GOVERNMENT OF WESTERN AUSTRALIA

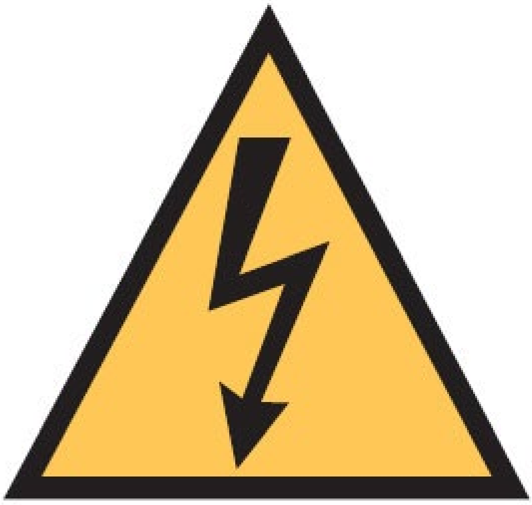
North Metropolitan TAFE

RTO Code: 52786

Portfolio of evidence

UEECD0046

Solve problems in single path circuits



UEE Training Package Support Material

Based on:
National Electrotechnology Industry Standards

North Metropolitan TAFE
V1 July 2022

GOVERNMENT OF WESTERN AUSTRALIA

North Metropolitan TAFE WA

Assessment Task 3 Portfolio of Evidence

Qualification national code and title	UEE30820 Certificate III in Electrotechnology Electrician
Unit/s national code/s and title/s	UEECD0046 - Solve problems in single path circuits

Student Name		**Assessment Type**	☐	Questioning (Oral / Written)
Student ID			☒	Portfolio
Lecturer Name				
Student Result (S/NYS)				

By completing and submitting this signed form to my lecturer, I am stating that:

a. The attached submission is completely my own work
b. I have correctly cited all sources of information used in this work (if required)
c. I understand a copy of my assessment will be kept by the NMTAFE for their records
d. I understand my assessment may be selected for use in the NMTAFE's validation and audit process to ensure student assessment meets requirements

Student Signature		**Date**	

Assessment type (☑):

☐ Questioning (Oral/Written)

☐ Practical Demonstration

☐ 3rd Party Report

☒ Other – Project/Portfolio *(please specify)*

Assessment Resources:

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Resources the assessor is to provide:

- Classroom setting as the venue.
- Test paper
- Graph paper

Resources the candidate is to provide:

- Black or Blue pen
- Pencil and eraser
- Scientific calculator (non-programmable)
- Maths drawing set
- AS/NZS 3000: current edition
- AS/NZS 3008.1.1 current edition
- WA Electrical Requirements current edition

Assessment Instructions:

Task description:

The following Portfolio Assessment relates to the knowledge requirements and performance evidence of the unit. Make sure you complete all questions and practical activities

- To be deemed ***Satisfactory*** you are required to achieve a mark of **100%**
- The following **Knowledge Assessment** is an open book assessment and does not need to be completed under supervision
- The following **Practical Activities** must be completed under supervision in a simulated workplace environment
- If ***Not Yet Satisfactory*** you will be required to re-attempt the **Knowledge Questions** that are marked ***not satisfactory*** and/or any **Practical Activity** marked as **Not Yet Satisfactory**

Student Instructions:

Ensure you have access to all the resources required for this assessment as described below.

1. Read the **Questions** section. If you are not clear about a question, ask your assessor for further information.
2. You may be able to complete the questions verbally. This would need to be negotiated with your assessor**.**

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3. Your assessor will provide feedback on your answers, including any questions that may require a further response.
4. If you have specific needs that you would like considered during this assessment, please discuss this with your assessor to identify any possible reasonable adjustments **prior** to commencing the assessment.
5. All diagrams must be neat, labelled and in pencil.
6. All calculations and numerical answers must be shown correct to two decimal places and include both the unit of measurement and metric prefix if applicable.

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Complete all Knowledge Questions.

Question 1	If 30 coulombs of electrons are passing a point every second, what is the value of the Current?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 2 In the table below, explain the purpose of each component in an electrical circuit.

