

2024 HSC Electrotechnology Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
• Identifies TWO predicted impacts of climate change on Australia	2
• Provides some relevant information	1

Sample answer:

Rising sea levels and an increase in average temperature.

Question 16 (b)

Criteria	Marks
• Outlines relevant issues	3
• Outlines ONE relevant issue OR • Identifies TWO issues	2
• Provides some relevant information	1

Sample answer:

Delivering a constant grid supply and meeting peak demands is difficult when wind and solar generation in commercial setups are dependent on the weather. Domestic supply of solar energy can cause spikes in the system when excess supply occurs.

Question 17 (a)

Criteria	Marks
• Demonstrates a sound understanding of how <i>stock size</i> affects the process of calculating materials	2
• Provides some relevant information	1

Sample answer:

Suppliers only keep materials in set sizes. Therefore the materials required need to be rounded up, which will cost more and create more offcuts.

Question 17 (b)

Criteria	Marks
• Demonstrates a sound understanding of the safe-use protocols required to use a battery powered-angle grinder	4
• Demonstrates some understanding of the safe-use protocols required to use an angle grinder	3
• Demonstrates a limited understanding of the safe use of power tools	2
• Provides some relevant information	1

Sample answer:

Prior to use, the body and battery should be checked for damage. The cutting disc should be tightly done up and be free of cracks or excessive wear. It should also be checked that it is the correct cutting disc for the material to be cut. The guard should also be in place.

When using the grinder, eye and hearing protection should be used. The cable tray should also be supported.

Question 18

Criteria	Marks
• Demonstrates a sound understanding of the considerations of adding battery storage to an existing solar system in a domestic dwelling	4
• Demonstrates some understanding of the considerations of adding battery storage to a solar system	3
• Demonstrates limited understanding of using battery storage systems	2
• Provides some relevant information	1

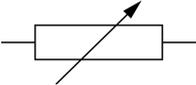
Sample answer:

When utilising batteries, the time of day or night to use high load equipment would not matter. The high cost of battery storage would mean it would take a number of years to recover the cost outlay of the batteries. The resale value of the dwelling would also increase. The added cost of possible updating of the existing solar system to use batteries would also need to be considered.

Question 19 (a)

Criteria	Marks
• Identifies the TWO circuit diagram symbols	2
• Provides some relevant information	1

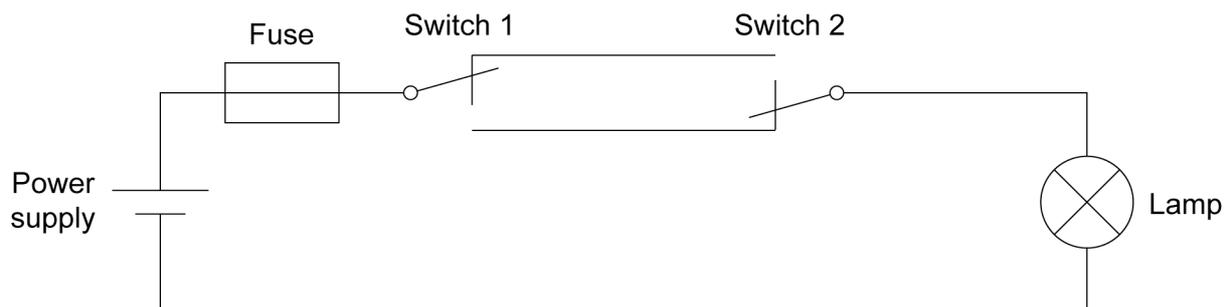
Sample answer:

Symbol	Name of symbol
	Variable resistor
	Circuit breaker

Question 19 (b)

Criteria	Marks
• Draws a correctly-functioning circuit diagram with appropriate labelling	5
• Draws a functioning circuit diagram with some labelling	4
• Draws a circuit diagram with minor errors	3
• Draws an electrical diagram with errors	2
• Provides some relevant information	1

Sample answer:



Question 20 (a)

Criteria	Marks
• Correctly identifies the changes required to the voltmeter AND ammeter	2
• Correctly identifies the change required to the voltmeter OR ammeter	1

Sample answer:

Both the voltmeter and ammeter must have their polarities reversed.

