

UEECD0043 - Solve problems in direct current circuits

	MHE text	Heading reference	Test bank	Quizzes	Cases	Worksheets	PPTs	Interactives	Animations	Prac manual	YouTube playlist
1. Identify d.c. electrical circuits											
1.1 Nature of the circuit problem is obtained from relevant documentation, electrical drawings or personnel to determine the scope of work to be undertaken	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	7, 8, 9, 10, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 35, 37, 41, 46, 51, 54, 55, 56	29							
1.2 Work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures for a given work area are identified and applied	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	45								
1.3 Tools, equipment and circuit measuring devices required for the electrical work are obtained and checked for correct operation and safety in accordance with workplace procedures	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	5, 6, 11, 13, 32, 33, 34, 36, 44, 62, 67, 88, 89, 91, 92, 93	10, 13, 14, 26, 27, 28, 33, 37		5					
1.4 Electrical apparatus is visually inspected, and components and circuits are identified	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits									
2. Determine electrical d.c. circuit problem											
2.1 Electrical hazards are identified, risks are assessed and control measures are implemented	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	45								3
2.2 Dimensions are extracted from drawings and diagrams in accordance with workplace procedures for application to the work to be undertaken	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits		31							3
2.3 Circuits are checked and isolated in accordance with workplace procedures and regulatory requirements	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits									
2.4 Expected circuit parameters are calculated from relevant component ratings/specifications	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits		9							
2.5 Circuit parameters are measured in accordance with industry standards and checked against expected values											
2.6 d.c. circuit problems are assessed from measured and calculated values using established methodologies as they apply to circuits	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	12, 14, 15, 16, 28, 29, 30, 47, 48, 49, 50, 57, 58, 59, 60, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 90, 94, 95, 96, 97, 99	1, 2, 3, 7, 15, 16, 17, 18, 19, 20, 21, 22, 23, 30, 32, 35	1, 2, 3, 4, 5	1, 2, 3, 4, 6, 7, 8					1, 2, 4, 5
2.7 Circuit solutions are determined from measured and calculated values of resistance, voltage, current and power in series, parallel, and series-parallel circuits in accordance with industry standards	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits									
2.8 Solutions are tested in accordance with workplace procedures and industry standards	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits									
2.9 Problems are resolved without damage to apparatus, circuits, the surrounding environment or services using sustainable energy practices	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits	1, 2, 3, 4, 31, 38, 39, 40, 42, 43, 52, 53	5, 6, 24, 25, 34, 36, 38							
2.10 Unplanned situations are responded to in accordance with workplace procedures in a manner that minimises risk to personnel and equipment			98	4, 11, 12							
3. Complete work and document problem-solving activities											
3.1 WHS/OHS work completion risk control measures and procedures are followed	Jenneson, Electrical Principles 7e	Chapter 1 Solve problems in d.c. circuits		8		2					
3.2 Worksite is cleaned and made safe in accordance with workplace procedures											
3.3 Justification for solutions used to resolve circuit problems is documented											
3.4 Work completion is documented, electrical drawings are updated, and relevant person/s notified in accordance with workplace procedures											
Performance Evidence											
• altering an existing circuit to comply with specified operating parameters											
• applying Ohm's Law to solve problems in direct current (d.c.) single path circuits											
• applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including identifying risks and applying risk control measures											
• calculating resistance of a conductor from factors such as conductor length, cross-sectional area, resistivity and changes in temperature and material	Jenneson, Electrical Principles 7e	1.38 Factors affecting resistance	87				45			Prac Manual	
• connecting analogue/digital ammeter into a circuit ensuring the polarities are correct to take current readings	Jenneson, Electrical Principles 7e	1.12.1 Measuring electricity—devices and units	34, 35							Prac Manual	
• connecting a series d.c. circuit containing capacitor and resistor to determine the time constant of the circuit	Jenneson, Electrical Principles 7e	1.55 Calculation of quantities from given information				7					