Answer

Component	Purpose
Fuse / Circuit Breaker	
Switch	
Conductors	
Energy Source	
Load	

Feedback		☐ Satisfactory ☐ Not satisfactory

Question 3 Convert the following values:

Answer

From	To
570 mW	**W**
3.3 μΩ	**pΩ**
0.007 V	**mV**
0.12 W	**mW**
25 kΩ	**Ω**
27 μA	**mA**
2200 kW	**GW**

Feedback		☐ Satisfactory ☐ Not satisfactory

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Question 4	How much current would flow in a circuit with a supply of 10V and a resistance of 50Ω?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 5	Draw a Graph showing the relationship between Voltage and Current in a DC circuit.	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 6	How much force is required to lift a switchboard weighing 20kg?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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Question 7	Calculate the Work done if a cable drum weighing 10kg was lifted through a vertical distance of 1.5 metres?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 8	Calculate the Power needed to climb a 5 metre ladder in 25 seconds if you weigh 70kg	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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Question 9	How much Power would be dissipated in a circuit with a Current of 5A and a Resistance of 40Ω?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 10	How much Power would be dissipated in a circuit with a Voltage of 12V and a resistance of 12Ω?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 11	How much Power would be dissipated in a circuit with a Voltage of 100V and a Current of 3A?	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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Question 12	For what purpose is a Wattmeter used?	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 13	Which of the following Resistors can be installed in a circuit that has a Voltage of 10V and operate correctly.				
Answer	**Resistance Value**	**Power Rating**	**Calculations**	**Yes**	**No**
	20Ω	**10W**			
	2Ω	**15W**			
	10Ω	**5W**			
	1000Ω	**100W**			
Feedback				☐ Satisfactory ☐ Not satisfactory	

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Question 14	According to the AS/NZS 3000, state the two methods of protection against the damaging effects of overcurrent and the Clause Number.	
	a)	
	b)	
	Clause No.	
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 15	Give an example for the use of electrolysis.	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 16	Calculate the Input Power of an electric motor with an Output of 6.3kW and an Efficiency of 70% ***Eff% = Output/Input x 100%***	
Answer	***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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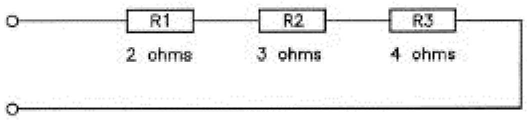
Question 17	Calculate the volt drop across each resistor, in the following circuit, with an applied voltage of 36 volts.	
Answer	 ***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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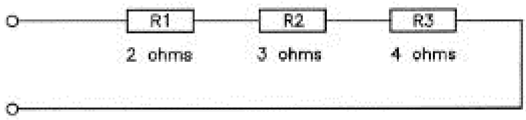
Question 18	Calculate the total Resistance, the total Current and the Power dissipated by each resistor, in the following circuit, with an applied Voltage of 27V.	
Answer	 ***Show all calculations:***	
Feedback		☐ Satisfactory ☐ Not satisfactory

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Question 19	Describe what effect a rise in temperature has on the following resistors: PTC resistor (Positive temperature Coefficient) & an NTC resistor (Negative Temperature Coefficient)	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 20	Describe what effect a change in Light Intensity has on the resistance of an LDR (Light-dependent resistor)	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

Question 21	Describe what happens to the resistance of a VDR (Voltage-dependent resistor) when it's Voltage level is exceeded.	
Answer		
Feedback		☐ Satisfactory ☐ Not satisfactory

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DANGER TAG PROCEDURE for ELECTRICAL TRADE Skills Areas

THE FOLLOWING PROCEDURE IS COMPULSORY

1. The student is to attach a DANGER TAG on to the plug top of the project lead before proceeding with the allocated project. A danger tag must be attached to the plug top at all times, when the lead is NOT plugged into the supply outlet. Plug tops or leads are not to be connected to the supply outlet WHILE A DANGER TAG is attached.

2. The student is to assemble the project according to project instruction procedure and lecturer's directions in its isolated and de-energised state and report to the lecturer as necessary and on completion.

3. The lecturer is to:-
   a. Check the project for safety and
   b. Ensure that the student has performed a safety check, including **short circuit test** using the recommended procedure.

4. When the lecturer is satisfied that the project is safe to connect and energise, the lecturer is to instruct the student to REMOVE the DANGER TAG from the plug top.

