Uoc: UEENEEG101A — Solve problems in electromagnetic devices and related circuits

CIII–Core

Essential Performance Capabilities

Required skills and knowledge	McGraw Hill Text	Heading reference	Test Bank	Quizzes	Cases	Worksheets	PPTs	Interactives	Animations	Prac Manual
T1 Magnetism encompassing:										
magnetic field pattern of bar and horse-shoe magnets.	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.1 Magnetic field pattern of bar and horse-shoe magnets	Q1, Q2, Q3	Q1	Q1, Q2, Q3, Q4, Q5		Slide 2, UEENEEE141A - Slide 8		Figure 3.2 Line of force in a magnetic field	
magnets attraction and repulsion when brought in contact with each other.	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.2 Magnets' attraction and repulsion when brought in contact with each other	Q4	Q5	Q1, Q2, Q3, Q4, Q5		Slide 3, UEENEEE141A - Slide 9			
common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials).	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.3 Common magnetic and non-magnetic materials and groupings (diamagnetic, paramagnetic and ferromagnetic materials)	Q5, Q6, Q7, Q8, Q10, Q12		Q1, Q2, Q3, Q4, Q5		Slide 4, UEENEEE141A - Slide 10			
principle of magnetic screening (shielding) and its applications.	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.4 The principle of magnetic screening (shielding) and its applications	Q11		Q1, Q2, Q3, Q4, Q5		UEENEEE141A - Slide 11			
practical applications of magnets	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.5 Practical applications of magnets	Q9		Q1, Q2, Q3, Q4, Q5		Slide 5, UEENEEE141A - Slide 12			
construction, operation and applications of reed switches.	Jenneson, Electrical Principles for Electrical Trades 7e	2.1.6 Construction, operation and applications of reed switches			Q1, Q2, Q3, Q4, Q5					
T2 Electromagnetism encompassing:							Slide 6			
conventions representing direction of current flow in a conductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.1 Conventions representing direction of current flow in a conductor	Q13		Q1, Q2, Q4, Q5	Q2				
magnetic field pattern around a single conductor and two adjacent conductors carrying current.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.2 Magnetic field pattern around a single conductor and two adjacent conductors carrying current			Q1, Q2, Q4, Q5	Q2			Figure 3.10 Magnetic field around a straight conductor	
Using the "right hand rule" to determine the direction of magnetic field around a current carrying conductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.3 Using the right-hand (grip) rule to determine the direction of magnetic field around a current-carrying conductor	Q15, Q16		Q1, Q2, Q4, Q5	Q2	Slide 7			
direction of force between adjacent current carrying conductors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.4 Direction of force between adjacent current-carrying conductors		Q18	Q1, Q2, Q4, Q5	Q2	Slide 8, UEENEEE141A - Slide 15			
effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions).	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.5 The effect of current, length and distance apart on the force between conductors (including forces on bus bars during fault conditions)	Q17, Q18		Q1, Q2, Q4, Q5	Q2		03a Magnetism: Draw the field pattern around each pair of conductors and determine the direction of the field and the force applied to the conductors.	Figure 3.13 Flux around straight conductors	
magnetic field around an electromagnet.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.6 Magnetic field around an electromagnet			Q1, Q2, Q4, Q5	Q2	Slide 10		Figure 3.14 Flux in a solenoid	
Using the "right hand rule" to determine the direction of magnetic field around a current carrying coil.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.7 Using the right-hand (grip) rule to determine the direction of magnetic field around a current-carrying coil			Q1, Q2, Q4, Q5	Q2			Figure 3.11 Current flow convention Figure 3.12 Righthand-grip rule	
magnetomotive force (m.m.f.) and its relationship to the number of turns in a coil and the current flowing in the coil.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.8 Magnetomotive force (MMF) and its relationship to the number of turns in a coil and the current flowing in the coil	Q19		Q1, Q2, Q4, Q5	Q2				Prac Manual
