with instructions and requirements.
2	**Select components, accessories and materials.**	2.1	OHS policies and procedures and safe work practices are followed.
		2.2	Schedule for selecting components, accessories or materials are followed to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste, using appropriate technology.
		2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	**Confirm selection of components, accessories and materials.**	3.1	Final checks are made to ensure selection of components, accessories or materials conforms to instructions.
		3.2	Appropriate personnel are notified of completion of the selection process.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

Required Skills and Knowledge

RSAK KS01 EE179A Parts and Component Selection

Evidence shall show an understanding of electrotechnology, parts and component selection to an extent indicated by the following aspects:

T1 Part and component identification encompassing:

- Type, number and ratings of a range of typical components used in the electro-technology and engineering industries

T2 Information about parts and components encompassing:

- Catalogues
- Computer access
- Alternative parts
- Telephone inquiry

Note: Examples of part identification and access may include: part codes, manufacturers and manufacturers supply outlets; availability and delivery times; price, including discounts, tax and delivery costs.

T3 Ordering procedures encompassing:

- Customer approval
- Supplier requirements
- In-house requirements

T4 Receiving/dispatching procedures

- Supplier requirements
- In-house requirements

Handling and storage

:

Note: This information and current details of critical aspects for each competency standard unit (CSU) in this qualification can be found at www.training.gov.au

Assignment Record Sheet

Parts and Component Selection

Name:	Student ID No.

Activity	Topic	Date	Lecturer	Required Skills and Knowledge
Sheet 1-1	Ordering replacement parts			E179(T1,2,3,&4)
Activity 1-1	Identification of Electrotechnology Accessories			E179(T1,2,3,&4)
Activity 1-2	Obtaining Information from a Catalogue or Online Search			E179(T1,2,3,&4)
Activity 1-3	Obtaining Information from the internet			E179(T1,2,3,&4)
Activity 1-4	Using a workshop manual to order parts			E179(T1,2,3,&4)
Activity 1-5	Ordering a new replacement part			E179(T1,2,3,&4)

Workplace Rules:

Rule 1 Follow the instructions
Rule 2 Tolerate ambiguity
Rule 3 Meet your obligations

Ordering a New or Replacement Part
Introduction

Task:

To identify parts and accessories and use available resources to arrange to obtain suitable new or replacement parts.

Why:

The ability to identify parts and obtain suitable replacements is a critical skill in the electrotechnology industry.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in an assessment testing your Skills and Knowledge on each (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must satisfactorily complete a final practical competency assessment.

Equipment:

Stationery
Computer hardware and software
Internet connection and authorisation
Electrical Accessories

References:

- Blackboard LMS
- Manufacturers' catalogues.
- Catalogues provided by manufacturers or suppliers.
- CDROMs provided by manufacturers or suppliers.
- The Internet.
- Advertisements.
- Brochures and descriptive literature.
- Workshop manuals for equipment.

Suggested Self-Study Guide

1. Access the following recommended references:

   Manufacturers' catalogues
   Workshop manuals
   Advertisements
   http://www.clipsal.com/trade/home
   http://www.hpm.com.au
   http://www.arlec.com.au
   http://www.cmielectrical.com.au
   http://www.sparkydirect.com.au
   http://www.omegapower.com.au
   http://www.mjselectricalsupplies.com.au
   http:schnap.com.au

2. Read the Summaries and practise answering the questions provided on the Work Sheets.
   Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Present your completed work to your lecturer for comment and signing off as complete.

Ordering a New or Replacement Part

1. A critical part of the process of installation and/or maintenance of equipment is the acquisition of new or replacement components or assemblies. Processes which result in the incorrect part being ordered, obtained and used may result in:

a. Unnecessary delays in installation or repair.
b. Customer dissatisfaction.
c. Increased transportation costs.
d. Loss of production.
e. Incorrect operation of equipment.
f. Damage to other related parts or assemblies.
g. Increased administrative time and costs to correct the error.
h. Tension between you and the supplier and/or carrier.
i. injury

It will depend on the company as to whether individual electricians order parts. A smaller company will place more responsibility on the individual to order the parts, whereas a large company will have an ordering department and the electrician will get parts ordered through this department. The electrician will still need to have a clear knowledge of the parts and components he/she needs.

Item Identification

2. When ordering a part the supplier must be provided with enough information to identify the part exactly, and pick-up or delivery arrangements must be made so that both parties know what they are expected to do in the process.

3. The information necessary to accurately identify the required part may come from one or more of several sources such as:

a. The actual part with the part number stamped on it
b. Written specifications (with detailed part number) associated with a new construction project.
c. A verbal description of the part.
d. A drawing or sketch of the part.
e. A description or part number of the same part on a similar machine or project.
f. Information provided by the manufacturer.
g. Information from local personnel.

Locating a Supplier

4. When the part has been precisely identified the process of locating a supplier can begin. The most common sources of information relating to specific parts or products include:

a. Catalogues provided by manufacturers or suppliers.
b. CDROM provided by manufacturers or suppliers.

c. The Internet.
d. Advertisements.
e. Brochures and descriptive literature.
f. Workshop manuals for the equipment (which often include exploded views of parts).
g. Telephone or fax enquiries to suppliers.
h. Work colleague

Local Acquisition Policy

5. Most firms have an acquisition policy which specifies the person authorised to approve purchases and the person authorised to place orders for parts and equipment. There is often a storeperson or a purchasing officer in a despatch and receipt area where relevant documentation can be processed and stored. This will require an internal requisition form to be filled out.

If the electrician has been given permission to order parts directly the employer will indicate one of the following purchasing methods:

- Issuing order books with an order number to accompany each order
- Petty cash
- A company credit card

6. In cases where a replacement part is required for a particular customer, the customer's approval needs to be obtained before the part is ordered. It will be necessary to clearly indicate the price to the client. This price should include GST and in some cases a handling charge. Being aware of the GST (Goods and Services Tax) is very important because the customer will not be obliged to pay it, if it hasn't been clearly stated at the time. Some companies are exempt from GST and purchasing goods on their behalf will require filling out an exemption form at the point of purchase. GST is 10% in Australia and failure to identify it during the purchasing process can become a large financial impost on the company after the purchase.

Details for Orders

7. A very important part of the purchasing process is clear communication with the client and the supplier.

Customer communication:

- Discussion regarding the parts cost and its cost compared to the replacement cost of a new machine. If the part is more than half the cost of the machine the client may opt for a new machine.
- Discuss whether the replacement is a genuine part or an aftermarket replica
- Discuss whether the part is even available
- Discuss whether the customer wants to purchase the item themselves
- Discuss whether the customer wants to proceed at all.

Supplier communication:

8. A simple form of order could be a telephone call to the supplier with details such as:

- Name of part
- Catalogue and catalogue number
- Quantity required
- Delivery name and address

Communication with the supplier needs to be clear and precise. The most important information for a supplier is the model number of the part required. If the part is out of date a similar part may have to be found. Failure to find the direct model or part number will require other relevant information so that a suitable replacement can be found.
Information such as:

- Voltage ratings
- Current ratings
- Number of poles
- Physical dimensions
- Material it is made from
- Dimensions
- How it operates
- Where it is to be installed
- How it is to be attached
- Cable entry required

9. **Relationship with supplier**

A good supplier relationship is important. A repeat customer will become a valued client who will get good service and prompt delivery. Discounts and helpful advice will follow on. Bulk purchases and repeat purchases will ensure better service and further benefits such as 30 days credit on goods purchased. A regular wholesale provider will save the business considerable time and money. Finding the right supplier can involve research on the internet, using a suitable business directory such as the yellow pages or contacting the companies' regular supplier to see if they have a contact that can help.

