

2017 HSC Electrotechnology Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
<ul style="list-style-type: none"> • Outlines an advantage of both fixing methods 	2
<ul style="list-style-type: none"> • Identifies an advantage of both soldering and screw fixing or outlines one feature of either method 	1

Sample answer:

<i>Fixing method</i>	<i>Advantage</i>
<i>Soft soldering</i>	Will not vibrate loose
<i>Screw terminal</i>	Non-permanent; can be easily undone to make adjustments

Question 16 (b)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a thorough understanding of the safe use of soft soldering • Provides a range of safety considerations 	3
<ul style="list-style-type: none"> • Demonstrates a sound understanding of the safe use of soft soldering • Provides safety considerations 	2
<ul style="list-style-type: none"> • Demonstrates a basic understanding of the safe use of soft soldering • Identifies a safety consideration 	1

Sample answer:

When using soft core solder you need to make sure you have adequate ventilation such as an open window or exhaust fan, wear safety glasses and be careful not to burn yourself or other material. After use be sure to wash your hands to remove any lead or flux residue.

Question 17 (a)

Criteria	Marks
• Identifies all bands including multiplier and tolerance bands	3
• Identifies some bands including multiplier OR tolerance bands	2
• Identifies some bands	1

Sample answer:

BROWN	RED	GREEN	GOLD
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Question 17 (b)

Criteria	Marks
• Demonstrates a thorough understanding of the factors that can affect resistance	3
• Demonstrates a sound understanding of the factors that can affect resistance	2
• Demonstrates a basic understanding of the factors that can affect resistance	1

Sample answer:

- Type of material
- Length
- Cross-sectional area
- Temperature.

Question 17 (c)

Criteria	Marks
• Correct answer including units of measurement	2
• Correct range without units OR one correct value with units	1

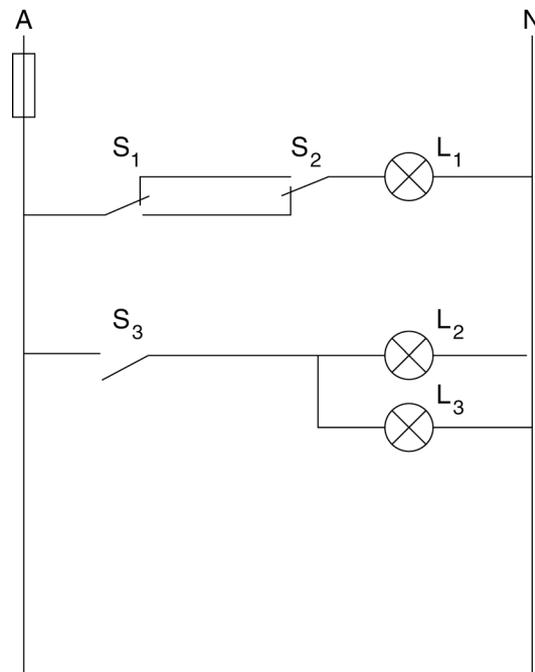
Sample answer:

399.5 μF to 540.5 μF .

Question 18

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates a thorough understanding of the use of ladder diagrams and components • Develops a correct diagram • Completes diagram to AS3000 standard 	4
<ul style="list-style-type: none"> • Demonstrates a sound understanding of the use of ladder diagrams and components • Fuse and switching placed as per AS3000 • Develops a diagram with errors 	2–3
<ul style="list-style-type: none"> • Demonstrates basic understanding of the use of ladder diagrams and components • Develops a diagram using some components 	1

Sample answer:



Note to Markers:

- Switching of the neutral is prohibited under AS3000 and not accepted for full marks.
- Fuse must be placed on active line.

Question 19

Criteria	Marks
<ul style="list-style-type: none"> • Sketches in general terms key features or use to consider when selecting four different battery-powered tools for an apprentice 	5
<ul style="list-style-type: none"> • Sketches in general terms key features or use to consider when selecting three or four different battery-powered tools 	3–4
<ul style="list-style-type: none"> • Sketches in general terms key features or use to consider when selecting one or two different battery-powered tools <p>OR</p> <ul style="list-style-type: none"> • Identifies some features or use of battery-powered tools 	1–2

Sample answer:

The batteries would need to be compatible and a fast charge. 5.0 amp batteries would be able to power all types of tools.

Tools:

Impact driver – reversing, takes a variety of bits.

Drill – reversing, has torque settings and chuck size.

Rotary Hammer – has hammer and rotary combination, takes SDS bits.