practical applications of electromagnets.	Jenneson, Electrical Principles for Electrical Trades 7e	2.2.9 Practical applications of electromagnets	Q14	Q2	Q1, Q2, Q4, Q5	Q2	Slide 9			Prac Manual
T3 Magnetic circuits encompassing:										
magnetic characteristic curve for various materials and identify the various regions.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.1 Magnetic characteristic curve for various materials and identifying the various regions	Q36, Q37, Q38, Q39, Q43	Q6	Q1, Q2, Q4, Q5	Q1, Q3	Slide 11			
Identify the various conditions of a magnetic material from its Hysteresis loop.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.2 Identifying the various conditions of a magnetic material from its hysteresis loop	Q41, Q43, Q44		Q1, Q2, Q4, Q5	Q1, Q3	Slide 12		Figure 3.18 Magnetic hysteresis	
factors which determine losses in magnetic material.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.3 Factors which determine losses in magnetic material	Q45		Q1, Q2, Q4, Q5	Q1, Q3	Slide 13			Prac Manual
methods used to reduce electrical losses in a magnetic circuit.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.4 Methods used to reduce electrical losses in a magnetic circuit	Q40		Q1, Q2, Q4, Q5	Q1, Q3				Prac Manual
magnetic flux (definition, unit and symbol).	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.5 Magnetic flux			Q1, Q2, Q4, Q5	Q1, Q3				
reluctance as the opposition to the establishment of magnetic flux.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.6 Reluctance as the opposition to the establishment of magnetic flux	Q33		Q1, Q2, Q4, Q5	Q1, Q3	Slide 14			
permeability (definition, symbol and unit).	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.7 Permeability	Q32	Q7	Q1, Q2, Q4, Q5	Q1, Q3				
difference for magnetic and non-magnetic materials in regards to reluctance and permeability.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.8 Difference for magnetic and non-magnetic materials with regard to reluctance and permeability	Q21, Q22, Q23, Q24, Q34, Q35		Q1, Q2, Q4, Q5	Q1, Q3				
calculation of m.m.f., flux or reluctance given any two values.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.9 Calculation of MMF, flux or reluctance, given any two values	Q20, Q25, Q26, Q28		Q1, Q2, Q4, Q5	Q1, Q3	Slide 15			
flux density (definition, symbol, unit and calculation).	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.10 Flux density	Q29, Q30, Q31	Q8	Q1, Q2, Q4, Q5	Q1, Q3				
magnetising force (definition, symbol, unit and calculation).	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.11 Magnetising force	Q27		Q1, Q2, Q4, Q5	Q1, Q3				
common magnetic circuit types.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.12 Common magnetic circuit types	Q42		Q1, Q2, Q4, Q5	Q1, Q3	Slide 16			Prac Manual
effect of an air gap in a magnetic circuit.	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.13 Effect of an air gap in a magnetic circuit			Q1, Q2, Q4, Q5	Q1, Q3				Prac Manual
terms "magnetic leakage" and "magnetic fringing".	Jenneson, Electrical Principles for Electrical Trades 7e	2.3.14 'Magnetic leakage' and 'magnetic fringing'			Q1, Q2, Q4, Q5	Q1, Q3		03b Magnetism: Label the 10 basic parts for a relay/contactor.	Figure 3.21 Armature relay and contactor	Prac Manual
T4 Electromagnetic induction encompassing:										
principle of electromagnetic induction (Faraday's law of electromagnetic induction).	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.1 Principle of electromagnetic induction (Faraday's Law of electromagnetic induction)	Q52, Q100		Q1, Q2, Q4, Q5	Q4, Q5	Slide 17			
applying "Fleming's right hand rule" to a current a carrying conductor under the influence of a magnetic field.	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.2 Applying Fleming's right-hand rule to a current-carrying conductor under the influence of a magnetic field		Q21	Q1, Q2, Q4, Q5	Q4, Q5				
calculation of induced e.m.f. in a conductor given the conductor length, flux density and velocity of the conductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.3 Calculation of induced EMF in a conductor, given the conductor length, flux density and velocity of the conductor	Q47, Q48	Q9	Q1, Q2, Q4, Q5	Q4, Q5	Slide 18		Figure 6.2 Conductor path through a magnetic field	
