

## 2014 HSC Electrotechnology Marking Guidelines

### Section I

#### Multiple-choice Answer Key

Question	Answer
1	B
2	B
3	C
4	D
5	A
6	C
7	A
8	A
9	B
10	B
11	D
12	A
13	D
14	D
15	C

## Section II

### Question 16

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a broad depth of understanding of a variety of ways of minimising waste</li> <li>• Uses correct terminology</li> </ul>	3
<ul style="list-style-type: none"> <li>• Demonstrates an understanding of a variety of ways of minimising waste</li> </ul>	2
<ul style="list-style-type: none"> <li>• Shows a limited understanding of how waste may be minimised</li> </ul>	1

**Sample answer:**

Reduce waste by accurate measurement of material required for work ie measure twice, cut once. Recycle materials for multiple use, eg reuse cable drum for cable offcuts. Recover copper offcuts and sell to scrap metal dealer.

### Question 17

Criteria	Marks
<ul style="list-style-type: none"> <li>• Covers most of the information provided in a schedule of work over a range of areas</li> </ul>	3
<ul style="list-style-type: none"> <li>• Covers most of the information provided in a schedule of work over some of the areas</li> </ul>	2
<ul style="list-style-type: none"> <li>• Shows a limited knowledge, indicating only minor point(s)</li> </ul>	1

**Sample answer:**

Designated work task; tools, equipment and material for use; procedures for safety, eg tool box meeting; total quality control measures; supervisor instruction; reporting procedures requirements; timeframe for work completion

**Question 18 (a)**

Criteria	Marks
• Able to identify all components correctly	2
• Able to identify most components correctly	1

**Sample answer:**

*P* Power supply / supply / energy source / cell

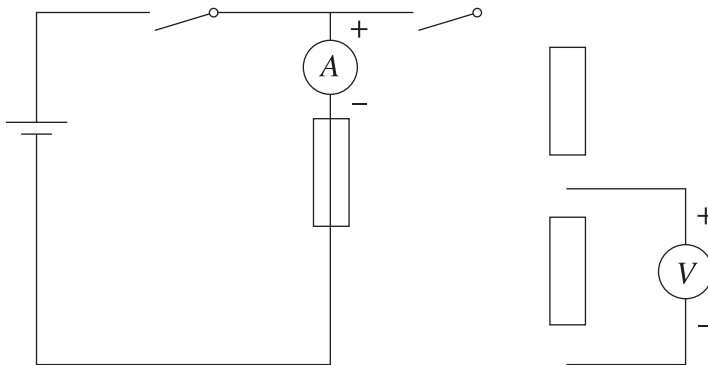
*Q* Conducting path / wire / cable / conductor – other sample answers – neutral

*R* Load or resistor

**Question 18 (b)**

Criteria	Marks
• Able to create a working diagram and includes correct polarity of the voltmeter and ammeter • Uses correct symbols	6
• Able to create a diagram with minor error(s) • Uses mostly correct symbols	4–5
• Able to create a diagram with some error(s) • Uses some correct symbols	2–3
• Demonstrates a limited understanding of circuit diagrams	1

**Sample answer:**



**Question 19 (a)**

Criteria	Marks
• Justifies an appropriate method including components required and weatherproofing	3
• Justifies an appropriate method including components required and/or weatherproofing	2
• Identifies a method	1

**Sample answer:**

Use wall-plug and screw to provide mechanical strength for the socket outlet and seal with silicone to provide weatherproofing as required.

**Question 19 (b)**

Criteria	Marks
• Demonstrates a comprehensive understanding of the required installation • Uses correct terminology	6
• Demonstrates a sound understanding of the required installation, which covers most steps required • Uses some terminology	4–5
• Demonstrates a basic understanding of the required installation	2–3
• Demonstrates a limited understanding of the required installation • Only able to name minor steps	1

**Sample answer:**

- Identify location of SO and switch board
- Design schedule of work – ie select appropriate cable, SO RCD/CBX, tools, PPE
- ID cable route
- Drill hole for cable route — through brick
- Mount the SO to manufacturer instructions and electrically isolated
- Run cable and terminate to SO
- Install appropriate rated RCD or CBX — follow isolation procedure for work in switch board
- Terminate cable to switch board
- Test installation to Australian standards before commissioning by licensed electrician
- Clean up site
- Advise customer/supervisor Job complete