10. A regular Wholesale supplier will solve many of the following issues which would need to be dealt with if making a one off order. Sometimes the part required may have to be ordered from interstate or overseas. Substantial negotiation would be necessary to agree on the following details.

Policies for parts and back orders	Delivery date/time
Costs for part and transportation	Discount
Packaging for transportation	Environmental considerations
Couriers	Material
Transportation insurance	Mounting position
Transportation method	Payment arrangements (airbags)
Potential transportation hazards	Preferred supplier
Customs requirements	Quotations
Size	Taxation (GST)
Suppliers conditions	Terms of payment
Supplier's returns policy	Unit of issue
Surface finish	Warranty arrangements

Receipt of Parts

11. When the replacement part is received:

- the part and details need to be checked against the order to ensure that the required part has been supplied
- the packaging should be checked for the correct quantity
- and that no part is broken or missing

If all aspects are correct the invoice can be passed to the appropriate person for payment in accordance with local procedures. A sample indicating the type of information that can appear on a typical Tax Invoice is given below.

12. If the part is found to be incorrect or unsatisfactory, immediate action needs to be taken to determine the source of the error. Possible sources of error include:

a. The part was incorrectly identified on the original order.
b. The supplier sent the wrong part.
c. The part was damaged in transit.
d. The part is incomplete.

13. If the part is unsatisfactory because of some act or omission on the part of the supplier, the supplier should be contacted immediately to report the situation so that corrective action can be negotiated. Most suppliers are usually keen to correct any situation which reflects poorly on their organisation.

14. A reliable wholesaler (supplier) is dependable and keen to keep up an unfailing service as long as the invoice is paid by the due date. Failure to pay by the due date may result in any of the following consequences:

- The companies' account being frozen until the account is paid. This means that equipment can't be purchased from the supplier until the account is paid.
- A reduction in the companies' future credit limit and time
- Debt collectors being engaged to recover the account
- The companies' reputation will be tarnished with other suppliers

Tax Invoice

PreApp Electrical Supplies 18 Loxwood Road Balga WA 6061 Telephone: (08) 9207 4340 Fax: (08) 9207 4333 ABN Number: 0000 000 000	Customer Account Number:

To	Delivery Address

Date	Despatch Method	Payment Terms	Delivery Instructions	Representative

Items

Quantity	Item #	Part Description	Value	Unit of Issue	Tax	Amount

Total Payment Due:	

Packed by:		Date:
Inspected by:		Date:
Received by:		Date:

North Metro TAFE Electrical Trades	**Ordering a New or Replacement Part** RSAK KS01-EE179A	Work Sheet 1-1	BLK 04/2013 KS01-EE179A/SI/a

Ordering a New or Replacement Part

1. What are four likely effects of ordering the wrong replacement part when working in a remote location?

2. List five possible sources of information which should be used when identifying a particular replacement part for a given machine.

3. What are three reasons why is it important to obtain a customer's approval before ordering a replacement part?

4. List four basic items of information which must be given when placing an order by telephone.

5. List four possible methods of locating a supplier for a particular item of equipment.

6. Give two possible sources of error if an incorrect or unsatisfactory part has been received from a supplier.

7. List four aspects of placing an order which may require negotiation with the supplier.

8. Why is it important to retain receipts of any parts received?

9. Different companies have different policies when it comes to ordering equipment. If an employee has been given permission to purchase equipment from a supplier direct, what are two possible ways of making a purchase?

10. What is the course of action when an item that has been ordered arrives and is found to be broken?

11. What are three possible consequences of not paying an invoice at the appropriate time?

12. List six Electrical Wholesalers in Western Australia who could supply electrical equipment, cable and accessories generally used within the industry.

Assignment: Ordering a Replacement Part

Satisfactory		Not Yet Satisfactory	

Lecturer:_____ Date_____

North Metro TAFE Electrical Trades	**Ordering a New or Replacement Part** RSAK KS01-EE179A	Activity 1-1	BLK 04/2013 KS01-EE179A/SI/a

Identification of Electrotechnology Accessories

Objective

To identify specific examples of various types of electrotechnology accessories from manufacturers catalogues.

Equipment

Access to online search engines
Relevant manufacturer's catalogues and price lists.
SAA/SNZ HB3:1996 Handbook. Electrical and electronic drawing practice for students.
AS 1102 Graphical symbols for electrotechnical documentation.

Procedure

1. Use the catalogues supplied to obtain size and type, catalogue number and price for the electrical accessories whose common names are given below. The information you provide should be sufficient to order a specific accessory without any confusion

2. Present your completed work to your lecturer for comment and signing off as complete.

	Common Name	Size and Type	Cat. Number	Catalogue	Trade Price single unit
1	Appliance Plug Top				
2	Bayonet Cap Batten Holder				
3	Cable Tie				
4	Edison Screw Batten Holder				
5	Ceiling Exhaust Fan				
6	Screwed Metal Conduit Tee				
7	Double Screw Connector				
8	Single Screw Connector				
9	Cord Extension Socket				
10	Corrugated Conduit				
11	Din Rail				
12	Earth Clip				
13	Earth Tag				
14	Earth Stake				
15	Floor Outlet				
16	Four Gang Switch Plate				
17	Four Terminal Ceiling Rose				
18	General Purpose Outlet				
19	Half Saddle				
20	TPS Junction Box				
21	Neutral Link				
22	Metal Wall Box				
23	PVC mini trunking				
24	Metal Conduit Nipple				
25	15 Amp Outlet				
26	PVC conduit bending spring				
27	PVC conduit bush				

	Common Name	Size and Type	Cat. Number	Catalogue	Trade Price single unit
28	PVC conduit saddle				
29	PVC conduit bush				
30	PVC wall box				
31	PVC conduit coupling				
32	PVC conduit elbow				
33	PVC conduit bend				
34	PVC conduit inspection tee				
35	PVC conduit lock ring				
36	PVC conduit 2 way junction box				
37	Single Pole Miniature Circuit Breaker				
38	Residual Current Device				
39	Straight Terminator				
40	15 Amp Plug Top				
41	Three Phase Outlet				
42	Tunnel Connector				
43	TPS Cable Clip				
44	Combination RCD				
45	Weather Proof Batten Holder				
46	Downlight				
47	Smoke Detector				
48	Exhaust Fan				
49	Ceiling Fan				
50	Fluorescent Light				

Assignment: Identification of Electro-technology Accessories

Satisfactory		Not Yet Satisfactory	

Lecturer:_____ Date_____

Obtaining Information from a Catalogue or Online Search

Objective

To prepare a list of electrical accessories using manufacturers' catalogues and an electrical floor plan.

Equipment

Access to online search engines
Relevant manufacturer's catalogues.
Floor plan of a basic domestic installation
SAA/SNZ HB3:1996 Handbook. Electrical and electronic drawing practice for students.
AS 1102 Graphical symbols for electrotechnical documentation.

