

2015 HSC Electrotechnology Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16

Criteria	Marks
<ul style="list-style-type: none"> Shows a broad understanding of PPE requirements for outdoor use Names the majority of requirements. 	2
<ul style="list-style-type: none"> Shows a basic understanding of PPE requirements for outdoor use 	1

Sample answer:

The worker should have a hat/hard hat with UV rated wide brim and neck flap, UV rated sunglasses/tinted safety glasses, sunscreen, long sleeved shirt and trousers.

Question 17

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates an extensive understanding of isolation of a circuit Isolates to industry standard practice Isolates with lockout, test circuit and verification of equipment 	4
<ul style="list-style-type: none"> Demonstrates a sound understanding of isolation of a circuit Isolates with lockout and test circuit but no verification of equipment 	3
<ul style="list-style-type: none"> Demonstrates a basic understanding of isolation of a circuit Isolates with either lockout or testing circuit or verification of equipment 	2
<ul style="list-style-type: none"> Demonstrates a limited understanding of isolation of a circuit 	1

Sample answer:

1. Identify circuit to be isolated
2. Notify any affected personnel
3. Identify the circuit breaker/circuit protection device
4. Isolate circuit
5. Apply danger tag/lockout procedure
6. Verify test equipment on known supply
7. Test the circuit is isolated/de-energised
8. Re-verify test equipment on known supply

Question 18 (a)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a substantial understanding of symbols • Correct definition of all symbols 	2
<ul style="list-style-type: none"> • Demonstrates a limited understanding of symbols • Correct definition of majority of symbols 	1

Sample answer:

Symbol	Definition
⌀	Centre line
∇	Countersink

Other answers accepted: Tapered hole. Gradient hole 14 mm to 9 mm. Funnel hole.

Question 18 (b)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a substantial understanding of drilling and tapping • Correct outlines of majority of steps required 	4
<ul style="list-style-type: none"> • Demonstrates an understanding of drilling or tapping • Outlines majority of steps required 	2–3
<ul style="list-style-type: none"> • Demonstrates a limited understanding of drilling or tapping • Outlines some of the steps required 	1

Sample answer:

1. Mark out hole to be drilled
2. Centre punch hole
3. Clamp or hold in vice
4. Drill a pilot hole
5. Drill out to 14 to 14.5 mm hole
6. Tap hole – use a cutting lubricant; turning clockwise half a turn then back to break the chip

Question 19

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a substantial understanding of fault-finding methods • Correctly identifies faults and testing methods 	6
<ul style="list-style-type: none"> • Demonstrates a sound understanding of fault-finding methods • Correctly identifies faults and basic testing methods 	4-5
<ul style="list-style-type: none"> • Demonstrates a basic understanding of fault-finding methods • Correctly identifies fault/s and basic testing method/s 	2-3
<ul style="list-style-type: none"> • Demonstrates a limited understanding of fault-finding • Correctly identifies a fault 	1

Sample answer:

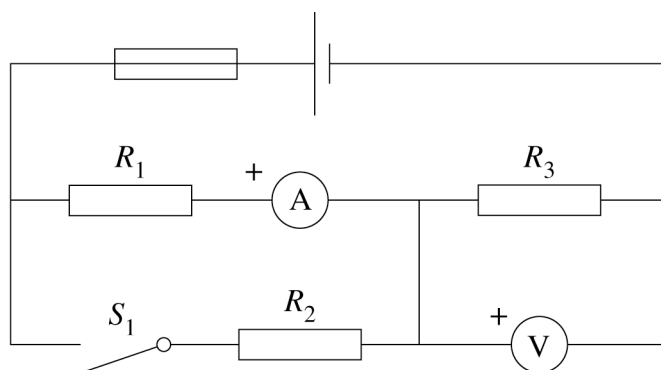
<i>Fault</i>	<i>Testing Method</i>
L ₁ bulb blown	Swap L ₁ and L ₂ , check continuity of L ₁
Termination fault at R ₂ and L ₁	Test continuity/resistance across R ₂ with circuit de-energised. L ₁ branch, test voltage drop from positive terminal until there is a change in voltage drop. Check continuity between input to R ₂ and output of L ₁

Note: Students may show understanding diagrammatically.