• calculating quantities from given information to determine capacitance, energy and voltage	Jenneson, Electrical Principles 7e	1.55 Calculation of quantities from given information	94			7					
• calculating one time constant as well as the time taken to fully charge and discharge a given capacitor	Jenneson, Electrical Principles 7e	1.55 Calculation of quantities from given information				7					
• calculating equivalent capacitance of capacitors connected in series and parallel circuits											
• dealing with unplanned events in accordance with workplace procedures in a manner that minimises risk to personnel and equipment			98	4, 11, 12							
• demonstrating graphical relationships of voltage, current and resistance	Jenneson, Electrical Principles 7e	Section 1.13 Voltage, current and resistance in a circuit									
• calibrating and using measuring device in accordance with manufacturer specifications											
• determining the operating parameters of an existing circuit											
• developing circuits to comply with a specified function and operating parameters											
• identifying and applying electrical industry standard symbols to represent electrical components in circuit diagram	Jenneson, Electrical Principles 7e	1.8 Symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram	18, 19, 23, 24	3			6, 16, 17				
• identifying fixed and variable resistors, including: - determining resistance of a colour coded resistor from colour code tables and confirming the value by measurement	Jenneson, Electrical Principles 7e	1.32 Reading resistors	67	26, 33		3, 4, 5		8		Prac Manual	

- measuring resistance of variable resistors under varying conditions of light, voltage and/or temperature	Jenneson, Electrical Principles 7e	1.29 Variable resistors				3, 4, 5						
- selecting a resistor for an application	Jenneson, Electrical Principles 7e	1.33 Selecting a resistor				3, 4, 5						
• solving problems in series and series-parallel circuits, including: - developing, setting up and connecting a single source d.c. series-parallel circuit	Jenneson, Electrical Principles 7e	1.35 Characteristics of a series circuit			1, 4, 5							
- measuring voltage and current	Jenneson, Electrical Principles 7e	Section 1.13 Voltage, current and resistance in a circuit										
- calculating resistance, voltage, current and power from measured and/or given values of any two of these quantities in a single source series-parallel circuit	Jenneson, Electrical Principles 7e	Section 1.13 Voltage, current and resistance in a circuit										
• using test equipment to confirm the effect of material length, cross-sectional area and temperature on the resistance of conductive materials	Jenneson, Electrical Principles 7e	1.38 Factors affecting resistance	87				45				Prac Manual	
• selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application	Jenneson, Electrical Principles 7e	1.40 Selecting an appropriate meter					57				Prac Manual	
• using measuring devices to Solve problems in direct current circuits												
• using meters for problem solving, including measuring resistance using direct, volt-ammeter and/or bridge methods	Jenneson, Electrical Principles 7e	1.41 Measuring resistance using direct, volt-ammeter and bridge methods	90				48				Prac Manual	
• using methodical Techniques to solve d.c. circuit problems from measured and calculated values												
Knowledge Evidence												
• electrical concepts, including: - calculations involving quantity of electricity, velocity and speed	Jenneson, Electrical Principles 7e	1.6 Calculations for quantity of electricity, and velocity and speed in its generation and transportation	14, 15, 16, 17			1, 2, 3, 4, 5	5					
- distribution of electricity from the source to the load via the transmission systems	Jenneson, Electrical Principles 7e	1.4 Transportation of electricity from the source to the load	7, 8, 9, 10			1, 2, 3, 4, 5	3	1				
- principle of conservation of energy	Jenneson, Electrical Principles 7e	1.27 Principle of conservation of energy				2	30					
- production of electricity, including: - renewable and non-renewable energy sources	Jenneson, Electrical Principles 7e	1.3 Production of electricity by renewable and non-renewable energy sources	55, 56	2		1, 2, 3, 4, 5						
- static and current electricity	Jenneson, Electrical Principles 7e	1.2 Static and current electricity	1, 2, 3, 4, 5, 6, 59	5, 6		1, 2, 3, 4, 5	2					
- utilisation of electricity by the various loads	Jenneson, Electrical Principles 7e	1.5 Utilisation of electricity by the various loads	11, 12, 13			1, 2, 3, 4, 5	4					
• electrical circuit, including: - industry standard symbols used to represent components in an electrical circuit diagram	Jenneson, Electrical Principles 7e	1.8 Symbols used to represent an electrical energy source, a load, a switch and a circuit protection device in a circuit diagram	18, 19, 23, 24	3			6, 16, 17					
- multiple and sub-multiple units	Jenneson, Electrical Principles 7e	1.10 Multiple and sub-multiple units		35			9				Prac Manual	