calculation of induced e.m.f. in a coil given the number of turns in a coil and the rate of change of flux.	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.4 Calculation of induced EMF in a coil, given the number of turns in a coil and the rate of change of flux	Q53, Q54		Q1, Q2, Q4, Q5	Q4, Q5, Q6	Slide 19			
calculation of force on a conductor given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.5 Calculation of force on a conductor, given the flux density of the magnetic field, length of the conductor and the current being carried by the conductor	Q46, Q56, Q57		Q1, Q2, Q4, Q5	Q4, Q5	Slide 20			
Lenz's law	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.6 Lenz's Law	Q55		Q1, Q2, Q4, Q5	Q4, Q5	Slide 21		Figure 6.3 Forces on a conductor in a magnetic field	
applications of electromagnetic induction	Jenneson, Electrical Principles for Electrical Trades 7e	2.4.7 Applications of electromagnetic induction	Q49, Q50, Q51, Q52		Q1, Q2, Q4, Q5	Q4, Q5	Slide 22			
T5 Inductance encompassing:							Slide 23			

construction of an inductor, including a bifilar winding inductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.1 Construction of an inductor, including a Bifilar winding inductor	Q58, Q59, Q60		Q1, Q2, Q4, Q5	Q6	Slide 24, UEENEEG006A - Slide 58			
Australian Standard circuit diagram symbol for the four types of inductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.2 Australian Standard circuit diagram symbol for the four types of inductor	Q61		Q1, Q2, Q4, Q5	Q6	Slide 25			
effect of physical parameters on the inductance of an inductor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.3 Effect of physical parameters on the inductance of an inductor	Q73		Q1, Q2, Q4, Q5	Q6	Slide 26			
common types of inductor cores.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.4 Common types of inductor cores	Q68		Q1, Q2, Q4, Q5	Q6	Slide 27	06a Inductors: Identify the type for each inductor shown in the image. Question 04a Direct current machines: Label the parts of a dc machine		
applications of the different types of inductors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.5 Applications of the different types of inductors	Q79, Q80		Q1, Q2, Q4, Q5	Q6	Slide 28			
definition of terms self induction, inductance and mutual inductance.	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.6 Self-inductance, inductance and mutual inductance	Q62, Q63, Q64, Q65, Q66, Q67	Q10	Q1, Q2, Q4, Q5	Q6	Slide 29		Figure 6.11 Mutual inductance between conductors	
calculation of value of self induced e.m.f. in a coil	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.7 Calculation of value of self-induced EMF in a coil	Q69		Q1, Q2, Q4, Q5	Q6	Slide 30			
mutual induction occurs between two coils	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.8 Mutual induction occurring between two coils			Q1, Q2, Q4, Q5	Q6	Slide 31		Figure 6.10 Mutual inductance in conductors Figure 6.13 Kettering system of automobile ignition	
graphical relationship between load voltage, current and self induced e.m.f. in a single d.c. circuit having inductance	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.9 Graphical relationship between load voltage, current and self-induced EMF in a single d.c. circuit which has inductance	Q71, Q72, Q73		Q1, Q2, Q4, Q5	Q6	Slide 32			
practical applications for the effects of self and mutual induction	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.10 Practical applications for the effects of self- and mutual induction	Q101, Q102		Q1, Q2, Q4, Q5	Q6	Slide 33			
undesirable effects of self and mutual induction	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.11 Undesirable effects of self- and mutual induction	Q74, Q75, Q76, Q77		Q1, Q2, Q4, Q5	Q6	Slide 34			
definition of term "time constant" and draw the characteristic curve as applied to a series circuit containing an inductor and a resistor. (LR circuit)Calculation of value of the time constant for an LR circuit given the values of the components	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.12 'Time constant' and drawing the characteristic curve as applied to a series circuit containing an inductor and a resistor	Q70, Q78	Q11	Q1, Q2, Q4, Q5	Q6	Slide 35			