Question 20

Criteria	Marks
• Circuit diagram correct and showing correct polarity of all components	5
• Circuit diagram correct	4
• Series parallel combination correct • Correct fuse or correct switch placement • One meter in correct position	3
• Series parallel combination correct • Correct fuse or correct switch placement	2
• Only two elements in correct position	1

Sample answer:



Question 21 (a)

Criteria	Marks
• Correct formula AND substitution	2
• Correct formula	1

Sample answer:

$$R_T = \frac{1}{\frac{1}{R_1 + R_2} + \frac{1}{R_3} + \frac{1}{R_5 + R_6}} = \frac{1}{\frac{1}{10 + 50} + \frac{1}{60} + \frac{1}{20 + 40}} = 20\Omega$$

Question 21 (b)

Criteria	Marks
• Correct formula AND substitution	2
• Correct formula	1

Sample answer:

$$I_3 = \frac{V}{R_3} = \frac{60}{60} = 1A$$

Question 21 (c)

Criteria	Marks
• Correct formula AND substitution	2
• Correct formula	1

Sample answer:

$$I_{5,6} = \frac{V}{R_5 + R_6} = \frac{60}{20 + 40} = 1A$$

$$V_6 = I_{5,6} \times R_6 = 1 \times 40 = 40V$$

Question 21 (d)

Criteria	Marks
• Correct formulae AND substitution or correct answer	3
• Correct formulae	2
• One correct formula	1

Sample answer:

$$S_1 \text{ open } I_T = \frac{V}{R_T} = \frac{60}{20} = 3A$$

$$S_1 \text{ closed } I_T = 4A \quad I_4 = 4A - 3A = 1A$$

$$R_4 = \frac{V}{I_4} = \frac{60}{1} = 60\Omega$$

$$I_{TOTAL} - \text{Branch}_1 - \text{Branch}_2 - \text{Branch}_4$$

$$\text{Or } 4 - 1 - 1 - 1 = 1A$$

$$\therefore \frac{V}{I} = \frac{60}{1} = 60\Omega$$

Question 21 (e)

Criteria	Marks
• Correct formulae AND substitution or correct answer	3
• Correct formulae	2
• One correct formula	1

Sample answer:

$$I_{1,2} = \frac{V}{R} = \frac{60}{10 + 50} = 1A$$

$$P = I^2 R = 1^2 \times 50 = 50W$$

Section III

Question 22

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a broad depth of relevant knowledge and understanding of efficient practices in the energy sector • Demonstrates the effect choices have on efficiency in the energy sector across the listed areas • Uses a range of clear examples • Correctly uses precise industry terminology in a well-reasoned response 	15
<ul style="list-style-type: none"> • Demonstrates a broad depth of relevant knowledge and understanding of efficient practices in the energy sector • Demonstrates the effect choices have on efficiency in the energy sector in a range of areas • Uses a range of examples • Correctly uses industry terminology 	12–14
<ul style="list-style-type: none"> • Demonstrates a depth of knowledge and understanding of efficient practices in the energy sector • Uses a range of examples in answer • Uses appropriate industry terminology 	9–11
<ul style="list-style-type: none"> • Demonstrates a general knowledge and understanding of efficient practices in the energy sector • Uses examples in answer • Uses appropriate industry terminology 	6–8
<ul style="list-style-type: none"> • Demonstrates a basic understanding of efficient practices in the energy sector • Uses limited industry terminology 	3–5
<ul style="list-style-type: none"> • Demonstrates limited knowledge of efficient practices in the energy sector • Uses limited industry terminology 	1–2

Answers could include:

- Use of sustainable resources
- Correct selection of materials
 - eg 316 stainless in salt water areas should not need replacing
- Energy efficient devices eg LED, solar-powered
- Able to be recycled easily
- Short term cost v long term savings
- Conservation of resources
 - Recycle waste
 - Accurate use of materials
- Use of upgradeable fittings/appliances
- Life cycle of fittings/appliances

- Aspect of building N→S or E→W
- Use of materials for construction:
 - Bricks
 - Tile
 - Double glazed windows
 - Insulation
 - Solar power
 - Rain water tanks
 - Grey water tanks for toilets
 - Waste disposal by absorption pit
- Energy efficient appliances with power ratings
 - Solar hot water
 - Low wattage lighting eg LED
 - Filtration system for water recycling
 - Water saving devices eg return valves for cold water until hot water comes through
 - $\frac{1}{2}$ flush cisterns
 - Spray water heads on shower
- Layout of home with utilities next to each other for minimal plumbing
- Design utilizes solar energy and heating
- Basic appliances lend themselves to easy repair or replacement rather than expensive complex appliances.