5. The student is to plug in the project and switch it on in the presence of the lecturer.

6. The lecturer is to determine whether or not the project is operating satisfactorily.

7. If the project operates satisfactorily the student may take measurements using correct meters with regard to the safety risks associated with using the particular item of test equipment including;
   a. Selecting correct meter function,
   b. Holding meter probes correctly during measuring with fingers behind knurls (finger guards) at all times.

   This is to be done under general supervision of lecturer. The student is NOT to modify, disassemble or carry out ANY unsafe act.

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8. If the circuit is to be modified the student must:
   a. Switch the circuit off,
   b. Disconnect the project from the supply,
   c. Attach the DANGER TAG to the plug top,
   d. Report to the lecturer for instructions,

   In the lecturer's presence the student is to:-
   e. TEST and VERIFY for ZERO VOLTAGE.
   f. Restart the DANGER TAG procedure from step 2 above.

9. When the student is satisfied that the project has been completed the student is to:-
   a. Switch the project off,
   b. Remove the plug,
   c. Replace the DANGER TAG on the plug top,
   d. Report to the lecturer for instructions,

   In the lecturer's presence the student is to:-
   e. TEST and VERIFY for ZERO VOLTAGE.

   The lecturer is then to instruct the student to:-
   f. Disassemble the project
   g. Remove the DANGER TAG and store the equipment in its designated place.

Student's Signature :____________________ **Date :___/___/_____**

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Skills Area SAFETY

Students working in skills areas at North Metropolitan TAFE Balga Campus do so, on condition that they agree to abide by the following safety instructions. Failure to observe the safety instructions will result in **IMMEDIATE SUSPENSION.**

1. No circuit is to be plugged in or switched on without the specific permission of the lecturer in charge of the class. A circuit must be switched off and tested for **ZERO VOLTS** before any supply leads are removed. The **DANGER TAG PROCEDURE** must be used at all times.
2. Do not leave any circuit switched on any longer than necessary for testing. Do not leave any circuit switched on unattended.
3. Check each item of equipment before using. Report any broken, damaged or unserviceable equipment to your Lecturer.
4. All wiring must be disconnected at the end of each practical class or as each project is completed.
5. Make all connections in a safe manner with an appropriate connecting device. Unshielded 4mm banana plugs are not to be used for wiring.
6. Switch off, remove the plug from the socket and attach your **DANGER TAG** to the plug top before working on any project. It is not sufficient to simply turn the switch off.
7. When disconnecting your wiring from a connection made under a screw, undo the screw to remove the wiring, do not cut the wire off.
8. Observe the correct colour code for all wiring projects.
9. Test your circuit for short circuits with your multimeter before asking your Lecturer to switch circuit on. Test the Tester before and after **EACH** test.
10. Skylarking and horseplay is not permitted at any time.
11. Proper clothing and safety footwear must be worn at all times. Thongs, sandals and singlets are not permitted. Hard capped safety boots or safety shoes **MUST** be worn **AT ALL TIMES** at North Metropolitan TAFE Balga Campus.

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12. Where an activity sheet is issued for a project, complete each step in the Procedure before moving to the next step. Advise your Lecturer when you have completed the activity.

13. Draw **ALL DIAGRAMS** in **PENCIL** so that they can be easily changed or corrected. Mark off each connection on your diagram as it is made.

14. Make sure that it is **YOUR** plug before inserting plug into an outlet.

15. Always switch multimeter **OFF**, or to the highest possible **AC VOLTS** range when you have finished using it.

16. Report any unexpected situations or events to your Lecturer.

Student's Signature :____________________ **Date :___/___/_____**

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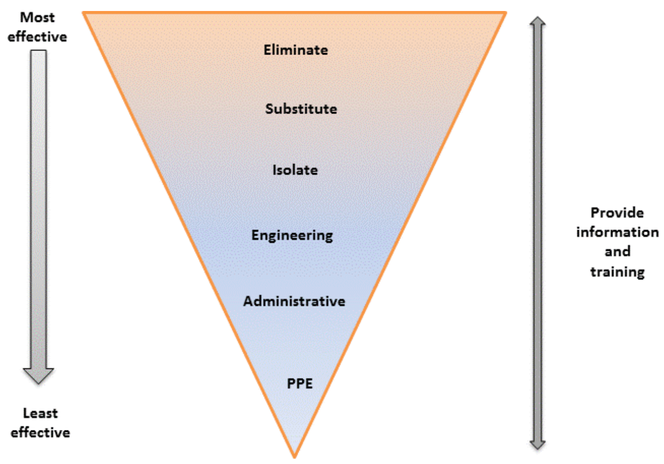
Risk assessment