time constants required for the current in an LR circuit to reach its final value	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.13 Time constants required for the current in an LR circuit to reach its final value			Q1, Q2, Q4, Q5	Q6	Slide 36			
determining of instantaneous values of voltage and current in an LR circuit using a universal time constant chart	Jenneson, Electrical Principles for Electrical Trades 7e	2.5.14 Determining of instantaneous values of voltage and current in an LR circuit using a universal time constant chart	Q78		Q1, Q2, Q4, Q5	Q6	Slide 37			
T6 Measurement Instruments encompassing:										
moving coil, moving iron, dynamometer meter movements and clamp testers.	Jenneson, Electrical Principles for Electrical Trades 7e	2.6.1 Moving-coil, moving-iron, dynamometer meter movements and clamp testers		Q3		Q7	Slide 38, Slide 39, Slide 40, Slide 41			
practical applications for moving coil, moving iron and dynamometer meter movements.	Jenneson, Electrical Principles for Electrical Trades 7e	2.6.2 Practical applications for moving-coil, moving-iron and dynamometer meter movements	Q82			Q7	Slide 42			
calculation of resistance of shunts and multipliers to extend the range of ammeters and voltmeters.	Jenneson, Electrical Principles for Electrical Trades 7e	2.6.3 Calculation of resistance of shunts and multipliers to extend the range of ammeters and voltmeters	Q81	Q12		Q7	Slide 43, Slide 44			
factors to be considered in selecting meters for a particular application.	Jenneson, Electrical Principles for Electrical Trades 7e	1.41 Selecting an appropriate meter				Q7				Prac Manual
safety category of meters and their associated applications.	Jenneson, Electrical Principles for Electrical Trades 7e	1.46 Hazards involved in using electrical instruments				Q7				
steps and procedures for the safe use, care and storage of electrical instruments.	Jenneson, Electrical Principles for Electrical Trades 7e	1.46 Hazards involved in using electrical instruments				Q7				Prac Manual
T7 Magnetic devices encompassing:										
construction, operation and applications of relays.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.1 Construction, operation and applications of relays	Q83	Q13	Q1, Q2, Q3, Q4, Q5		Slide 45			
construction, operation and applications of contactors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.2 Construction, operation and applications of contactors	Q103	Q14	Q1, Q2, Q3, Q4, Q5		Slide 46			
magnetic methods used to extinguish the arc between opening contacts.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.3 Magnetic methods used to extinguish the arc between opening contacts			Q1, Q2, Q3, Q4, Q5					
construction, operation and applications of Hall Effect devices.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.4 Construction, operation and applications of Hall effect devices			Q1, Q2, Q3, Q4, Q5		Slide 47			
operation and applications of magnetostriction equipment.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.5 Operation and applications of magnetostriction equipment			Q1, Q2, Q3, Q4, Q5		Slide 48			
construction, operation and application of magnetic sensing devices.	Jenneson, Electrical Principles for Electrical Trades 7e	2.7.6 Construction, operation and application of magnetic sensing devices			Q1, Q2, Q3, Q4, Q5		Slide 49			
T8 Machine principles encompassing:										
basic operating principle of a generator.	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.1 Basic operating principle of a generator	Q85	Q9, Q15			Slide 50			
applying Fleming's right hand rule for generators.	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.2 Applying Fleming's right-hand rule for generators					Slide 51, UEENEEE141A - Slide 14			
basic operating principle of a motor	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.3 Basic operating principle of a motor	Q56, Q57, Q84				Slide 52			
applying Fleming's left hand rule for motors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.4 Applying Fleming's left-hand rule for motors	Q86				Slide 53, UEENEEG102A - Slide 11	Question 04b Direct current machines: Label the components of Fleming's left hand rule for motors.		