- purpose of each component in the electrical circuit	Jenneson, Electrical Principles 7e	1.5 Utilisation of electricity by the various loads	20, 21, 22									
• Ohm's Law, including:												
- d.c. single path circuit	Jenneson, Electrical Principles 7e	1.11 Basic d.c. single-path circuit		15			10		3		Prac Manual	
- determining voltage, current and resistance in a circuit	Jenneson, Electrical Principles 7e	1.13.1 Determining voltage, current and resistance in a circuit	28, 29, 30, 31	17			13				Prac Manual	
- effects of an open circuit, a closed circuit and a short circuit on a d.c. single path	Jenneson, Electrical Principles 7e	Section 1.9 Effects of an open circuit, a closed circuit and a short circuit					12	2				
- relationship between voltage and current from measured values in a circuit												
- graphical relationships of voltage, current and resistance	Jenneson, Electrical Principles 7e	Section 1.13 Voltage, current and resistance in a circuit									Prac Manual	
- relationship between voltage, current and resistance	Jenneson, Electrical Principles 7e	Section 1.13 Voltage, current and resistance in a circuit							6		Prac Manual	
- voltage and current levels in a d.c. single path circuit	Jenneson, Electrical Principles 7e	1.13 Voltage and current levels in a basic d.c. single-path circuit		4			11				Prac Manual	
• electrical power, including: - effects of power rating of various resistors	Jenneson, Electrical Principles 7e	1.30 Power ratings of a resistor			2, 3						Prac Manual	
- methods for measuring of electrical power in a d.c. circuit	Jenneson, Electrical Principles 7e	1.17 Measurement of electrical power in a d.c. circuit	43, 44		2, 3		19					
- power dissipated in circuit from voltage, current and resistance values	Jenneson, Electrical Principles 7e	1.15 Power dissipated in a circuit from voltage, current and resistance values	38, 39, 40, 41, 42	20	2, 3		15				Prac Manual	
- power ratings of electrical devices	Jenneson, Electrical Principles 7e	1.16 Power ratings of devices		5	2, 3		18				Prac Manual	
- relationship between force, power, work and energy	Jenneson, Electrical Principles 7e	1.14 Relationship between force, power, energy and work	37	7	2, 3		14				Prac Manual	
• effects of electrical current, including: - relevant industry standards relating to fundamental principles for protection against the damaging effects of current	Jenneson, Electrical Principles 7e	1.22 Principles for protection against the damaging effects of current					25					

- mechanisms by which metals corrode	Jenneson, Electrical Principles 7e	1.21 Mechanisms by which metals corrode	50	4, 11, 12			24	4			
- principles by which electric current can result in the production of: - heat - magnetic fields - a chemical reaction	Jenneson, Electrical Principles 7e	1.19 Basic principles by which electric current can result in the production of heat, the production of magnetic fields or a chemical reaction	46, 47, 51, 52	3, 4, 6, 9			22				
- typical uses of electrical current	Jenneson, Electrical Principles 7e	1.20 Typical uses of the effects of current	48, 49				23				
- physiological effects of current	Jenneson, Electrical Principles 7e	1.18 Physiological effects of electrical current and the fundamental principles for protection	45	8			20, 21				
• electromotive force (EMF) sources and conversion of electrical energy, including: - input, output, efficiency and losses of electrical systems and machines	Jenneson, Electrical Principles 7e	1.25 Input, output, efficiency or losses of electrical systems and machines			2		28				
- principles of generating an EMF, including: - when a mechanical force is applied to a crystal	Jenneson, Electrical Principles 7e	1.23.15 Piezoelectric sources	54, 62, 63			2					
- when moving a conductor in a magnetic field	Jenneson, Electrical Principles 7e	1.23 Basic principles of producing an electromotive force (EMF)	53		1, 2, 3, 4, 5	2	26, 27				
- by the application of light falling on the surface of photovoltaic (PV) cells	Jenneson, Electrical Principles 7e	3.12.2 Solar energy	58	1		2					
- from the heating of one junction of a thermocouple	Jenneson, Electrical Principles 7e	1.23 Basic principles of producing an electromotive force (EMF)	60, 61			2					
- principles of producing an electrical current from primary, secondary and fuel cells	Jenneson, Electrical Principles 7e	1.24 Principles of producing an electrical current	57, 64, 65, 66	10, 13, 14		2		3	4		
• resistors, including: - types and applications of fixed and variable resistors used in the electrotechnology industry	Jenneson, Electrical Principles 7e	1.28 Resistors 1.29 Variable resistors				3, 4, 5	31, 32, 33, 34			Prac Manual	
- characteristics of variable resistors used in the electrotechnology industry, including: - adjustable resistors: potentiometer and rheostat - light dependent resistor (LDR) - voltage dependent resistor (VDR) - temperature dependent resistor	Jenneson, Electrical Principles 7e	1.29 Variable resistors		25		3, 4, 5					
- power ratings of a resistor	Jenneson, Electrical Principles 7e	1.30 Power ratings of a resistor	97			3, 4, 5				Prac Manual	