Consequence		1 **Rare** The event may occur in exceptional circumstances	2 **Unlikely** The event could occur sometimes	3 **Moderate** The event should occur sometimes	4 **Likely** The event will probably occur in most circumstances	5 **Almost Certain** The event is expected to occur in most circumstances
1	**Insignificant** No injuries or health issues	LOW	LOW	LOW	LOW	MODERATE
2	**Minor** First aid treatment	LOW	LOW	MODERATE	MODERATE	HIGH
3	**Moderate** Medical treatment, potential LTI	LOW	MODERATE	HIGH	HIGH	CRITICAL
4	**Major** Permanent disability or disease	LOW	MODERATE	HIGH	CRITICAL	CATASTROPHIC
5	**Extreme** Death	MODERATE	HIGH	CRITICAL	CATASTROPHIC	CATASTROPHIC

1. **Eliminate** – if it is possible, the hazard should be removed completely. For example, get rid of dangerous machines.
2. **Substitute** – replace something that produces the hazard with something that does not produce a hazard. For example, replacing solvent based paint with water based paint. Risk assessment on the substitution must be conducted to ensure that it will not pose another hazard.
3. **Engineering control** – isolate a person from the hazard by creating physical barrier or making changes to process, equipment or plant to reduce the hazard. For example, install ventilation systems.
4. **Administrative control** – change the way a person works by establishing policies and procedures to minimise the risks. For example, job scheduling to limit exposure and posting hazard signs.
5. Use **personal protective equipment** (PPE) – protect a person from the hazard by wearing PPE. For example, wearing gloves, safety glasses, hard hats and high-visibility clothing. PPE must be correctly fitted, used and maintained to provide protection.



Hierarchy of control

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Safe Work Method Statement

Task Step #	Task Steps	Hazards	Risk Rating	Hazard Control Measures	Revised Risk Rating

Student Signature……………………

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Practical Activity 1

Conductors and Insulators

Objective

To identify electrical conductors and insulators from the samples provided.

Equipment

Prepared samples of insulating materials
Prepared samples of conducting materials
Resource book and writing equipment

Instructions

Task Procedure

1. Occupation Safety and Health must be adhered to at all times with reference to the Laboratory Safety procedure, Danger Tag procedure and JHA risk analysis procedure.

2. Examine each of the materials provided and determine whether it is a conductor or an insulator (by inspection). Record your results in Table 1.

3. Submit your work to your Lecturer for comment and assessment.

4. Work site is cleaned and made safe in accordance with established procedures and return all equipment to its proper place.

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Table 1

Number	Material	Conductor	Insulator
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Satisfactory:	

Not Satisfactory:	

Lecturer: ______________________________ Date: _______________

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Practical Activity 2

<u>Protection Devices</u>

Objective

To identify basic electrical protection devices

Equipment

Prepared protection project board
Fuses: SER, HRC, bottle, glass, automotive
Air- break circuit breakers (2 types)
Overload Relay
Sample RCDs

Instructions

Task Procedure

1. Occupation Safety and Health must be adhered to at all times with reference to the Laboratory Safety procedure, Danger Tag procedure and JHA risk analysis procedure.

1. Inspect each of the electrical protection devices and record the details of each in Table 1. Operate the device if applicable.

3. Submit your work to your Lecturer for comment and assessment.

4. Work site is cleaned and made safe in accordance with established procedures and return all equipment to its proper place.