Torch – hands free operation, vary brightness to light work area.

Question 20 (a)

Criteria	Marks
• Demonstrates a reasoning for the correct current flow	2
• Identifies the correct flow of current	1

Sample answer:

No current flows through R_4 and R_5 branch. S_1 branch becomes a short circuit and the current follows the path of least resistance.

Question 20 (b)

Criteria	Marks
• Correct formula AND substitution OR correct answer with units	2
• Correct formula	1

Sample answer:

$$R_T = R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3 + R_4 + R_5}} = 6 + \frac{1}{\frac{1}{12} + \frac{1}{4 + 5 + 3}} = 12 \Omega$$

Question 20 (c)

Criteria	Marks
• Correct formulae AND substitution OR correct answer with units	3
• Correct formulae OR substitution with minor error	2
• Correct formula	1

Sample answer:

$$I_T = \frac{V}{R_T} = \frac{24}{12} = 2 \text{ A}$$

Because $R_2 = R_3 + R_4 + R_5$

$$I_2 = \frac{1}{2} I_T = \frac{1}{2} \times 2 = 1 \text{ A}$$

Question 20 (d)

Criteria	Marks
• Correct formulae AND substitution OR correct answer with units	3
• Correct formulae OR substitution with minor error	2
• Correct formula	1

Sample answer:

$$R_{2,3} = \frac{1}{\frac{1}{12} + \frac{1}{4}} = 3 \Omega$$

$$V_3 = \frac{R_{2,3}}{R_1 + R_{2,3}} \times V_T = \frac{3}{6 + 3} \times 24 = 8 \text{ V}$$

Question 20 (e)

Criteria	Marks
• Correct formula/e AND substitution OR correct answer with units	3
• Correct formula/e OR substitution with minor error	2
• Correct formula	1

Sample answer:

$$R_T = R_1 + R_{2,3} = 6 + \frac{1}{\frac{1}{12} + \frac{1}{4}} = 6 + 3 = 9 \Omega$$

$$P = \frac{V^2}{R_T} = \frac{24^2}{9} = 64 \text{ W}$$

Section III

Question 21

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates extensive knowledge and understanding of the relationship between safe work practices and risk in the energy sector • Demonstrates an understanding of the interrelationship between the Risk Matrix and Hierarchy of Risk Control • Uses a broad range of relevant workplace examples • Correctly uses industry terminology in a logical and cohesive response 	15
<ul style="list-style-type: none"> • Demonstrates thorough knowledge and understanding of the relationship between safe work practices and risk in the energy sector • Demonstrates an understanding of the application of both the Risk Matrix and Hierarchy of Risk Control • Uses a broad range of relevant workplace examples • Correctly uses industry terminology 	12–14
<ul style="list-style-type: none"> • Demonstrates sound knowledge and understanding of the relationship between safe work practices and risk in the energy sector • Demonstrates some understanding of the application of both the Risk Matrix and Hierarchy of Risk Control • Uses a range of relevant examples • Correctly uses industry terminology 	9–11
<ul style="list-style-type: none"> • Demonstrates basic knowledge and understanding of the relationship between safe work practices and risk in the energy sector • Demonstrates an appreciation of the purpose of the Risk Matrix and/or Hierarchy of Risk Control • Uses example(s) • Uses some industry terminology 	6–8
<ul style="list-style-type: none"> • Demonstrates limited knowledge of safe work practices in the energy sector • Uses limited industry terminology 	3–5
<ul style="list-style-type: none"> • Demonstrates limited knowledge of safe work practices 	1–2

Answers could include:

Risk Matrix

- Purpose
- Application of matrix to different tasks

Hierarchy of Risk Control

- Purpose
 - Understanding of the application from elimination to PPE
- Application of hierarchy to different tasks

Examples

- Working at height
 - Substitute
 - Work platforms, boom lifts etc
 - Engineering controls
 - Leg levellers
 - Tying off ladder
 - PPE
 - Harness
 - Hard hat
- Changing fuses to circuit breakers in the main switchboard
 - PPE
 - All hand tools have insulated handles
 - Rubber soled work boots
 - Administrative control
 - Have two people work on task.

Note to Markers:

Students should take an example and apply the Risk Matrix to it to determine the level of risk.

They should then use the Hazard Control Hierarchy to explain how they would make the identified example safer.