Procedure

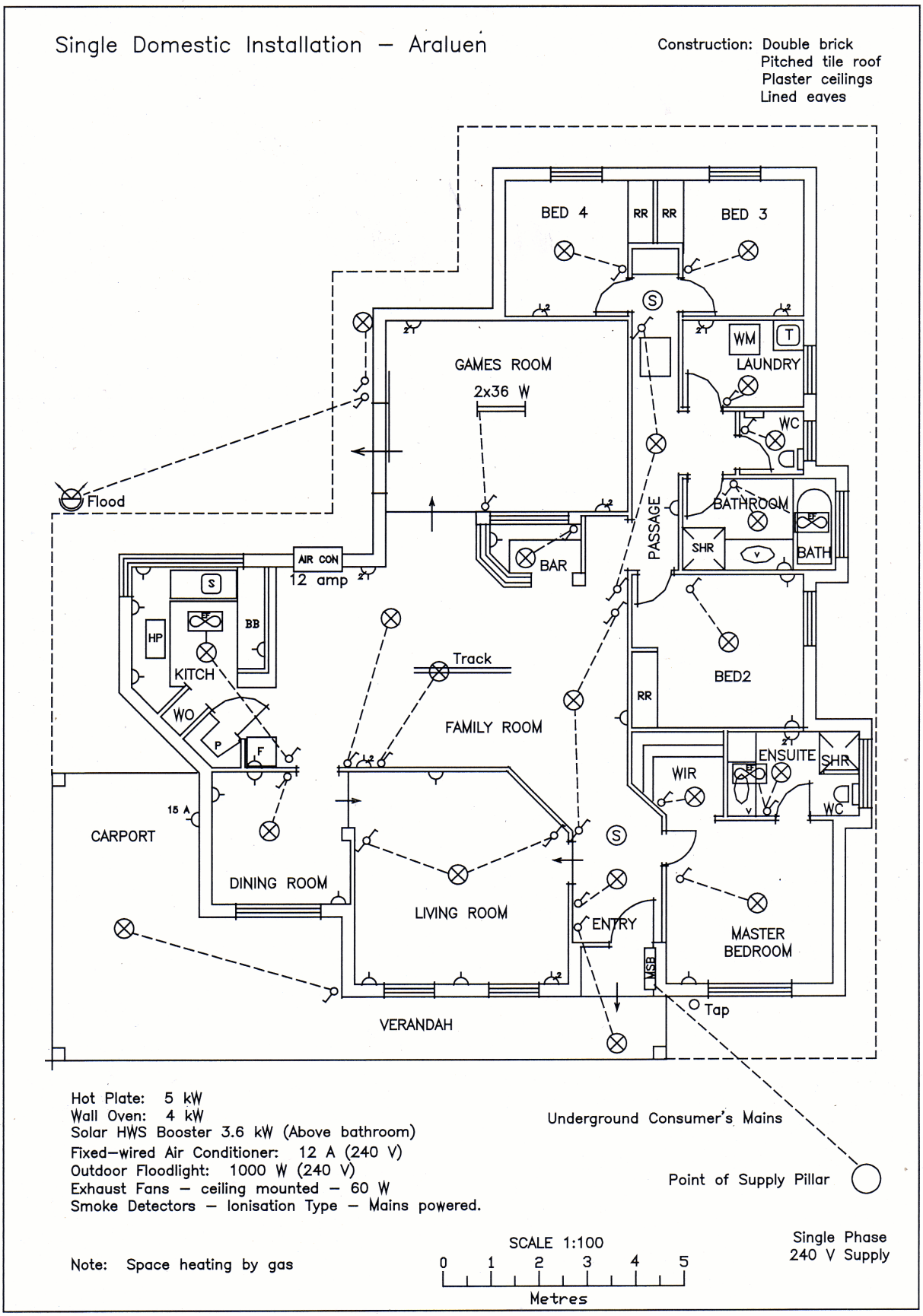
1. Use the catalogues supplied to obtain details of the electrical accessories shown on the given electrical floor plan.

2. Show the total cost of the items to be ordered.

3. Present your completed list to your lecturer for comment and signing off as complete.

4. Include your list of items in your folio for this unit.

Floor Plan:



Araleun2.dwg

Order Form

Supplier:	Order Number:	Date:

Please Supply:

Item	Cat./Part Number	Quantity	Unit of Issue	Cost per Unit	Total Cost
Exhaust Fan	**Airflow CE200**	**3**	**1**	$29.95	$89.85
				Total Cost:	

Despatch to: PreApp Electrical Services 18 Loxwood Road Balga WA 6061	Method:	Date Required:

Signature: _____ Position: _____

Assignment: Obtaining Information from a Catalogue or Online Search

Satisfactory		Not Yet Satisfactory	

Lecturer:_____ Date_____

Using online tools to purchase electro-technology equipment

Objective

To obtain from suppliers on the internet, details of 3 different digital multimeters suitable for general use in electrical work.

Equipment

Internet connection.

Procedure

1. Access the Internet using the authorisation details provided by your lecturer.

2. Open a typical Internet browser using details provided by your lecturer.

3. Use the Internet browser to search for 3 different digital multimeters suitable for general use in electrical work including:

Supplier:	
Manufacturer 1:	
Type or Model:	
Catalogue No:	
Price:	

Supplier:	
Manufacturer 2:	
Type or Model:	
Catalogue No:	
Price:	

Supplier:	
Manufacturer 3:	
Type or Model:	
Catalogue No:	
Price:	

4. Include the results of your research in your folio for this module.

Assignment: Obtaining Information from Internet

Satisfactory		Not Yet Satisfactory	

Lecturer:_____ Date_____

North Metro TAFE Electrical Trades	**Using a Workshop Manual** RSAK KS01-EE179A	Activity 1-4	BLK 04/2013 KS01-EE179A/SI/a

Using a Workshop or Owner's Manual

Objective

To find a replacement part for the appliance your lecturer designates.

Equipment

Access to online search engines
Enrolment to unit module on Blackboard LMS
Phone book

Procedure

1. Use the research skills you have developed through this unit to find a replacement part for the electrical appliance your lecturer gives you.

2. Use the skills you have developed to firstly download an owner's manual for the item and then use this manual to work out what part number you will need to quote.

3. Use an online search engine or a suppliers catalogue to search for the part and fill in the missing information.

4. Describe the source of the information that determined the source of the part, the details of the part in the table and then submit it to your lecturer for signing off as complete.

5. Ask your lecturer to choose one from the following:

- Element for a hot water system
- Element for a stove hot plate
- Timer for a wall oven
- Green LED indicator for a remote stop start
- Broken RJ45 wall socket
- Lecturer suggestion

Details of part/ component required

Supplier:		
Manufacturer :		
Type or Model:		
Catalogue No:		
Price:		

Assignment: Using a Workshop or Owner's Manual

Satisfactory		Not Yet Satisfactory	

Lecturer:_____ Date_____

North Metro TAFE	**Ordering a New or Replacement Part**	Activity	BLK 04/2013
Electrical Trades	RSAK KS01-EE179A	1-5	KS01-EE179A/SI/a

Ordering Replacement Parts

Objective

To obtain from a catalogue or the internet, the itemised replacement parts.

Equipment

Internet connection.
Catalogues provided

Procedure

1. Access the Internet using the authorisation details provided by your lecturer or collect the required catalogue.

2. Open a typical Internet browser using details provided by your lecturer or look up a catalogue.

3. Use the Internet browser or catalogue to search for the parts listed below and fill in the missing information:

Component	Supplier:	Manufacturer	Type or Model	Size	Resistance/ Capacitance/ VA rating and other	Catalogue Number	Resistance Tolerance/ Capacitive Tolerance/ Operating Temp	Price
Wire wound potentiometer								
Resistor								
Zener Diode								
Capacitor								
Variable Resistor								
Solenoid								
Transformer								

Assignment: Ordering a New Replacement Part

Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

PART THREE

Unit of Competence – National ID -UEENEEE141A

Use of routine equipment/plant/technologies in an energy sector environment

Energy sector equipment/plant/technologies

This unit covers the use of routine tools, equipment and personnel protective equipment required to do work in the energy sector environment, in accordance with the schedule of work to ensure that the work is completed within an agreed time-frame, at an acceptable standard of quality and with a minimum of waste.