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Table 1

No.	Name	Purpose	Voltage Rating	Current Rating	Basic Operation
e.g.	bottle fuse	protect wiring	250V	15A	melting of fusible element
1					
2					
3					
4					
5					
6					
7					

Satisfactory:		Not Satisfactory:	

Lecturer: ______________________________ Date: ______________

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Practical Activity 3

Identification of Practical Resistors

Objective

To identify examples of practical resistors

Equipment

Analogue Multimeter
Digital Multimeter
Resistor samples project board, including:

- Wire wound ceramic resistors.
- Variable resistors
- Potentiometers
- Rheostats
- Temperature dependent resistors
- Light dependent resistors
- Voltage dependent resistors
- Trimmer resistors
- Encapsulated heating elements
- Wire wound heating elements > 100 W

Instructions

Task Procedure

1. Identify each of the resistors supplied and enter your results in the Table.
2. Measure the resistance of each type of resistor with an analogue multimeter and a digital multimeter and enter the results in the Table.
3. Submit your work to your Lecturer for comment.
4. Return all of the equipment to its proper place.

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Type of Resistor	R (Analogue)	R (Digital)	Application

Satisfactory:	

Not Satisfactory:	

Lecturer: ____ Date: ______________

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Practical Activity 4

Sources of EMF

Objective

To identify six different sources of EMF and to briefly explain how that EMF is produced by each of those sources.

Equipment

Multimeter
Galvanometer
Glass rod and cat's fur
Hand wound demonstration generator
Major magnet and prepared coils of winding wire
Piezo electric spark gun
Prepared solar cell
Prepared thermocouple, LP gas bottle, flint gun
Prepared metal plates, beaker, container of dilute sulphuric acid
Safety glasses
Plastic tray
Clip board and writing equipment.

Instructions

Task Procedure

1. Produce a measurable voltage using six different methods.
   Note: that the voltage produced in some cases will be extremely small so it may be necessary to use the galvanometer to detect it.

2. Write down the principle involved in each of the methods you used to produce an emf (on a separate sheet), and record how the voltage can be increased in each case. Give one or more practical examples of how each method is used to produce electricity in industry. See the example below.

3. Give one example of where the production of an emf is UNDESIRABLE where applicable.

4. Submit your work to your Lecturer for comment and assessment.

5. Return all of the equipment to its proper place.

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Sources of EMF

Write down each of the five ***primary*** sources of EMF of which cause an electrical current to flow in a circuit, give a brief explanation of the process of how the EMF is produced and then list an application(s) how or where you would find the EMF sources being used in a practical way.

Source of the EMF	How the EMF is produced	Common Application(s)

Satisfactory:			Not Satisfactory:	

Lecturer: ______________________________ Date: ______________

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Practical Activity 5

Resistor Colour Code

Objective

To determine the resistance and power rating of common colour coded resistors using a resistor colour code and manufacturers' information.

Equipment

Sample colour coded resistors
Resistor Colour Code
Multimeter
Manufacturers' power rating information
Clip board and writing equipment

Instructions

Task Procedure

1. Examine each of the resistors provided and determine its resistance and tolerance according to the Resistor Colour Code and verify the resistance using a multimeter. Estimate the power rating of each of the resistors. Record the values in the Results Table.

2. Submit your work to your Lecturer for comment.

3. Return all of the equipment to its proper place.

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Results Table

Colours						
First	**Second**	**Third**	**Fourth**	**Resistance**	**Tolerance**	**Power**

Satisfactory:		Not Satisfactory:	

Lecturer: ______________________________ Date: ______________

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Practical Activity 6

Measuring Electrical Power

Objective

To connect all the components of a basic electrical circuit (see diagram) and measure electrical power.

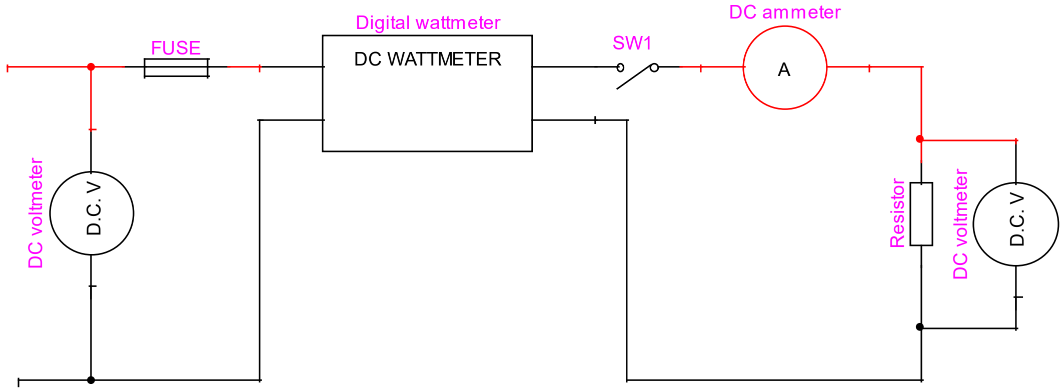
Equipment

Basic electrical circuit components consisting of:

An extra-low voltage variable DC supply (set to approx.12 volts).
A single-pole single-throw switch (SPST)
A fuse
DC Wattmeter
DC ammeters and voltmeters as required
A suitable load resistor (approx. 6 - 12 ohms)
A digital multimeter
Danger Tag (Danger - Do Not Operate)

Instructions

Circuit Diagram



Task Procedure

DANGER TAG PROCEDURE REQUIRED – READ ALL INSTRUCTIONS BEFORE PROCEEDING

1. Occupation Safety and Health must be adhered to at all times with reference to the Laboratory Safety procedure, Danger Tag procedure and JHA risk analysis procedure.

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2. Using your voltage and resistance values, calculate the expected line current that will flow in the circuit and the power dissipated by the load resistor.
3. Select the appropriate ammeter and wattmeter based on your calculations being aware of the range and its effect on the accuracy of your reading.
4. Connect the components according to the circuit diagram given above. Mark each connection off on the diagram as you go. Do **NOT** connect the circuit to the supply, at this stage.
5. Measure the resistance of the circuit at the terminals to which the voltage source is to be connected (with the switch closed) to ensure there is no short circuit condition present. The resistance should measure slightly higher than the load resistance. Record the resistance:

   Resistance: ______________________________

6. Have your circuit wiring and resistance measurements checked by your Lecturer.
7. Remove your danger tag and plug in the power supply with the leads supplying the load disconnected. Use your multimeter and the adjustment knob to set the variable power supply to 12V
8. Disconnect the power supply and replace your danger tag. Once isolated connect the leads going to the load to the power supply.
9. When your lecturer agrees, remove your danger tag and connect your circuit to the 12 volt supply. Energise the circuit and take all readings necessary to complete Results Table 1 & 2.

Table 1 - Meter Reading Results

Meter Readings	Switch On	Switch Off
Voltage reading across the supply terminals		
Voltage reading across load		
Ammeter reading		
Wattmeter reading		

10. Switch the DC supply off and remove the plug from the outlet. Attach your danger tag to the plug top.
11. Submit your work to your Lecturer for comment and assessment.
12. Work site is cleaned and made safe in accordance with established procedures and return all equipment to its proper place.

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Practical Questions

1. What was the voltage across the load resistor when the switch was open?

   Voltage: ________________

2. Calculate the power dissipated in the circuit in Table 2 below using the readings from Table 1.

3. What fault would be indicated (if any) if the supply voltage was 12 volts, the switch was closed, the ammeter indicated 0 amps and the voltmeter across the fuse indicated 12 volts?

   ____

4. From Table 2 below, compare your results and discuss which method of measuring electrical power, do you consider to be the most accurate compared with the wattmeter reading.
.

   ____

   ____

Table 2 - Meter Reading Results & Calculations

Meter Readings		Calculation	Result
V	A	(VxI)	W
V	Ω	(V^2/R)	W
A	Ω	(I^2xR)	W
Wattmeter		Not required, transfer reading from Table 1	W

Satisfactory:	

Not Satisfactory:	

Lecturer: ______________________________ Date: ____________

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Practical Activity 7

Series circuit with one load and analysis of Volt Drop in practical DC Circuit

Objective

To connect the components of a basic electrical circuit and test it for correct operation