Question 20 (b)

Criteria	Marks
• Shows correct working in the calculation of resistance OR provides a correct answer using correct units	2
• Provides some relevant information	1

Sample answer:

$$R_T = \frac{V}{I} = \frac{100 \text{ V}}{90 \text{ mA}} = 1111.11 \Omega$$

Question 20 (c)

Criteria	Marks
• Shows correct working in the calculation of current OR provides a correct answer using correct units	2
• Provides some relevant information	1

Sample answer:

$$I = \frac{V_1}{R_1} = \frac{100 - 55}{560} = 0.08 \text{ A}$$

Question 20 (d)

Criteria	Marks
• Shows correct working in the calculation of power OR provides a correct answer using correct units	3
• Makes progress towards calculating the power	2
• Provides some relevant information	1

Sample answer:

$$I = \frac{V}{R_T} = \frac{100}{560 + 330 + 470} = 0.0735 \text{ A}$$

$$P = VI = 100 \times 0.0735 = 7.35 \text{ W}$$

Question 20 (e)

Criteria	Marks
• Shows correct working in the calculation of supply voltage OR provides a correct answer using correct units	4
• Shows relevant working in the calculation of supply voltage with minor errors	3
• Makes progress towards calculating the supply voltage	2
• Provides some relevant information	1

Sample answer:

$$V_1 = IR_1 = 70 \times 10^{-3} \times 560 = 39.2 \text{ V}$$

$$V_{\text{supply}} = V_1 + V_{2+3} = 39.2 + 50 = 89.2 \text{ V}$$

Section III

Question 21 (a)

Criteria	Marks
<ul style="list-style-type: none"> Proposes a correct procedure and the tools required to manufacture the shroud 	6
<ul style="list-style-type: none"> Proposes most steps and tools required to manufacture the shroud 	5
<ul style="list-style-type: none"> Outlines some steps and tools relevant to the manufacturing of the shroud 	4
<ul style="list-style-type: none"> Identifies some steps and/or tools relevant to the manufacturing of the shroud 	2–3
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

The shroud should be made from the least number of pieces dependant on the size of the available material. Gloves should be worn to prevent cuts from sharp edges.

Procedure:

- Mark out using a reference straight edge
- Mark out allowing for bending flange and a safe edge on the front
- Cut out using tinman’s snips
- Fold any of the required bends by clamping straight edge along the bends
- Mark out and drill holes for pop rivets
- Join by pop riveting
- Clean all edges of burrs or sharp edges
- Treat exposed surfaces to prevent rust.

Tools used:

- Rule
- Permanent marker
- Try square
- Straight edge
- Mallet
- G clamps
- Tinman’s snips
- Drill and drill bits
- Pop rivet gun & pop rivets.

Question 21 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive description of the procedure to identify and isolate the circuit, and install an outdoor power outlet 	9
<ul style="list-style-type: none"> Provides a thorough description of the procedure to identify and isolate the circuit, and install an outdoor power outlet 	7–8
<ul style="list-style-type: none"> Provides a sound description of isolating a circuit and/or installing a power outlet 	5–6
<ul style="list-style-type: none"> Provides some description of isolating a circuit and/or installing a power outlet 	3–4
<ul style="list-style-type: none"> Provides some relevant information 	1–2

Answers could include:

- Inform people of the approximate time of disruption to onsite power
- Identify the power outlet to be removed
- Check that the test equipment is working
- Test that the selected power outlet is live by using a multimeter or test lamp
- De-energise the circuit at the switchboard
- Test that the power outlet is de-energised by using a multimeter or test lamp to confirm correct circuit has been isolated
- Retest the multimeter or test lamp from a known live source
- Isolate the circuit by locking out/tagging out the circuit breaker at the switchboard
- Remove existing internal power outlet
- Drill a pilot hole through the back of the brick wall behind the internal power outlet using a rotary hammer drill
- Enlarge hole to a size of 2.5 mm² TPS
- Mark out holes to fix the external power outlet
- Drill using the rotary hammer drill and fit wall plugs in the external wall
- Feed 2.5 mm² TPS through the wall and terminate the feed to the external power outlet
- Screw the external power outlet to the wall
- Seal outlet to the wall using silicone
- Terminate feed to the internal power outlet
- Refit internal power outlet
- Dead test for earth continuity and polarity of the existing and new power outlet
- Remove lockout tag and re-energise the circuit
- Live test for polarity of the existing and new power outlet
- Clean the site.