Contents

Modern generation methods

Electricity transmission and distribution systems

Distribution of electricity to consumers

Distribution of electricity in the consumer's installation

References

- Electrical Wiring Practice Volume 1,Chapter 1 Keith Pethebridge and Ian Neeson, McGraw-Hill Australia
- WA Electricity (Licensing) Regulations 1991
- Electrotechnology Training Package (UEE 11) (or extracts).
- WA Electrical Requirements
- Australian/New Zealand Wiring Rules AS/NZS 3000:2018

Pre-Requisites

UEENEEE101A

Apply Occupational Health and Safety regulations, codes and practices in the workplace

Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	3	Writing	3	Numeracy	3

Employability Skills Information

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a competency standard unit	Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to use routine equipment, plant and technologies	1.1 Instructions in the use of routine equipment, plant or technologies are communicated and confirmed to ensure clear understanding.
	1.2 OHS policies and procedures are communicated and confirmed to ensure they are understood as they apply in the carrying out of the work.
	1.3 Tools, equipment and personnel protective equipment necessary for the work are identified, scheduled and checked to ensure they work correctly as intended and are safe to use in accordance with established procedures.
	1.4 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved.
	1.5 Resources and materials needed to do the work are confirmed, scheduled and obtained in accordance with established procedures.
	1.6 Schedule of work including practices for working safely are confirmed in accordance with instructions and requirements.

2	Use routine equipment, plant and technologies	2.1	OHS policies and procedures and safe work practices are followed to eliminate or minimise incidents.
		2.2	Routine equipment, plant or technologies are used in accordance with schedule of work to ensure work is completed in an agreed time, to a quality standard and with a minimum of waste.
		2.3	Further instructions are sought from appropriate personnel in the event of unplanned happenings or conditions.
		2.4	Ongoing checks of work quality are undertaken in accordance with instructions and requirements.
3	Complete use of routine equipment, plant and technologies	3.1	Final checks are made to ensure the use of routine equipment, plant or technologies conforms with instructions and to requirements.
		3.2	Appropriate personnel are notified of completion of the work using routine equipment, plant or technologies.
		3.3	Tools, equipment and any surplus resources and materials are, where appropriate, cleaned, checked and returned to storage in accordance with established procedures.
		3.4	Work area is cleaned up and made safe and sustainable energy practices are followed.
		3.5	Appropriate records are updated in accordance with instructions and established procedures.

Required Skills and Knowledge covered in this section of the resource book

KS01-EE141A Energy sector equipment/plant/technologies

Evidence shall show an understanding of energy sector equipment/plant/technologies to an extent indicated by the following aspects:

T1 Electrical concepts encompassing:

- Electrical supply and distribution within a building or premises
- Arrangement of circuits
- Protection for safety requirements and their practice
- Difference between alternating and direct current
- Measurement and calculation of voltage, current, resistance and power in practical circuits.
- Concepts and applications of magnetism and electromagnetic induction
- Transformer operating principles and their application
- Hazards associated with electrical systems and apparatus.

Note: This information and current details of critical aspects for each competency standard unit (CSU) in this qualification can be found at www.training.gov.au

Energy Sector Equipment, Plant and Technologies and Practises

Achievement Record Sheet

Name:	Polytechnic ID No:	App No:
Address:		Organisation:

Activity	Topic	Date	Lecturer	Required Skills and Knowledge
Sheet 1-1	Electrical energy past present and future			E141 (T1)
Activity 1-1	Researching a significant event in the history of the electricity supply industry			E141 (T1)
Activity 1-2	To research a significant person in history of electrical generation			E141 (T1)
Activity 1-3	To research a generation method (Presentation)			E141 (T1)
Worksheet 1-4	Direct and Alternating Current			E141 (T1)
Activity 1-4	Magnetism Practical			E141 (T1)
Activity 1-5	Transformer and Induction Practical			E141 (T1)

Workplace Rules:

Rule 1 Follow the instructions
Rule 2 Tolerate ambiguity
Rule 3 Meet your obligations

Development of Electricity Supply Systems

Task:

To develop an understanding on the history and the development of modern electricity supply systems. Electricity is a major modern energy source and this section outlines the process of generation, transmission and distribution of electricity.

Why:

Knowledge of the history is necessary so that those involved in the industry are aware of the part electricity plays in modern society and why distribution systems are important.

To Pass:

1. You must correctly answer the questions on the Work Sheets provided and achieve a mark of 75% or more in a knowledge test for each relevant Required Skills and Knowledge (RSAK) topic.

2. You must satisfactorily complete the set activities and laboratory tasks.

3. You must achieve 100% in a final practical competency assessment.

Equipment and resources:

Enrolment in unit module on Blackboard LMS
Access to workshop equipment, appliances and tools

References:

- Electrical Wiring Practice - Volume 1, Pethebridge and Neeson.(Chapter 1)
- http://www.powerworks.com.au
- http://www.aemo.com.au (regarding National Electricity Market)
- http://www.snowyhydro.com.au/
- http://www.etsautilities.com.au/centric/home.jsp
- http://www.ena.asn.au/
- http://inventors.about.com/library/inventors/blelectric.htm

- WA Electricity Licensing Regulations
- UEE11 Training Package
- WA Electrical Requirements
- Australian/New Zealand Wiring Rules AS/NZS 3000:2018

Development of Electricity Supply Systems

Objectives

- To provide an overview of the history of the development of the electricity supply system.
- To discuss modern methods of generation including renewable energy and sustainable energy practices.
- To describe the electricity transmission and distribution systems.
- To introduce the three-phase, four-wire electrical supply system.
- To consider the process of obtaining connection to the electricity supply system.

1. Study the following sections in the recommended references:

Electrotechnology Practice:
Electrical Wiring Practice - Volume 1, Pethebridge and Neeson. (Chapter 1 Section 1.1, 1.2, 1.4, 1.5 and 1.6
Electrical Licensing and 3.2 Standards)
WA Electrical Requirements Section 6
Australian/New Zealand Wiring Rules AS/NZS 3000:2018 (Scope and Application

The following websites;

- http://www.powerworks.com.au
- http://www.aemo.com.au (regarding National Electricity Market)
- http://www.snowyhydro.com.au/
- http://www.etsautilities.com.au/centric/home.jsp
- http://www.ena.asn.au/
- http://inventors.about.com/library/inventors/blelectric.htm

2. Read the Pethebridge and Neeson Volume 1 Chapter One and practise answering the questions provided on the Work Sheets. Refer to other relevant texts if you feel it is necessary.

3. Answer the questions given on the Work Sheets. Use a separate answer sheet or sheets for each Work Sheet. Note that you are required to answer ALL questions correctly, although not necessarily at the same time.

4. Complete the activities in this Section.

5. Submit your answers to the Work Sheets and your completed activity sheets to your Lecturer for discussion.

North Metro TAFE Electrical Trades	**Electrotechnology Industry** RSAK KS01-EE141A Section 1	Study Guide 1-1	BLK 04/2013 KS01-EE141A/SI/a

Development of Electricity Supply Systems

Suggested Self-Study Guide

Read the following information provided and use as a reference to answer the worksheet questions.