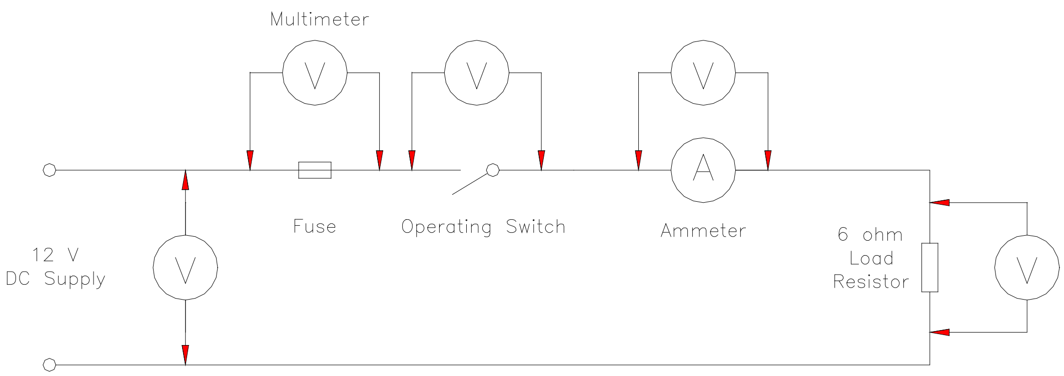
Equipment

Basic electrical circuit components consisting of:
- An extra-low voltage variable DC supply (set to 12 volts).
- A single pole single throw switch
- A fuse
- A DC ammeter
- A 6 ohm load resistor (at least 24 watts)

A digital multimeter
Danger Tag (Danger - Do Not Operate)

Instructions

Circuit Diagram



Danger Tag Procedure Danger Tag procedure **will** be followed during this activity

Task Procedure

1. Occupation Safety and Health must be adhered to at all times with reference to the Laboratory Safety procedure, Danger Tag procedure and SWMS.

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2. Using your voltage and resistance values, calculate the expected line current that will flow in the circuit
3. Select the appropriate ammeter based on your calculations being aware of the range and its effect on the accuracy of your reading.
4. Connect the components according to the circuit diagram given above. Mark each connection off on the diagram as you go. Do NOT connect the circuit to the supply.
5. Measure the resistance of the circuit at the terminals to which the voltage source is to be connected (with the switch closed) to ensure there is no short circuit condition present. The resistance should measure slightly higher than the load resistance. Record the resistance:

   Resistance: ______________________________

6. Have your circuit wiring and resistance measurements checked by your Lecturer.
7. With the lecturers permission remove your danger tag and plug in the power supply with the project leads supplying the load disconnected. Use your multimeter and the adjustment knob to set the variable power supply to 12V
8. Disconnect the power supply and replace your danger tag. Once isolated connect the leads going to the load to the power supply.
9. Remove your danger tag and connect your circuit to the 12 volt supply. Energise the circuit and take all readings necessary to complete Results Table 1.

Results Table 1

	Switch is On (Closed)	Switch is Off (Open)
Current Reading		
Voltage reading across the supply terminals		
Voltage reading across the fuse		
Voltage reading across the switch		
Voltage reading across the ammeter		
Voltage reading across the load		

10. Switch the DC supply off and remove the plug from the outlet. Attach your danger tag to the plug top.
11. Submit your work to your Lecturer for comment and assessment.
12. Work site is cleaned and made safe in accordance with established procedures and return all equipment to its proper place.

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Practical Questions

1. With the supply connected and energised, what was the voltage drop across the switch in the “open” position?

   Voltage: ____

2. With the supply connected and energised, what was the voltage drop across the fuse while current was flowing in the load resistor?

   Voltage: ____

3. Using the values of voltage and current in your Results Table, calculate the resistance of the load resistor.

   Resistance: ____

4. What is the approximate resistance (in ohms) across the terminal of the switch when it is in the “closed” position?

   ____

5. What is the approximate resistance (in ohms) across the terminals of the switch in the “On” position?

   ____

6. What is the approximate resistance (in ohms) across the terminals of the switch in the “Open” position?

   ____

7. What is the approximate resistance (in ohms) across the terminals of the switch in the “Off” position?

   ____

8. What fault would be indicated when the supply voltage to a circuit is measured across the terminals of the fuse protecting it?

   ____

Satisfactory:			Not Satisfactory:	

Lecturer: ____ Date: ______________

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Practical Activity 8

Series circuit with multiple loads

Objective

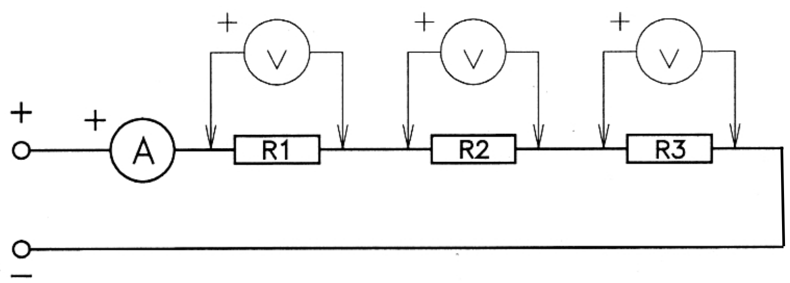
To connect the given resistors in series to a suitable DC supply and verify the readings by calculation.