Section IV

Question 23 (a)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a broad depth of relevant knowledge and understanding of sequencing of work • Identifies required work operations in correct order • Uses correct industry terminology 	5
<ul style="list-style-type: none"> • Demonstrates a sound knowledge and understanding of sequencing • Identifies most required work operations in correct order • Uses mostly correct industry terminology 	3–4
<ul style="list-style-type: none"> • Demonstrates a basic knowledge and understanding of sequencing • Identifies most required work operations, some in correct order • Uses some correct industry terminology 	2
<ul style="list-style-type: none"> • Demonstrates a limited understanding of sequencing of work • Identifies some required work operations 	1

Sample answer:

Prior to the commencement of construction a builder's supply would need to be installed. After the reinforcing has been placed in the formwork and prior to concreting any conduit work needs to be carried out.

When the frame and brick veneer work is complete the roughing in of cables is carried out.

When gyprock, painting and kitchen installation is completed, finishing off of lighting, power, switchboard and any other electrical work takes place.

Coordination between trades.

Question 23 (b)

Criteria	Marks
<ul style="list-style-type: none"> • Develops a Safe Work Method Statement that demonstrates a broad depth of relevant knowledge and understanding • Uses an example that demonstrates knowledge and understanding related to task • Uses precise industry terminology in a well-reasoned response 	10
<ul style="list-style-type: none"> • Develops a Safe Work Method Statement that demonstrates relevant knowledge and understanding of Safe Work Method Statements • Uses an example that demonstrates knowledge and understanding related to task • Uses correct industry terminology in a well-reasoned response 	8–9
<ul style="list-style-type: none"> • Develops a Safe Work Method Statement that demonstrates some relevant knowledge and understanding of Safe Work Method Statements • Uses an example • Uses correct industry terminology 	6–7
<ul style="list-style-type: none"> • Develops a Safe Work Method Statement that demonstrates limited knowledge and understanding of Safe Work Method Statements • Considers some procedures, hazard and/or controls • Uses some industry terminology 	4–5
<ul style="list-style-type: none"> • Develops a Safe Work Method Statement that demonstrates basic knowledge of Safe Work Method Statements • Uses limited industry terminology 	2–3
<ul style="list-style-type: none"> • Provides some relevant information 	1

Answers could include:

Example: fitting off lighting

- Possible hazards
 - Working at height
 - Electrocution
- Control of risk
 - use scaffolding or work platform
 - follow isolation procedures
- Implementing control
 - tradesman
 - supervisor
- Monitoring/reviewing Control
 - site manager
 - WHS officer
 - ongoing review of documentation by management
- Management of Documentation
 - kept on site by site manager

2015 HSC Electrotechnology 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	Drawings, diagrams and compliance – compliance – p30	X				X			
2	1	Components, tools and equipment – hand and power tools – p30					X			X
3	1	Direct current circuits – parallel circuits – p40			X				X	X
4	1	Direct current circuits – Ohm’s law – p39	X		X					X
5	1	Safety – risk management – p54	X				X	X	X	
6	1	Sustainability – environmental issues and sustainability – p60	X				X		X	
7	1	Direct current circuits – energy and power – p38	X							X
8	1	Direct current circuits – resistors – p41			X		X			X
9	1	Safety – safe work practices and procedures – p55	X		X	X	X	X	X	
10	1	Drawings, diagrams and compliance – architectural drawing – p48	X							X
11	1	Direct current circuits – resistors – p41	X		X					X
12	1	Drawings, diagrams and compliance – electrical drawings and diagrams – p49	X		X		X			X
13	1	Direct current circuits – electrical concepts – p37	X							X
14	1	Direct current circuits – energy and power – p38			X					X
15	1	Direct current circuits – capacitors – p44	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	2	Safety – safe work practices and procedures – p55	X		X			X		X
17	4	Working in the industry – energy sector worker – p68	X		X		X	X		X
18 (a)	2	Drawings, diagrams and compliance – working with drawings, diagrams, schedules and manuals – p48	X				X		X	X
18 (b)	4	Components, tools and equipment – hand and power tools – p31	X		X		X		X	X
19	6	Direct current circuits – series/parallel circuits p40/problem solving – p44	X		X		X		X	X
20	5	Drawings, diagrams and compliance – electrical drawings and diagrams – p49	X		X		X		X	X
21 (a)	2	Direct current circuits – Ohm’s law – p39	X		X				X	
21 (b)	2	Direct current circuits – Ohm’s law – p39	X		X				X	
21 (c)	2	Direct current circuits – series/parallel – p40	X		X				X	
21 (d)	3	Direct current circuits – series/parallel – p40	X		X				X	
21 (e)	3	Direct current circuits – series/parallel – p40	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	Sustainability – energy sector workplace – p61–62	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	Working in the industry – working with others – pg69 – energy sector workers – p68	X	X	X	X	X	X	X	X
23 (b)	10	Safety – safe work practices and procedures – p55	X	X	X		X	X	X	X