<u>An excerpt of the following is available on the Blackboard LMS module for this unit.</u>

Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.1 **A brief history of electrical production and supply**
Discoveries and development of electrical energy, Table 1.1
Brief history of the electrical supply industry, Table 1.2
Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.2, **Modern generation methods**
Figures 1.2 a, b, c and d.
Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.3 **Renewable energy and sustainable energy practices**
Renewable energy sources, Figures 1.3a, b, c, d, e, f, g and h.
Generating and using energy efficiently
Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.4 **Electricity transmission and distribution systems**
Figures 1.4 a, b and c
Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.5 **Distribution of electricity to consumers**
Page 16, Figures 1.5 a and b
Read Pethebridge and Neeson Volume 1 Chapter 1 Section 1.6 **Distribution of electricity to consumer's installation**
Getting connected to the supply network, Figure 1.6
Notification of intention to carry out electrical work, Table 1.3
Financial contribution
Verification of compliance, Figure 1.6b
Connecting the supply
Dealing with defective work
Situations requiring special procedures

North Metro TAFE	**Energy Sector equipment/plant/technologies**	Work Sheet	BLK 04/2013
Electrical Trades	RSAK KS01-EE141A Section 1	1-1	KS01-EE141A/SI/a

Answer all of the following review questions taken from page 21 of Pethebridge and Neeson Volume 1 Chapter 1

1. How does coal-powered thermal generation work?

2. In what year did Western Australia first receive a public electricity supply?

3. What invention is considered to be the introduction of public electricity supply?

4. Describe the basic principle of electricity generation in an alternator.

5. At what voltages do steam turbine driven alternators produce electricity?

6. How is the steam that is used to drive the turbine, isolated from the reactor in nuclear-powered thermal generation?

7. How is the thermal efficiency of a gas turbine alternator increased?

8. Why is it important to drive a generator at a particular constant speed?

9. Apart from being a clean energy source, name an advantage hydro generation has over steam generation?

10. What is hot rock technology?

11. How can water be reused for power generation in a hydro scheme?

12. List some common applications of direct power generation.

13. Give an example of efficient use of energy.

14. What is an advantage of the three-phase a.c. systems?

15. What was the main disadvantage of the original d.c. supply systems?

16. Describe the principles and advantages of modern d.c. transmission.

17. How are the conductors in a three phase low-voltage system designated?

18. The force of attraction between two electric charges is inversely proportional to the square of their distance, is a law is of electrical physics. Who is the law named after?

19. What are the typical primary and secondary transmission voltages?

20. What role does the sub-station play in the transmission and distribution of electricity?

21. Who or what determines how much energy is needed from the electricity supply system at any one time?

22. What is the most common distribution system to consumers in Australia and New Zealand?

23. Explain the function of the fourth conductor in the three-phase low voltage distribution system.

24. Illustrate the SWER system showing the typical voltages it supplies.

25. List the configurations of low-voltage supply to consumers.

26. How is the protective earth and neutral (PEN) conductor arranged in the consumer's installation?

27. Describe the wiring rules requirement for arrangement of electrical installations.

28. List the components of a consumer's installation that are installed at a main switchboard.

29. Briefly describe the main process involved in connecting supply to a consumer's installation.

30. What actions are taken if an inspector finds an installation to be defective?

31. Name three aspects of electrical work typically covered in service and installation rules.

32. Describe a situation where special procedures are used for inspection and connection or disconnection of supply.

North Metro TAFE	**Energy Sector equipment/plant/technologies**		BLK 04/2013
Electrical Trades	RSAK KS01-EE141A Section 1	Activity 1-1	KS01-EE141A/SI/a

Researching a significant event in the history of the electricity supply industry

Objective

To research one of the significant events set out in tables 1.1 and 1.2 (pages 3 and 4 Pethebridge and Neeson).

Equipment

Internet
Library

Procedure

1. Access the Internet or Library and obtain enough information to fill one type written A4 page.

1. Use the Internet or Library catalogue to search for the information required to fill in the A4 page.

2. Submit your research as a completed activity sheet to your Lecturer for discussion.

North Metro TAFE	**Energy Sector equipment/plant/technologies**		BLK 04/2013
Electrical Trades	RSAK KS01-EE141A Section 1	Activity 1-2	KS01-EE141A/SI/a

In your opinion who made the most important contribution to the electrical industry? Give substantial reasons for your decision.

Objective

To research a significant person from tables 1.1 and 1.2 (pages 3 and 4 Pethebridge and Neeson).

Equipment

Internet
Library

Procedure

1. Access the Internet or Library and obtain enough information to fill one type written A4 page.

1. Use the Internet or Library catalogue to search for the information required to fill in the A4 page.

2. Submit your research as a completed activity sheet to your Lecturer for discussion.

North Metro TAFE	**Energy Sector equipment/plant/technologies**		BLK 04/2013
Electrical Trades	RSAK KS01-EE141A Section 1	Activity 1-3	KS01-EE141A/SI/a

Choose a modern electrical generation method and produce a presentation for the rest of the group.

Objective

To research a generation method (pages 5 to 12 Pethebridge and Neeson).

Equipment

Internet
Library
Overhead projector
Classroom computer

Procedure

1. Access the Internet Library and Pethebridge and Neeson to obtain enough information to present information to the group that is more detailed than in Pethebridge and Neeson or explores some aspect that is not covered in Pethebridge and Neeson.

2. The information is to be presented to the group in any form that makes it relevant and interesting. A PowerPoint presentation is one option. Diagrams, videos and talks are other suggestions.

3. Submit your research as a completed activity sheet to your Lecturer for discussion.

Direct and Alternating Current

Sources of Alternating and Direct Current

1. Direct continuous current is primarily produced using a chemical reaction such that which occurs in a battery. Direct Current is also outputted by Photo-Voltaic cells such as Solar Panels.

2. Direct Current can be produced by using a generator however the output D.C. is not "pure" as it contains "Ripple". Essentially the output is Alternating Current but converted into Direct Current by mechanical or electronic switching mechanisms.

3. Alternating current is producing using a mechanically driven generator, large volumes of electricity can be supplied in this way and it forms the basis of all modern electricity supply systems.

4. Alternating current is used for supply authority distribution systems, because it has several advantages over a direct current distribution system. The main advantages include:

    a. The voltage can be increased or decreased more easily and economically using transformers.
    b. A.C. motors are often simpler, more reliable and require less maintenance than d.c. motors.
    c. A three phase a.c. supply system provides two voltage levels.
    d. A.C. can be transmitted over long distances at high voltages with minimum losses.
    e. Large a.c. generators (alternators) are generally easier to build and maintain than d.c. generators.

5. Although a.c. is generally more economical to produce and distribute than d.c., the behaviour of a.c. is much more complex than d.c., because the effects of inductance and capacitance are of a major significance, this due to the characteristics of the A.C. sine wave (or sine curve) output.

Waveforms

6. It is frequently necessary to describe a voltage or current by graphing its value over a given period of time. Direct current maintains the same magnitude and polarity over time, and can be represented as shown in Figure 1.

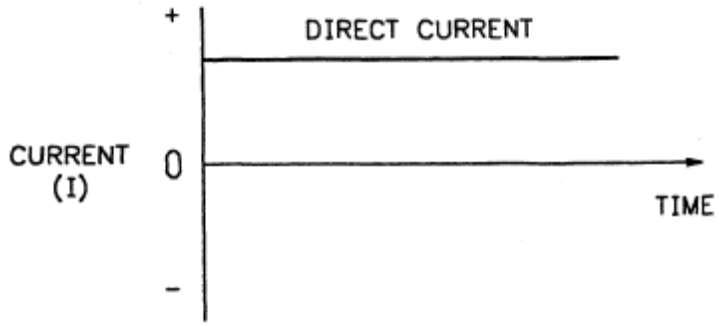
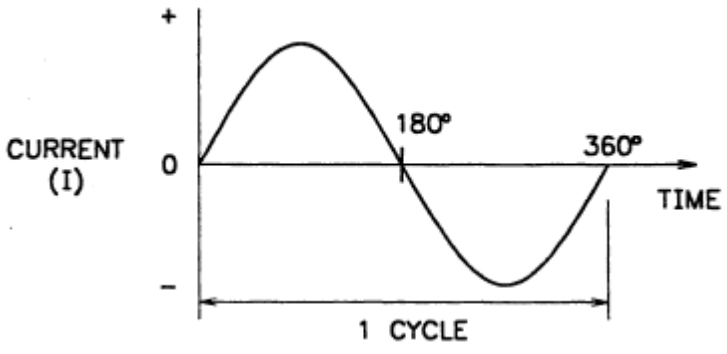


Figure 1 - A graph of direct current

7. A sinusoidal a.c. voltage waveform is a graph of the magnitude and polarity of the voltage induced in a coil rotating uniformly through a two pole magnetic field for one complete revolution or cycle – a cycle is the time taken for the process to begin repeating itself. The number of cycles which occur in a given period is called the **frequency** and is usually expressed in cycles per second. The unit 'cycles per second' is given a special name – Hertz (Hz).