calculation of force and torque developed by a motor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.5 Calculation of force and torque developed by a motor	Q56, Q57				Slide 54			
T9 Rotating machine construction, testing and maintenance encompassing:										
components of a d.c. machine.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.1 Components of a d.c. machine	Q87, Q88	Q4, Q16			Slide 55	Question 01a Electromagnetic force: Label the parts of the d.c. machine in the diagram.	Figure 4.5 Magnetic circuit in a four-pole d.c. machine Figure 4.12 Rectifying action of a commutator Figure 4.29 Reversal of rotation of a d.c. motor	Prac Manual
difference between a generator and a motor in terms of energy conversion.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.2 Difference between a generator and a motor in terms of energy conversion					Slide 56			
nameplate of a machine.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.3 Machine nameplates					Slide 57			Prac Manual

using electrical equipment to make electrical measurements and comparison of readings with nameplate ratings.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.4 Using electrical equipment to make electrical measurements and comparison of readings with nameplate ratings								Prac Manual
Identification of faults in a machine from electrical measurements.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.5 Identification of faults in a machine from electrical measurements					Slide 58			
care and maintenance processes for rotating machines	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.6 Care and maintenance processes for rotating machines					Slide 59			Prac Manual
safety risks associated with using rotating machinery.	Jenneson, Electrical Principles for Electrical Trades 7e	2.9.7 Safety risks associated with using rotating machinery					Slide 60			Prac Manual
T10 Generators encompassing:										
basic operation of a d.c generator.	Jenneson, Electrical Principles for Electrical Trades 7e	2.8.1 Basic operating principle of a generator								
calculation of generated and terminal voltage of a d.c. shunt generator	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.1 Calculation of generated and terminal voltage of a d.c. shunt generator					Slide 61			
prime movers, energy sources and energy flow used to generate electricity.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.2 Prime movers, energy sources and energy flow used to generate electricity								
types of d.c. generators and their applications.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.3 Types of d.c. generators and their applications		Q17			Slide 62			
methods of excitation used for d.c generators.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.4 Methods of excitation used for d.c. generators					Slide 63			
equivalent circuit for a d.c. generator.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.5 Equivalent circuit for a d.c. generator								
importance of residual magnetism for a self excited generator.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.6 Importance of residual magnetism for a self-excited generator					Slide 64			
open circuit characteristics of d.c. generators.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.7 Open circuit characteristics of d.c. generators	Q89				Slide 65			
load characteristics of a d.c generator.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.8 Load characteristics of a d.c. generator	Q91, Q92, Q93							
reversing the polarity of a d.c. generator	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.9 Reversing the polarity of a d.c. generator	Q90				Slide 66			
Connect and test a d.c generator on no-load and load	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.10 Connecting and testing a d.c. generator on no load and load								
Identify safety risks associated with using generators.	Jenneson, Electrical Principles for Electrical Trades 7e	2.10.11 Identifying safety risks associated with using generators								
T11 Motors encompassing:										
operation of a motor and its energy flow.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.1 Operation of a motor and its energy flow				Q8, Q9	Slide 67			
effect of back e.m.f. in d.c. motors	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.2 Effect of back EMF in d.c. motors				Q8, Q9	Slide 67			
torque as the product of the force on the conductors and the radius of the armature/rotor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.3 Torque as the product of the force on the conductors and the radius of the armature/rotor		Q18		Q8, Q9	Slide 68			
types of d.c. motors and their applications.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.4 Types of d.c. motors and their applications	Q94, Q95			Q8, Q9	Slide 69			Prac Manual
circuit diagrams for the types of d.c. motors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.5 Circuit diagrams for the types of d.c. motors				Q8, Q9				Prac Manual
equivalent circuit for the types of d.c. motors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.6 Equivalent circuit for the types of d.c. motors				Q8, Q9				
calculation of power output of a motor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.7 Calculation of power output of a motor				Q8, Q9	Slide 70			
characteristics of the different types of d.c. motors.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.8 Characteristics of the different types of d.c. motors				Q8, Q9	Slide 71			
connection and testing a d.c. shunt motor on no-load and load	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.9 Connecting and testing a d.c. shunt motor on no load and load				Q8, Q9				
reversing the direction of rotation of a d.c. motor.	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.10 Reversing the direction of rotation of a d.c. motor		Q19		Q8, Q9	Slide 72			Prac Manual
safety risks associated with using motors (include risks of series d.c. motors).	Jenneson, Electrical Principles for Electrical Trades 7e	2.11.11 Safety risks associated with using motors				Q8, Q9				
T12 Machine efficiency encompassing:										
losses that occur in a d.c machine.	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.1 Losses that occur in a d.c. machine	Q96	Q22			Slide 73			Prac Manual
methods used to determine the losses in a d.c. machine.	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.2 Methods used to determine the losses in a d.c. machine		Q22			Slide 74			
calculation of losses and efficiency of a d.c machine.	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.3 Calculation of losses and efficiency of a d.c. machine				Q8, Q9	Slide 75			
efficiency characteristic of a d.c. machine and the conditions for maximum efficiency.	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.4 Efficiency characteristics of a d.c. machine and the conditions for maximum efficiency	Q97	Q20						
application of Minimum Energy Performance standards (MEPS).	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.5 Application of Minimum Energy Performance Standards (MEPS)	Q98							
methods used to maintain high efficiency.	Jenneson, Electrical Principles for Electrical Trades 7e	2.12.6 Methods used to maintain high efficiency	Q99							Prac Manual