Equipment

Series resistor project board
Connecting leads
Ammeters and voltmeters as required
Multimeter
Extra Low Voltage (ELV) direct current supply

Instructions

Circuit



**Voltmeters are not connected, the arrows indicate where to take a measurement with a multimeter*

Danger Tag Procedure Danger Tag procedure **will** be followed during this activity

Task Procedure

1. Check to see that the project board is isolated from the supply. **Measure the resistance of each of the resistors on the project board with a multimeter before connecting** them with project leads to create a circuit. Remember to subtract the resistance of your multimeter leads from your measurement to record the resistances in the Results Table.

2. Use "Ohm's Law" to calculate the voltage and current using the **measured values** of resistance, **not the nominal values.** Compile your results in the Results Table.

3. Connect the circuit according to the circuit diagram given above. **Do not connect** your circuit to the ELV supply yet.

4. Ensure your multimeter is working correctly, set it to read ohms and then set it on the lowest ohms range to **record the total resistance of the circuit**. Record the amount here.

   ____

5. Following the danger tag procedure and with the permission of the lecturer energise your ELV supply to set the correct voltage using a multimeter. After this has been done isolate the ELV supply and make it safe for the circuit to be connected (ELV supply switched off, unplugged from the mains and danger tag on mains lead near plug).

6. Connect your circuit to the ELV supply but do not energise it until you have the Lecturer's approval.

   Lecturer Initials. Safe to energise? YES/NO

7. Following the danger tag procedure and safe work practices take all voltage and current readings, enter the values where appropriate in the results table and compare your measured values with that of your calculated values.

8. Switch the circuit off and remove the plug from the outlet. **Do not disconnect/ dismantle** your circuit until the lecturer says you can.

8. Submit your results to your Lecturer for comment and discussion. The lecturer will advise if you can pack away your equipment and return it to its proper place.

Results Table - Series Circuit

	Resistance (Ω)		**Volts (V)**		**Current (A)**	
	Nominal	Measured	Calculated	Measured	Calculated	Measured
R1						
R2						
R3						
Total (Calculated)		$R_1 + R_2 + R_3$	$V_{R1} + V_{R2} + V_{R3}$	Supply V	Supply V / Measured R	
Total (Measured)		Multimeter reading	Supply V			Ammeter Reading

Notes
Nominal resistance values are normally indicated on the resistor or project box.
Use the measured values of resistance where possible for your calculations.
Record correct units with all values in the results table.

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Practical Questions

1. What general statement can be made about the current in each component in a series circuit?

   Answer: ____

2. What general statement can be made about the algebraic sum of the potential differences across each component in a series circuit?

   Answer: ____

3. How much current would flow in this circuit if R1 became short circuited?

   Answer: ____

4. What general statement can be made about the total resistance in a series circuit in relation to the resistance of any single resistor in the circuit?

   Answer: ____

5. If ONE of the components in a series circuit is open circuited, what effect would it have on the current in the other components in the circuit?

   Answer: ____

6. What was the importance of measuring the circuit resistance before connecting it to the supply?

   Answer: ____

Satisfactory:			Not Satisfactory:	

Lecturer: ______________________________ Date: ______________

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Reasonable Adjustment			
Adjustment Required	☐ **Yes**	☐ **No**	
Describe the adjustments that have been made to the assessment:			
Assessor name and signature		**Date**	
Student name and signature		**Date**	

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Assessment Outcome Knowledge Questions	☐ **Satisfactory**	☐ **Not Satisfactory**
Assessment Outcome Practical Activities	☐ **Satisfactory**	☐ **Not Satisfactory**

Knowledge Questions / Practical Activity Feedback:

Actions Required if Not Satisfactory:

Assessor name and signature		**Date**	
Student name and signature		**Date**	