Section IV

Question 22 (a)

Criteria	Marks
<ul style="list-style-type: none"> Applies knowledge and understanding of electrical symbols used in floor plans to develop a comprehensive quantities schedule for electrical fittings 	6
<ul style="list-style-type: none"> Applies knowledge and understanding of electrical symbols used in floor plans to develop a quantities schedule 	4–5
<ul style="list-style-type: none"> Applies knowledge and understanding of electrical symbols in floor plans to develop a limited quantities schedule OR	2–3
<ul style="list-style-type: none"> Recognises some electrical symbols in floor plans 	
<ul style="list-style-type: none"> Provides some relevant information relevant to electrical symbols, floor plans or quantities schedules 	1

Sample answer:

Quantity	Item
7	Single socket outlet
10	Double socket outlet
11	Batten holder
3	Exhaust fan
1	Cooking range
2	Waterproof socket outlet
7	Single gang light switch
4	Double gang switch
1	Electrical bell
1	Push button
1	Main switchboard
1	TV aerial outlet
6	Data outlet
1	Hot water service
1	Telephone outlet

Question 22 (b)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates an extensive understanding of the relationship between effective work practices and the efficient completion of electrical work in the construction of domestic dwellings • Uses appropriate industry terminology to demonstrate an extensive understanding of effective work practices 	9
<ul style="list-style-type: none"> • Demonstrates an understanding of the relationship between effective work practices and the completion of electrical work in the construction of domestic dwellings • Uses appropriate industry terminology to demonstrate an understanding of effective work practices 	6–8
<ul style="list-style-type: none"> • Outlines work practices used in the completion of electrical work • Uses some industry terminology 	3–5
<ul style="list-style-type: none"> • Provides some relevant information on work practices in the electrotechnology industry 	1–2

Answers could include:

Sustainable work practices

- Minimising waste of materials → cost effective
- Storage/stock of materials → time (materials ready)
- Time management of trades → cost
- Recycling of waste
- Bin separation of waste → cost (less waste disposal cost)

Organising for the task

- Safe work method statements → cost (insurance, SafeWork fines)
- Organising with other trades and jobs → time management
- Planning for efficient completion of task → time and cost of labour and materials
- Ensuring quality of installation → cost, less faults, advertising

Carrying out the task

- Ensuring safe work practices → cost and time (safety related costs)
- Time management and modifying schedule to meet changes → cost (working with trades and fines)
- Working in with other trades to complete necessary work in a timely manner → cost (working with trades and fines)

Final checks and notification of completion

- Correction of defects → cost and time (having to return to fix work) and reputation.

2017 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	Safe work practices and procedures – page 55		X	X		X			
2	1	Hand and power tools – page 30							X	X
3	1	Hand and power tools – page 31		X			X		X	
4	1	Environment – issues and sustainability Electrical concepts (basic) – page 37	X						X	X
5	1	Anti-discrimination – page 70	X	X				X		
6	1	Sustainable energy– pages 60–61							X	X
7	1	Safe work practices and procedures – pages 55–56			X			X	X	X
8	1	Careers and training – page 66				X	X	X		
9	1	Parallel circuits – page 40			X				X	
10	1	Electrical concepts (basic) – page 37			X		X			X
11	1	Sustainable energy – page 60					X		X	X
12	1	Series/parallel circuits – page 40	X		X				X	X
13	1	Compliance – page 50			X		X		X	X
14	1	Capacitance – page 44			X				X	X
15	1	Energy and power – page 38	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 (a)	2	Joining components – page 33							X	X
16 (b)	3	Dismantling and assembling equipment – page 34				X		X	X	
17 (a)	3	Resistors – page 41 Compliance – page 50	X		X				X	X
17 (b)	3	Resistors – page 41			X				X	X
17 (c)	2	Capacitance – pages 43–44	X		X				X	X
18	4	Electrical drawings, diagrams, schedules and manuals – page 49	X				X		X	X
19	5	Hand and power tools – pages 30–31 Energy sector worker – page 68				X			X	X
20 (a)	2	Electrical circuit (basic) – page 39	X		X				X	X
20 (b)	2	Resistors – page 41			X				X	
20 (c)	3	Series/parallel circuits – page 40			X				X	
20 (d)	3	Series/parallel circuits – page 40			X				X	
20 (e)	3	Energy and power – page 38			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
21	15	Risk management – pages 54–55 Safe work practices and procedures – page 56	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
22 (a)	6	Working with diagrams, drawings, schedules and manuals – page 48 Architectural drawings – page 48 Relationship to building construction work – page 49	X		X		X	X	X	
22 (b)	9	Energy sector workplace – pages 61–62 Energy sector worker – page 68	X	X	X		X	X		X