**Question 20 (a)**

Criteria	Marks
• Demonstrates correct application of the formula	1

*Sample answer:*

$$R = \frac{V}{I} = \frac{9.8}{0.02} = 490 \Omega$$

**Question 20 (b)**

Criteria	Marks
• Correctly uses formula	2
• Uses correct substitution	
• Correct formula shown	1

*Sample answer:*

$$I_{meter} = \frac{V}{R} = \frac{9.8}{200 \times 10^3} = 49 \times 10^{-6} \text{ A}$$

$$I_R = 20 \times 10^{-3} - 49 \times 10^{-6} = 0.019951 \text{ A}$$

$$R = \frac{V}{I} = \frac{9.8}{0.019951} = 491.2034 \Omega$$

**Question 21 (a)**

Criteria	Marks
• Correctly uses series resistance and parallel resistance formulas	3
• Uses correct substitution	
• Correctly uses series resistance and/or parallel resistance formulas	2
• Uses mostly correct substitution	
• Series resistance and/or parallel resistance formulas shown	1

*Sample answer:*

$$R = \frac{1}{\left(\frac{1}{82} + \frac{1}{68} + \frac{1}{56}\right)} + 22 + \frac{1}{\left(\frac{1}{47} + \frac{1}{39}\right)} + 18 = 83.65 \Omega$$

**Question 21 (b)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Correctly uses formula</li> <li>• Uses correct substitution</li> </ul>	2
<ul style="list-style-type: none"> <li>• Correct formula shown</li> </ul>	1

*Sample answer:*

$$I = \frac{V}{R} = \frac{120}{83.65} = 1.43 \text{ A}$$

**Question 21 (c)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Correctly uses formula</li> <li>• Uses correct substitution</li> </ul>	2
<ul style="list-style-type: none"> <li>• Correct formula shown</li> </ul>	1

*Sample answer:*

$$V = IR = 1.43 \times \frac{1}{\left(\frac{1}{47} + \frac{1}{39}\right)} = 30.47 \text{ V}$$

**Question 21 (d)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Correctly uses formula</li> <li>• Uses correct substitution</li> </ul>	2
<ul style="list-style-type: none"> <li>• Correct formula shown</li> </ul>	1

*Sample answer:*

$$P = \frac{V^2}{R} = \frac{30.47^2}{39} = 23.81 \text{ W}$$

Could also use  $P = V \times I$  OR  $I^2R$

## Section III

### Question 22

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a broad depth of relevant knowledge and understanding of how the electrotechnology industry has reduced workplace injuries</li> <li>• Provides clear and specific answer relating to the specific incident</li> <li>• Considers both the immediate response and long-term requirements and consequences</li> <li>• Correctly uses precise industry terminology in a well-reasoned response</li> </ul>	15
<ul style="list-style-type: none"> <li>• Demonstrates a broad depth of relevant knowledge and understanding of how the electrotechnology industry has reduced workplace injuries</li> <li>• Provides clear and specific answer relating to the specific incident</li> <li>• Considers both the immediate response and long-term requirements and consequences</li> <li>• Correctly uses industry terminology</li> </ul>	12–14
<ul style="list-style-type: none"> <li>• Demonstrates a depth of knowledge and understanding of how the electrotechnology industry has reduced workplace injuries</li> <li>• Considers both the immediate response and long-term requirements</li> <li>• Uses appropriate industry terminology</li> </ul>	9–11
<ul style="list-style-type: none"> <li>• Demonstrates a general knowledge and understanding of reducing the incidence of workplace injuries</li> <li>• Considers the immediate response and/or long-term requirements</li> <li>• Uses appropriate industry terminology</li> </ul>	6–8
<ul style="list-style-type: none"> <li>• Demonstrates a basic understanding of addressing workplace injuries</li> <li>• Uses limited industry terminology</li> </ul>	3–5
<ul style="list-style-type: none"> <li>• Demonstrates limited knowledge of workplace injuries</li> <li>• Uses limited industry terminology</li> </ul>	1–2

**Answers could include:**

**Immediate response**

- Safety of yourself not to become a victim
- First aid — DRS ABCD — call ambulance/ send for help
- Incident report / supervisor to satisfy WorkCover requirements
- Contact WorkCover
- Check isolation of overhead light to make area safe
- Check for danger. Is victim safe to give assistance to?
- Remove tools and equipment to make area safe
- Isolate area to make safe