   Note: Period – The time it takes to complete one cycle.

8. The frequency of the 240/415V_{ac} supply is 50Hz (50 cycles per second), so the current (and voltage) is rising and falling at a known rate in such a way that one complete cycle occurs in 1/50th of one second, or 0.02 seconds (20ms). These relationships for a single phase a.c. sine wave are shown graphically in Figure 2.

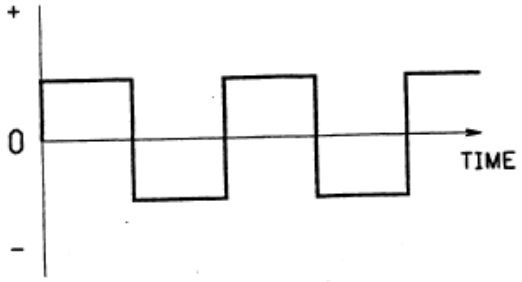


$$\text{Period} = \frac{1}{f} \quad \text{(seconds)} \qquad \text{Frequency} = \frac{1}{t} \quad \text{(Hertz)}$$

Figure 2 - Single phase a.c. sine wave

9. All a.c. supply systems generate a sine wave, but other waveforms are used in electronic applications. The most common of these are:

a. Rectangular Waveform



b. Triangular Waveform

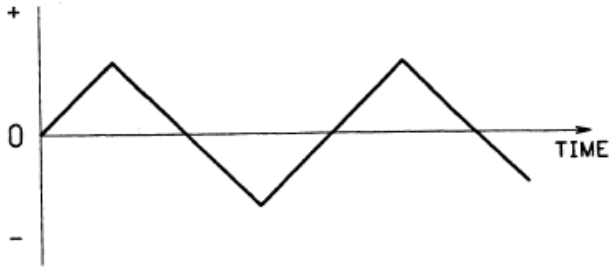


Figure 3 – Waveforms

Single Phase Transformers

7. A transformer is a stationary device used to increase or decrease the voltage of an a.c. supply with very low losses.

8. A transformer has at least two windings wound on a magnetic core. The winding connected to the input is called the PRIMARY and the winding connected to the output is called the SECONDARY. Many variations of the coil arrangement are possible.

9. The core is usually made from a high quality laminated stalloy or ferrite, to reduce iron losses such as eddy currents and hysteresis. Many small to medium sized transformers use grain oriented 'C Cores' instead of laminations.

10. The two main core shapes are 'core type' and 'shell type'.

Typical core shapes and winding styles are shown in Figures 1 and 2.

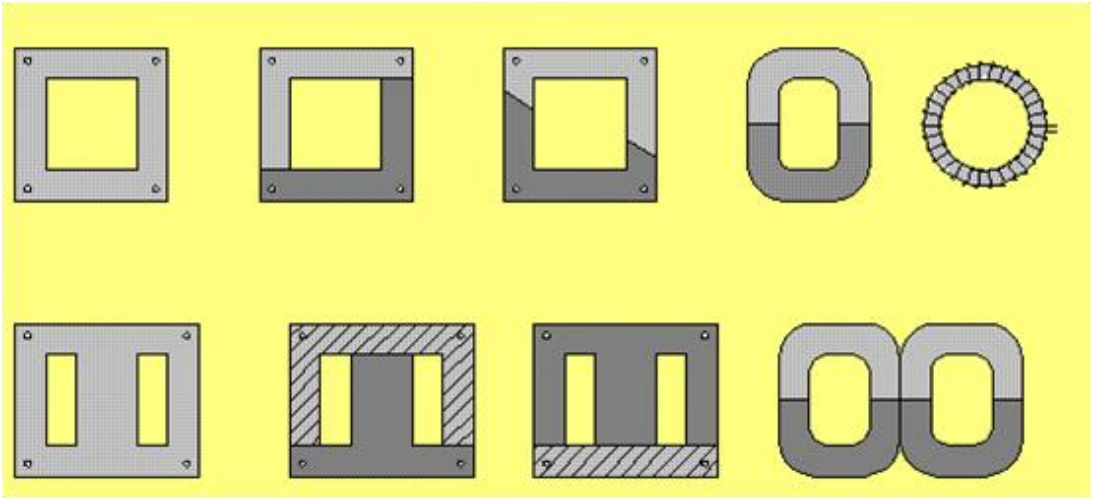


Figure 1 - Typical single phase core shapes

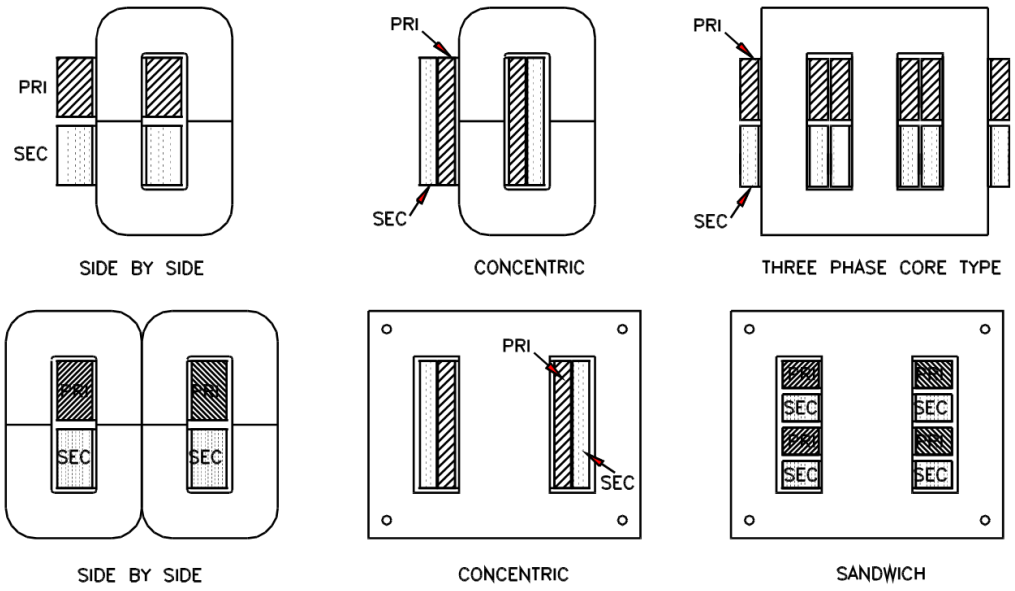


Figure 2 - Typical winding styles

The top 3 diagrams are examples of Core type construction and the bottom 3 diagrams are examples of shell type construction.

11. Electrical insulation in the form of an oxide, a powder, or a thin mylar film is provided between laminations. This insulation should not be damaged. Ferrite is a very good magnetic conductor but it is a very poor electrical conductor.

Double Wound Transformer

12. In this type, the primary and secondary windings are insulated electrically, but they are connected magnetically (by mutual induction). The symbol for a double wound transformer is shown in Figure 3:

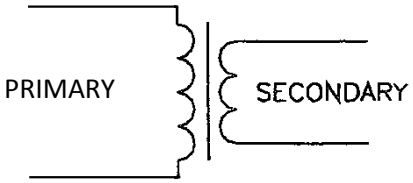


Figure 3 - Single phase transformer symbol.

If the output voltage is higher than the input, it is a STEP UP transformer. If the output voltage is lower than the input, it is known as a STEP DOWN transformer.

In a step DOWN transformer the resistance of the primary winding is usually higher than the resistance of the secondary winding and visa versa because the winding with the lowest voltage is usually wound with a heavier gauge wire. Some transformers have 'tapped' primary or secondary windings to allow for more than one primary or secondary voltage.

