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| <b>Title</b> | <b>Demonstrate knowledge of capacitors and semiconductor diodes</b> |                |          |
| <b>Level</b> | <b>2</b>  | <b>Credits</b> | <b>3</b> |

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| <b>Purpose</b> | <p>This unit standard and provides for a basic appreciation of capacitors, and semiconductor diodes for trainees in the electrical industry.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> <li>– demonstrate knowledge of capacitors;</li> <li>– demonstrate knowledge of semiconductor diodes; and</li> <li>– test semiconductor diodes.</li> </ul> |
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| <b>Classification</b> | Electrical Engineering > Core Electrical |
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| <b>Available grade</b> | Achieved |
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### Guidance Information

- 1 This unit standard has been developed for learning and assessment off-job.
- 2 References  
Electricity (Safety) Regulations 2010;  
AS/NZS 3000:2018, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*, including Amendment 1;  
and all subsequent amendments and replacements.
- 3 Definition  
The term *current regulations and standards* is used in this unit standard to refer to the requirements of the above references.
- 4 For assessment purposes
  - a Candidates shall be supplied with formulae involving more than three quantities.
  - b Use of a calculator during assessment is permitted.
  - c Candidates are expected to express calculated values in the relevant Système International (SI) units, including multiples and sub-multiples (pico, nano, micro, milli, kilo, mega, etc) and be able to convert between them.
- 5 Formulae quoted in this unit standard use internationally recognised symbols and units.

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### Outcomes and performance criteria

#### Outcome 1

Demonstrate knowledge of capacitors.

**Performance criteria**

- 1.1 Capacitor types are described in terms of their physical construction.  
Range stacked-plate, rolled, electrolytic, variable, ceramic.
- 1.2 Capacitance is defined in terms of voltage and charge, and its symbol and units are stated.
- 1.3 The factors influencing capacitance are stated, together with the effect of each when it is increased and decreased.  
Range factors – area, distance between plates, dielectric permittivity.
- 1.4 Charge is calculated from given values of capacitance, applied voltage, current, and time.  
Range simple calculations using formulae  $Q = CV$  and  $Q = It$ .
- 1.5 Charge/discharge curves are sketched or observed for current and voltage.
- 1.6 Practical applications are stated for air, paper, mica ceramic, electrolytic, and solid dielectric capacitors, according to industry practice.
- 1.7 Capacitance and voltage rating are identified from capacitor markings according to current practice.
- 1.8 Combined capacitance of series and parallel connected capacitors is calculated.
- 1.9 The regulatory requirements relating to capacitors used for radio and television interference suppression are stated with reasons, according to current regulations and standards.
- 1.10 The safety precautions necessary to prevent electric shock from charged capacitors are stated.

**Outcome 2**

Demonstrate knowledge of semiconductor diodes.

**Performance criteria**

- 2.1 Diode types are named and their terminals are identified.  
Range types – small signal diode, zener diode, power diode; terminals: anode and cathode.

2.2 Diode behaviour under forward and reverse bias conditions is explained with the aid of sketches of the voltage versus current characteristics.

Range small signal diode, zener diode, power diode.

2.3 Diode terms are defined, and typical values during normal and abnormal operation are stated.

Range forward bias, voltage drop, reverse breakdown, peak inverse voltage (PIV,  $V_{rrm}$ ), average forward current, power dissipation, junction temperature, leakage current.

2.4 The operation of single-phase rectifier circuits is explained with the aid of diagrams, in terms of input and output waveforms, currents, and voltages.

Range half-wave, centre-tapped transformer full-wave, bridge full-wave.

2.5 Examples of applications other than rectification are stated.

Range examples of applications – free wheeling diodes on solenoids, diode matrices in lamp test circuits, voltage reference; evidence of three uses is required.

**Outcome 3**

Test semiconductor diodes.

Range small signal diode, zener diode, power diode.

**Performance criteria**

3.1 Diode is tested in accordance with industry practice and results are documented.

Range diode tests include – forward resistance, reverse mode resistance; in-circuit testing of forward voltage drop and reverse leakage current.

3.2 Test results are interpreted to determine serviceability in terms of measured versus expected values.

3.3 The potential for damage to diodes when carrying out insulation resistance tests, and the procedures employed to prevent such damage, are described.

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| <b>Replacement information</b> | This unit standard replaced unit standard 751. |
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| <b>Planned review date</b> | 31 December 2022 |
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**Status information and last date for assessment for superseded versions**

| Process               | Version | Date             | Last Date for Assessment |
|-----------------------|---------|------------------|--------------------------|
| Registration          | 1       | 10 February 1999 | 31 December 2013         |
| Revision              | 2       | 3 April 2001     | 31 December 2013         |
| Review                | 3       | 26 May 2005      | N/A                      |
| Rollover and Revision | 4       | 15 March 2012    | N/A                      |
| Revision              | 5       | 15 January 2014  | N/A                      |
| Rollover and Revision | 6       | 28 January 2021  | N/A                      |

**Consent and Moderation Requirements (CMR) reference**

0003

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

**Comments on this unit standard**

Please contact The Skills Organisation [reviewcomments@skills.org.nz](mailto:reviewcomments@skills.org.nz) if you wish to suggest changes to the content of this unit standard.