### **Long-term**

- Education and training relating to working at heights, isolation procedures, teamwork, supervisory obligations regarding apprentices to minimise future incidents
- Rehabilitation of apprentice injuries to expedite return to work
- Develop standard operating procedure and safe work method statement for relevant task
- Review work area access permit and all relevant WHS documentation for site and employer of apprentice
- Review risk assessment for task to prevent repeated incidents
- Possible WorkCover prosecution or restrictions
- Evidence of hazard identification prior to commencement of work and risk control procedures to satisfy WorkCover requirements
- Evidence of apprentice having appropriate training to carry out task
- Evidence of safe work practices and procedures eg:
  - selection of PPE
  - adherence to work instructions
  - working at heights
  - ladders
  - appropriate tools
  - working with electricity
- Analysis of procedures for incidents, accidents and emergencies



## Section IV

### Question 23 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a broad depth of relevant knowledge and understanding of sustainable energy techniques</li> <li>• Considers a broad range of examples</li> <li>• Correctly uses precise industry terminology in a well-reasoned response</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates relevant knowledge and understanding of sustainable energy techniques</li> <li>• Considers a range of examples</li> <li>• Correctly uses industry terminology</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates some knowledge of sustainable energy techniques</li> <li>• Considers some examples</li> <li>• Correctly uses some industry terminology</li> </ul>	2
<ul style="list-style-type: none"> <li>• Demonstrates limited knowledge and understanding of sustainable energy techniques</li> </ul>	1

***Answers could include:***

Select appropriate lighting (energy efficient, eg LED, CF, magnetic induction); appliances, eg HWS – solar, energy efficient exhaust fans or passive cooling; lighting control, eg automotive, lumitrol, sensors; solar panels; water tank. Any of these measures or all combined will work to reduce greenhouse gas emissions related to electricity supplied by coal fired power generation.

**Question 23 (b)**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"> <li>• Demonstrates a broad depth of relevant knowledge and understanding of Safe Work Method Statements</li> <li>• Considers procedure linked to hazard and controls related to task</li> <li>• Uses precise industry terminology in a well-reasoned response</li> </ul>	10
<ul style="list-style-type: none"> <li>• Demonstrates a depth of relevant knowledge and understanding of Safe Work Method Statements</li> <li>• Considers procedure, hazard and controls related to task</li> <li>• Uses correct industry terminology in a well-reasoned response</li> </ul>	8–9
<ul style="list-style-type: none"> <li>• Demonstrates relevant knowledge and understanding of Safe Work Method Statements</li> <li>• Considers some procedures, hazards and controls related to task</li> <li>• Uses correct industry terminology</li> </ul>	6–7
<ul style="list-style-type: none"> <li>• Demonstrates relevant knowledge and understanding of Safe Work Method Statements</li> <li>• Considers some procedures, hazard and/or controls</li> <li>• Uses some industry terminology</li> </ul>	4–5
<ul style="list-style-type: none"> <li>• Demonstrates limited knowledge of Safe Work Method Statements</li> <li>• Uses limited industry terminology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Demonstrates limited knowledge of Safe Work Method Statements</li> </ul>	1

***Answers could include:***

Liaise with client — start/finish time.

Isolate light circuit; lockout procedure to remove danger of electrocution while removing existing lights.

Set up elevated work platform and ID anchor point for harness to minimise fall risk of personnel, tools and equipment. Remove the lights – barricade area under platform to restrict access due to falling equipment. Terminate light circuit at ceiling to minimise electrocution risk. Place pressurised luminaires and/or fittings in appropriate recycling to minimise exposure to chemicals; eye injury; cuts. Ensure isolation and re-test light circuit at ceiling to minimise electrocution risk.

Install new light fittings. Barricade work area to restrict access. Fix and secure fitting – safety chain to prevent fitting falling during operation. De-isolate, remove lockout, test and commission new lights to ensure correct operation.

Clean up site and remove EWP, barricades to eliminate risk related to housekeeping. Sign off any relevant documentation to eliminate risk of prosecution.