Double Wound Transformer Construction

13. Figure 4 shows a typical layout and construction for a double wound single phase shell type transformer which has one primary winding and one secondary.

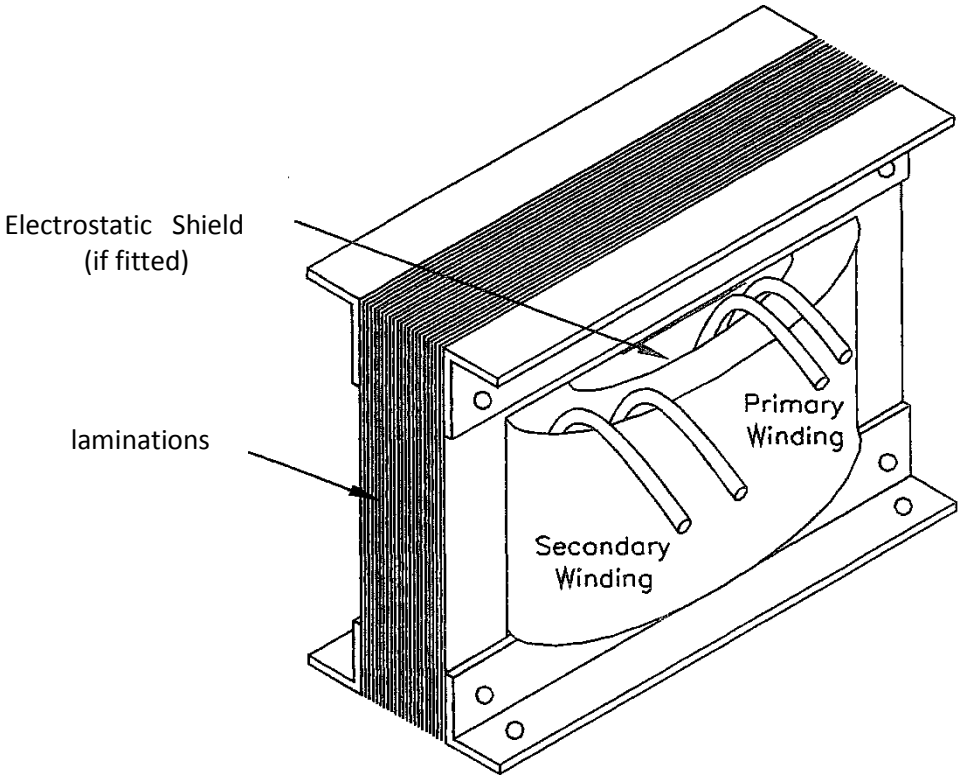
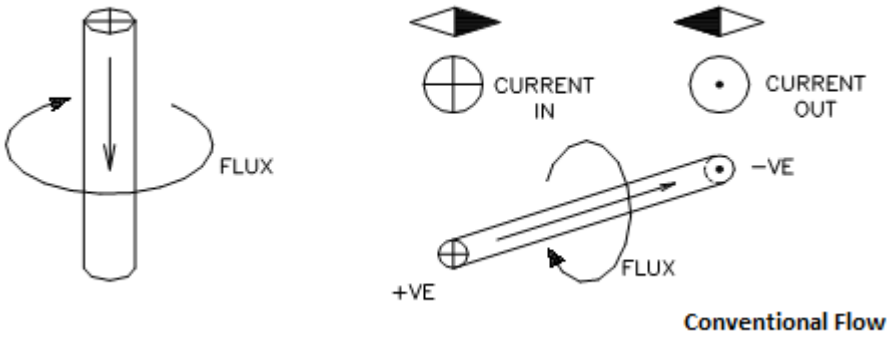


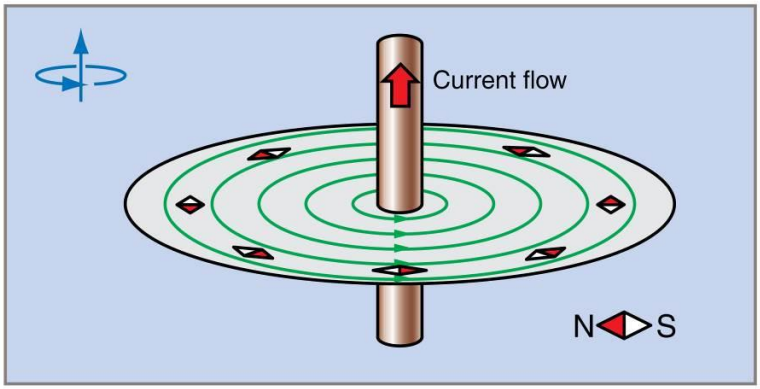
Figure 4 - Shell type transformer

Electromagnetism and Magnetic Circuits

Electromagnetism

14. When current passes through a conductor, a magnetic field is produced around the conductor and at right angles to it. If the current flow is away from the observer, the magnetic field is in a clockwise direction around the conductor.





Applications of an Electromagnet

15. Electromagnets are used in most machines where electrical energy is converted into motion and visa versa. Typical uses are:

a. MRI machines.
b. Door Strikes.
c. Speakers.
d. Motors.
e. Generators.
f. Magnetic relays, starters and contactors.
g. Electromagnets for lifting steel objects.

h. Solenoids (electromagnets with a moving core).
i. Magnetic brakes and clutches.
j. Magnetic circuit breakers and overload sensors.
k. Magnetic reed switches and inductive limit switches.

Electromagnetic Induction (EMI)

16. When a conductor is moved across a magnetic field, a voltage is INDUCED in the conductor. The process is known as electromagnetic induction (EMI) or Faraday's Law of magnetic induction. If the conductor is part of a closed electrical circuit a current will flow.

17. The value of the voltage induced in the conductor, and hence the current, will be proportional to:

a. The strength of the magnetic field - a stronger field causes a higher voltage.

b. The number of turns in series - more turns gives a higher total voltage.

c. The speed at which the conductor cuts or links with the lines of magnetic force - the greater the speed the greater the voltage.

d. The angle at which the conductor cuts the lines of magnetic force - the closer the angle of cutting is to 90º, the greater will be the voltage induced. Thus, a conductor moving at 0º (or parallel) to a flux has no voltage induced in it.

18. The direction of induced current in a conductor depends on the polarity of the magnetic field and the direction of movement of the conductor in that field. If the conductor is not moving, no voltage is induced so no current will flow.

19. A conductor moving CLOCKWISE under the influence of a NORTH magnetic pole has induced current flowing away from the observer, assuming that current flows from positive to negative (conventional flow) in an external circuit.

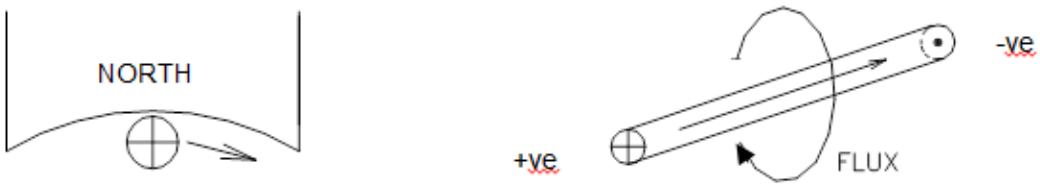


Figure 1. Conductor under a North Pole

20. If any one of the three variables are changed, the induced current will be reversed. If two variables are changed, the induced current remains in the same direction.