- power loss (heat) occurring in a conductor	Jenneson, Electrical Principles 7e	1.31 Power loss (heat) occurring in a conductor		3		3, 4, 5				Prac Manual	
- resistor colour code tables	Jenneson, Electrical Principles 7e	1.32 Reading resistors	67	26, 33		3, 4, 5		8		Prac Manual	
• series, parallel, and series-parallel circuits, including: - applications where these circuits are used in the electrotechnology industry	Jenneson, Electrical Principles 7e	1.34.2 Where are series circuits used? 1.36.2 Voltage in parallel circuits 1.37 Series/parallel circuits		36	1, 3, 4, 5	6				Prac Manual	
- characteristics of series, parallel, and series-parallel circuits, including: - connection of loads - current path - voltage drops - power dissipation - effects of an open circuit	Jenneson, Electrical Principles 7e	1.35 Characteristics of a series circuit 1.36 Parallel connected circuits 1.37 Series/parallel circuits	68, 69, 71, 72, 73, 74, 75, 77	8, 9, 16 18, 19, 32	3, 4	6	41			Prac Manual	
- diagrams of single source d.c. series, parallel, and series-parallel circuits	Jenneson, Electrical Principles 7e	1.34 Series (connected) circuits 1.36 Parallel connected circuits 1.37.3 equivalent resistance	70, 76, 81, 82		1, 3, 4, 5	6	44			Prac Manual	
- identification of the components of series, parallel, and series-parallel circuits, including power supply, loads, connecting leads and switch	Jenneson, Electrical Principles 7e	1.34 Series (connected) circuits 1.36.5 Power in parallel circuits 1.37 Series/parallel circuits	80		1, 3, 4, 5	6				Prac Manual	
- relationship between voltage drops and resistance in a simple voltage divider network	Jenneson, Electrical Principles 7e	1.35 Characteristics of a series circuit			1, 4, 5		39				
- Techniques for determining voltage, current, resistances or power dissipated from measured or given values (of any two of these quantities)	Jenneson, Electrical Principles 7e	1.35 Characteristics of a series circuit			1, 4, 5		39				
- relationship between branch currents and resistances in a two-branch parallel and series-parallel current divider network	Jenneson, Electrical Principles 7e	1.36.3 Current in parallel circuits	99		3, 4	6					
• factors affecting the resistance of a conductor, including: - conductor length - cross-sectional area - resistivity - changes in temperature and material	Jenneson, Electrical Principles 7e	1.38 Factors affecting resistance	87				45			Prac Manual	
- effect the change in cross-sectional area, length and type of material has on the resistance of a conductor	Jenneson, Electrical Principles 7e	1.38.4 Type of material (resistivity) 1.38.2 Length 1.38.3 Cross-sectional area (CSA)	22, 23							Prac manual	
- effects of resistance on the current-carrying capacity and voltage drop in cables	Jenneson, Electrical Principles 7e	1.39 Effects of resistance on the current-carrying capacity and voltage drop in cables					46			Prac Manual	

- effects of temperature change on the resistance of various conducting materials	Jenneson, Electrical Principles 7e	1.38.5 Temperature	86	24					8		
• effects of measuring devices in a circuit, including:											
- advantages and disadvantages of each voltage indicator tester	Jenneson, Electrical Principles 7e	1.49.1 Voltage testers									
- calibration and use of the measuring device											
- methods for connecting an analogue/digital voltmeter into a circuit ensuring the polarities are correct and taking various voltage readings	Jenneson, Electrical Principles 7e	1.12.1 Measuring electricity—devices and units	34, 35							Prac Manual	
- correct Techniques to read the scale of an analogue meters and how to reduce the 'parallax' error	Jenneson, Electrical Principles 7e	1.47 Techniques for reading the scale of an analogue meter					54			Prac Manual	
- hazards associated with the use of measuring devices, including polarity	Jenneson, Electrical Principles 7e	1.12.1 Measuring electricity—devices and units 1.45 Hazards involved in using electrical instruments	33							Prac Manual	
- hazards involved in using electrical instruments and the safety control measures that should be taken	Jenneson, Electrical Principles 7e	1.40.4 Internal impedance	36							Prac Manual	
- instruments used in the field to measure voltage, current, resistance and insulation resistance and the typical circumstances in which they are used	Jenneson, Electrical Principles 7e	1.40.3 Sensitivity	88				49			Prac Manual	
- methods for using insulation resistance measuring devices to relevant industry standards	Jenneson, Electrical Principles 7e	1.51.1 Insulation resistance		37		1	58			Prac Manual	
- loading effect of various voltmeters when measuring voltage across various loads	Jenneson, Electrical Principles 7e	1.50 Using and selecting an appropriate meter								Prac Manual	
- methods for measuring resistance using direct, volt-ammeter and bridge methods	Jenneson, Electrical Principles 7e	1.41 Measuring resistance using direct, volt-ammeter and bridge methods	90				48			Prac Manual	