# Electrotechnology

## 2014 HSC Examination Mapping Grid

### Section I

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
1	1	– Components, tools and equipment UEENEEE102A, UEENEEE105A – page 30							X	X
2	1	– Safety UEENEEE101A – page 54	X		X	X	X	X		
3	1	– Sustainability UEENEEEK142A – page 61			X				X	X
4	1	– Drawings, diagrams and compliance UEENEEE107A – page 49	X	X			X		X	X
5	1	– Direct current circuits UEENEEE104A – page 42			X		X		X	X
6	1	– Safety UEENEEE101A – page 54	X	X	X	X	X	X	X	X
7	1	– Working in the industry UEENEEE148A – page 69	X	X	X	X	X	X	X	
8	1	– Working in the industry UEENEEE148A – page 67	X	X	X		X	X	X	
9	1	– Direct current circuits UEENEEE104A – page 41	X		X		X		X	X
10	1	– Direct current circuits UEENEEE104A – page 38			X		X		X	X

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
11	1	– Drawings, diagrams and compliance UEENEEE107A – page 49 – Working in the industry UEENEEE148A – page 66 – Safety UEENEEE101A – page 55	X				X		X	X
12	1	– Drawing, diagrams and compliance UEENEE107A – page 48	X	X	X	X	X	X		X
13	1	– Drawing, diagrams and compliance UEENEE107A – page 48	X		X		X		X	X
14	1	– Safety UEENEEE101A – page 56			X	X		X	X	X
15	1	– Direct current circuits UEENEEE104A – page 44	X		X				X	X

**Section II**

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
16	3	– Sustainability UEENEEEK142A – pages 61–62	X	X	X	X	X	X	X	X
17	3	– Working in the industry UEENEEE148A – page 67	X	X	X		X	X	X	X

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
18 (a)	2	– Direct current circuits UEENEEE104A – page 39 – Drawings, diagrams and compliance UEENEEE107A – pages 48–49 – Working in the industry UEENEEE148A – page 67	X		X		X		X	X
18 (b)	6	– Direct current circuits UEENEEE104A – pages 38–45 – Drawings, diagrams and compliance UEENEEE107A – pages 48–49 – Working in the industry UEENEEE108A – page 67	X		X	X	X	X	X	X
19 (a)	3	– Components, tools and equipment UEENEEE102A – pages 29 and 31 UEENEEE105A – pages 29 and 31	X	X	X	X	X	X	X	X
19 (b)	6	– Components, tools and equipment UEENEEE102A – pages 68–69 UEENEEE105A – pages 68–69 – Working in the industry UEENEEE148A – pages 68–69 – Safety UEENEEE101A – pages 53–56 – Drawings, diagrams and compliance UEENEEE107A – pages 49–50 – Sustainability UEENEEEK142A – pages 61–62	X	X	X	X	X	X	X	X

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
20 (a)	1	– Direct current circuits UEENEEE104A – pages 39 and 42	X		X	X	X	X		X
20 (b)	2	– Direct current circuits UEENEEE104A – page 42	X		X	X	X	X		X
21 (a)	3	– Direct current circuits UEENEEE104A – pages 40–44	X		X	X	X	X		
21 (b)	2	– Direct current circuits UEENEEE104A – page 39	X		X	X	X	X		
21 (c)	2	– Direct current circuits UEENEEE104A – page 39	X		X	X	X	X		
21 (d)	2	– Direct current circuits UEENEEE104A – page 39	X		X	X	X	X		

**Section III**

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
22	15	– Safety UEENEEE101A – pages 53–57 – Working in the industry UEENEEE148A – pages 66–69	X	X	X	X	X	X	X	X

**Section IV**

Question	Marks	HSC content – focus area	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
23 (a)	5	<ul style="list-style-type: none"> <li>– Drawings, diagrams and compliance UEENEEE107A – pages 48–50</li> <li>– Sustainability UEENEEEK142A – pages 60–62</li> <li>– Working in the industry UEENEEE148A – pages 67–69</li> </ul>	X		X	X	X	X	X	X
23 (b)	10	<ul style="list-style-type: none"> <li>– Components, tools and equipment UEENEEE102A – page 34 UEENEEE105A – page 34</li> <li>– Drawings, diagrams and compliance UEENEEE107A – pages 48–50</li> <li>– Safety UEENEEE101A – pages 53–56</li> <li>– Sustainability UEENEEEK142A – pages 60–62</li> <li>– Working in the industry UEENEEE148A – pages 67–69</li> </ul>	X	X	X	X	X	X	X	X