Main Applications of Electromagnetic Induction

21. **Generation** If a loop or coil of wire is rotated through a magnetic field an emf will be induced in the coil - if the coil forms a closed loop a current will flow in the circuit. This is the principle on which alternators and generators are based. If the coil is rotated at a constant speed sinusoidal alternating current can be produced as shown below:

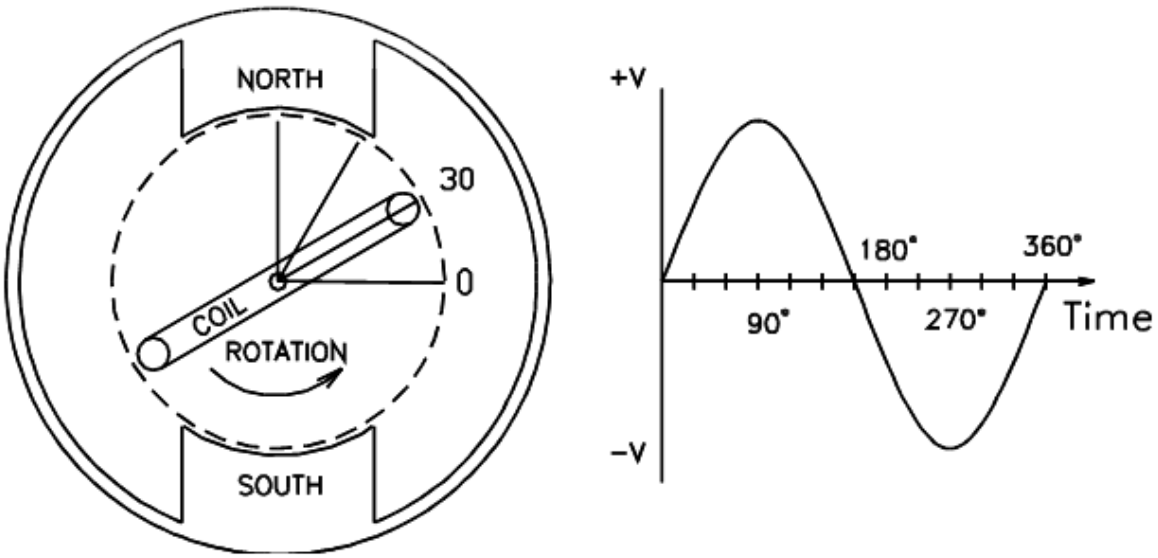


Figure 2. Coil rotated through a magnetic field

22. **Induction Motors** mainly a.c. motors have a series of stationary electromagnetic coils wound in such a way as to produce a magnetic flux within which a rotor is located. The rotor has conductors, but there is no electrical connection between the stationary winding (the stator) and the rotor. The alternating current flowing in the stator induces current in the rotor winding and the interaction between the magnetic fluxes causes the rotor to rotate.

North Metro TAFE	**Energy Sector equipment/plant/technologies**		TOG 06/2018
Electrical Trades	RSAK KS01-EE141A Section 1	Worksheet 1-4	KS01-EE141A/SI/a

Magnetism and Electro-magnetic Induction

1. List four basic properties of magnets or magnetic fields.

2. The strongest magnetic flux of a magnet is at the…….of the magnet.

3. Do unlike magnetic poles attract or repel each other?

4. Is magnetic flux strongest at the pole ends or in the middle of a magnet?

5. In which direction are magnetic flux lines assumed to travel around a magnet?

6. Describe Faraday's law of electromagnetic induction.

7. Identify three main requirements to induce a voltage into a conductor under Faraday's law.

8. State three factors which govern the value of voltage induced in a conductor when it is moved across a magnetic flux.

Alternating Current

8. What condition is necessary for a voltage to be induced in a conductor by a magnetic field?

9. Can a current be induced in a conductor when it is moved parallel to the flux in a magnetic field?

10. What is the most common name for the rotating electrical device used to produce alternating current?

11. What effect does it have on the frequency of the output from an alternator if the number of magnetic poles are increased?

12. What is the unit of frequency at which alternating current changes at expressed in?

13. What is the meaning of the term “Hertz” when it is applied to the specification of frequency?

14. A conductor is rotated within a two pole magnetic field system. At what point(s) in the cycle does the conductor experience its maximum induced voltage?

15. What is the standard supply frequency of the a.c. distribution system in Australia?

Single Phase Transformers

16. Can typical single phase transformers be used to raise or lower d.c. voltages?

17. What are the names given to the two windings on a basic single phase step-down transformer?

18. Which winding on a basic single phase step-down transformer has the lowest d.c. resistance?

19. What name is given to a basic transformer in which the primary and secondary windings are electrically separate from each other?

20. To which winding in a single phase double wound step-down transformer is the input voltage normally connected?

21. From which winding in a single phase double wound step-down transformer is the output voltage normally taken?

22. What name is given to a transformer in which the secondary voltage is greater than the primary voltage?

23. From what material is the core of a power transformer normally made?

North Metro TAFE	**Energy Sector equipment/plant/technologies**		TOG 06/2018
Electrical Trades	RSAK KS01-EE141A Section 1	Activity 1-4	KS01-EE141A/SI/a

Magnetism Practical

Task:
To identify types of permanent magnets and their magnetic field patterns.

Equipment:
Sample permanent magnets with keepers
Toroidal ferrite permanent magnet
Magnetic compasses
Small pieces of soft iron (about 10x3x10 mm)
Small transparent PVC separators (about 10x3x10 mm)
Transparent plate and iron filings

Method:
1. Examine the sample permanent magnets supplied. Place each permanent magnet under a transparent plate and sprinkle iron filings on top of the plate. Tap the plate gently to distribute the iron filings. Do not allow the iron filings to come in contact with the magnet - they would be difficult to remove.

2. Sketch each magnet and the pattern formed by the iron filings. Use the outlines on the attached sheet as a guide. (Next Page)

3. Use the magnetic compass to determine the polarity of the poles of each magnet (check the polarity of the magnetic compass before each observation - the marked end should be pointing to geographic North).

4. Position two bar magnets as shown on the attached sheet and sketch the resulting magnetic fields. Use a non-magnetic spacer to keep the magnets apart where necessary.

5. Select one permanent magnet and a piece of soft iron, and devise a method of demonstrating the principle of magnetic induction. Sketch the resulting magnet field.

Questions:
1. What is the assumed polarity of the marked end of a magnetic compass?

_____

2. Where the magnetic field strongest around a magnet?

_____

3. Do like magnetic poles attract or repel?

Sketches: Draw the Magnetic Lines of Force how they move around each of the following:

Single bar Magnet

Like poles facing each other

Unlike poles facing each other

North Metro TAFE	**Energy Sector equipment/plant/technologies**		TOG 06/2018
Electrical Trades	RSAK KS01-EE141A Section 1	Activity 1-5	KS01-EE141A/SI/a

Transformer and Induction Practical

Objective:

Identify connections to small double-wound transformers

Determine electrical characteristics of the transformers.

Document the rated values of the transformers

Take resistance readings of primary and secondary windings.

Lecturer to demonstrate transformer action (and as such electromagnetic induction) to the class using a variable A.C. supply conneted to a Double-wound transformer connected to a load (Lamp).

Equipment required:

Two Double-wound Transformers (Less than 200VA)
Multimeter

Task:

Obtain two different small transformers and find the available information on each.

Document the values obtained.

Perform resistance tests on the transformer windings to determine which of the leads would be connected to the Primary winding and which leads are connected to the secondary winding.

Results:

Sketch a circuit diagram of the transformer showing each of the electrical windings of the transformer.

Indicate the Primary and Secondary windings of each transformer

Table your results on the next page.

Results Table

	Transformer A	Transformer B
Primary Voltage		
Secondary Voltage		
Primary Current		
Secondary Current		
Transformer VA Rating		
Primary Resistance		
Secondary Resistance		
Step-Up? Step-Down?		

Draw your diagrams here:

Label the primary and secondary windings.
Indicate the input and outputs

End of Resource Book

Ensure you have all your assignments signed off as completed by your Lecturer.