- non-contact voltage indicator types and use											
- operating characteristics of analogue and digital meters	Jenneson, Electrical Principles 7e	1.46 Operating characteristics of analogue and digital meters					53				
- connecting an analogue/digital voltmeter into a circuit ensuring the polarities are correct and taking various voltage readings	Jenneson, Electrical Principles 7e	1.50 Using and selecting an appropriate meter								Prac Manual	
- operation of various voltage indicator testers	Jenneson, Electrical Principles 7e	1.49 Non-contact testing instruments					55				
- purpose and characteristics of a voltmeter	Jenneson, Electrical Principles 7e	1.48.2 The voltmeter section		2						Prac Manual	
- purpose of an ammeter and the correct connection (series) of an ammeter into a circuit	Jenneson, Electrical Principles 7e	1.12.1 Measuring electricity—devices and units 1.42 Instruments used to measure voltage, current, resistance and insulation resistance	32	1						Prac Manual	
- reasons the internal resistance of an ammeter must be extremely low and the dangers and consequences of connecting an ammeter in parallel and/or wrong polarity	Jenneson, Electrical Principles 7e	1.12.1 Measuring electricity—devices and units 1.45 Hazards involved in using electrical instruments	33							Prac Manual	
- methods for selecting an appropriate meter in terms of units to be measured, range, loading effect and accuracy for a given application	Jenneson, Electrical Principles 7e	1.40 Selecting an appropriate meter					57			Prac Manual	
- types of voltage indicator testers, including light-emitting diode (LED), neon, solenoid, volt-stick and series tester and the purpose of each voltage indicator tester	Jenneson, Electrical Principles 7e	1.49 Non-contact testing instruments					50, 51				
- methods for using voltage indicator testers to detect the presence of various voltage levels	Jenneson, Electrical Principles 7e	1.50 Using and selecting an appropriate meter									
• capacitors and capacitance, including:	Jenneson, Electrical Principles 7e	1.53 Capacitors and capacitance	13, 93			7	60				
- construction of a standard capacitor	Jenneson, Electrical Principles 7e					7					
- different types of dielectric material and each dielectric's relative permittivity	Jenneson, Electrical Principles 7e	1.53.6 Dielectric constants				7					
- types of capacitors commonly used in the electrotechnology industry	Jenneson, Electrical Principles 7e	1.53.3 Capacitor types				7	61	9			
- industry standard symbol of various types of capacitors, including standard, variable, trimmer and polarised	Jenneson, Electrical Principles 7e	1.53.3 Capacitor types				7					
- terms and units for capacitance, electric charge and energy	Jenneson, Electrical Principles 7e	1.53.4 Capacitance		27, 34		7	62				
- factors affecting capacitance	Jenneson, Electrical Principles 7e	1.53.6 Dielectric constants		28		7					
- behaviour of a series d.c. circuit containing resistance and capacitance components.	Jenneson, Electrical Principles 7e	1.54.2 The time constant				7					
- charge and discharge curves	Jenneson, Electrical Principles 7e	1.55 Calculation of quantities from given information				7					
- arrangement of a series d.c. circuit containing capacitance and resistor to determine the time constant of the circuit	Jenneson, Electrical Principles 7e										
• capacitors in series and parallel, including:	Jenneson, Electrical Principles 7e	1.59 Application of capacitors in the electrotechnology industry				8	67				
- application of capacitors in the electrotechnology industry	Jenneson, Electrical Principles 7e										
- common faults in capacitors	Jenneson, Electrical Principles 7e	1.56.2 Capacitor faults				8					
- arrangement of capacitors in series and/or parallel configurations to achieve various capacitance values	Jenneson, Electrical Principles 7e	1.58 Effects on the total capacitance of capacitors connected in series				8					
- equivalent capacitance of capacitors connected in series and parallel											
- effects of capacitors connected in parallel by calculating their equivalent capacitance	Jenneson, Electrical Principles 7e	1.57 Effects of capacitors connected in parallel	96			8	65		10		
- effects on the total capacitance of capacitors connected in series by calculating their equivalent capacitance	Jenneson, Electrical Principles 7e	1.58 Effects on the total capacitance of capacitors connected in series		30		8	66		9		
- hazards involved in working with capacitance effects and the safety control measures that should be taken, including safe handling and the correct methods of discharging various size capacitors, dangers of a charged capacitor and the consequences of discharging a capacitor through a person	Jenneson, Electrical Principles 7e	1.56 Hazards and safety control measures involved in working with capacitance effects				8	52, 64				
- testing of capacitors to determine serviceability	Jenneson, Electrical Principles 7e	1.56.4 Testing capacitors		31		8					