Section IV

Question 22

Criteria	Marks
<ul style="list-style-type: none"> Provides an extensive explanation of how an employer could create an ongoing safe environment for workers and the general public Provides a range of examples referenced to legislation Provides a logical, coherent and clear response using correct industry terminology 	13–15
<ul style="list-style-type: none"> Provides a thorough explanation of how an employer could create an ongoing safe environment for workers (and the general public) Provides examples relating to legislation Provides a logical and clear response using correct industry terminology 	10–12
<ul style="list-style-type: none"> Demonstrates a sound understanding of how an employer could create an ongoing safe work environment Provides some relevant examples Provides a logical response using mostly correct industry terminology 	7–9
<ul style="list-style-type: none"> Demonstrates some understanding of safe work practices Provides a response using some industry terminology and/or examples 	4–6
<ul style="list-style-type: none"> Demonstrates a limited understanding of safe work practices 	1–3

Answers could include:

- Site induction
- Toolbox talks
- Work planning
- WHS committee
- Incidents/accidents:
 - Report hotline
 - Maintenance of incidents/accidents record
 - Return to work procedures
- Emergency response team
- Safety barriers for the general public and around hazards
- SWMS
- Maintenance of an SDS register
- Risk assessment
- Access to first aid kit
- Maintenance of tools and equipment
- Monitoring of practices of apprentices
- Training and refresher courses
- Signage and posters
- Regular site inspections
- Acquire and maintain correct licensing.

2024 HSC Electrotechnology Mapping Grid

Section I

Question	Marks	HSC content – focus area
1	1	Components, tools and equipment – fixing, securing and mounting accessories – page 26
2	1	Sustainability – sustainable energy – pages 49–50
3	1	Sustainability – sustainable energy – page 50
4	1	Sustainability – sustainable energy – page 50
5	1	Safety – incidents, accidents and emergencies – page 38
6	1	Single path circuits – energy and power – page 42
7	1	Sustainability – energy sector workplace – page 51
8	1	Drawings, diagrams and compliance – electrical drawings and diagrams – page 32
9	1	Single path circuits – measuring and testing – page 45
10	1	Components, tools and equipment – hand and power tools – page 26
11	1	Drawings, diagrams and compliance – electrical drawings and diagrams – page 32
12	1	Components, tools and equipment – hand and power tools – page 26
13	1	Working in the industry – work tasks and practices – page 55
14	1	Single path circuits – Ohm’s Law – page 43
15	1	Single path circuits – Ohm’s Law – page 43

Section II

Question	Marks	HSC content – focus area
16 (a)	2	Sustainability – climate change – page 49
16 (b)	3	Sustainability – sustainable energy – pages 49–50
17 (a)	2	Components, tools and equipment – materials – page 24
17 (b)	4	Components, tools and equipment – hand and power tools – page 25
18	4	Sustainability – issues and sustainability – page 49
19 (a)	2	Drawings, diagrams and compliance – electrical drawings and diagrams – page 32
19 (b)	5	Drawings, diagrams and compliance – electrical drawings and diagrams – page 32
20 (a)	2	Single path circuits – measuring and testing – page 45
20 (b)	2	Single path circuits – Ohm’s law – page 43
20 (c)	2	Single path circuits – series circuits – page 43
20 (d)	3	Single path circuits – series circuits – page 43
20 (e)	4	Single path circuits – series circuits – page 43

Section III

Question	Marks	HSC content – focus area
21 (a)	6	Components, tools and equipment – fabricating components – page 28
21 (b)	9	Components, tools and equipment – fixing, securing and mounting accessories – pages 26–27 Safety – WHS compliance – pages 35–36 Working in the industry – work tasks and practices – page 55

Section IV

Question	Marks	HSC content – focus area
22	15	Drawings, diagrams and compliance – compliance – pages 32–33 Safety – WHS compliance – pages 35–36 Working in the industry – work tasks and practices – pages 55–57