L-Università ta' Malta

MATSEC
Examinations Board

Marking Scheme

SEC Engineering Technology Unit 2

Main Session 2025
10th May 2024

Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with the MATSEC Examinations Board when in doubt.

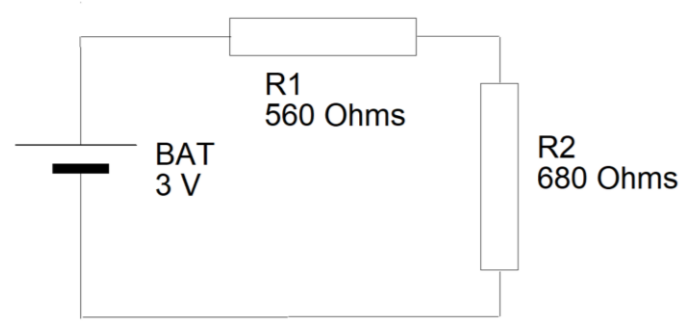
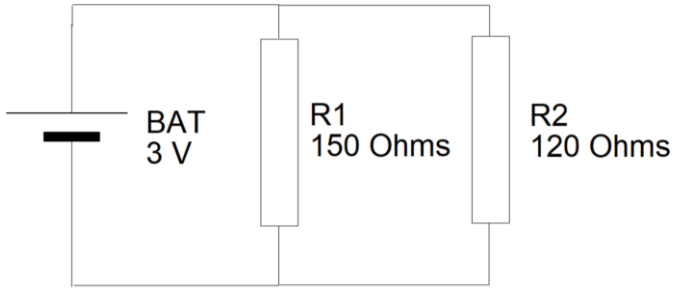
<table>
<tr><th>Criteria Reference</th><th>The candidate should be able to:</th><th>Question Number</th><th>Maximum marks that can be achieved</th><th>Allocation of marks NOT to be subdivided any further than indicated below</th><th>Examples of expected answer</th></tr>
<tr><td rowspan="4">K-1</td><td></td><td>Q1</td><td>4</td><td></td><td></td></tr>
<tr><td>MQF 1: Categorise different materials as insulators, conductors.</td><td>1a</td><td>1</td><td>0.25 marks for each correct answer.</td><td><table><tr><th>Conductor</th><th>Insulator</th></tr><tr><td>Copper</td><td>Oil</td></tr><tr><td>Gold</td><td>Porcelain</td></tr></table></td></tr>
<tr><td>MQF 2: Define the term semi-conductor.</td><td>1b</td><td>1</td><td>1 mark for a correct answer.</td><td>Example of a correct answer:

Semiconductors possess intermediate conductivity, lying between insulators and conductors. Through doping, small amounts of impurities are added to pure semiconductors to enhance their conductivity.

Any other suitable answer is to be accepted.</td></tr>
<tr><td>MQF 3: State the parameters affecting resistance of a material.</td><td>1c</td><td>2</td><td>1 mark for naming each correct parameter.</td><td>Candidates are expected to state TWO parameters affecting resistance.
Examples of correct answers:
- Resistivity of a material
- Length
- Cross-sectional area

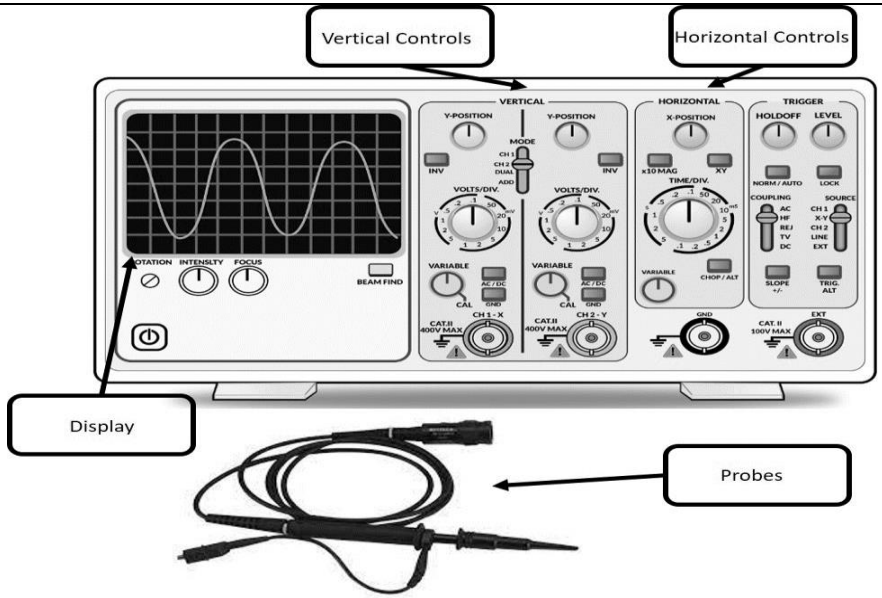
Example of a good statement:
Resistivity of a material: Resistivity is unique to all materials. It may be used to compare two materials’ electrical conductivity and decide which one would offer the least resistance to the flow of current.

Any other suitable statement is to be accepted.</td></tr>
</table>

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
		Q2	**4**		
K-3	MQF 1: Differentiate between open and closed circuit.	2a	1	1 mark for the correct answer.	An open circuit refers to a circuit where current does not flow due to a discontinuity. Conversely, a closed circuit is one where current can flow continuously. Any other suitable answer is to be accepted.
	MQF 2: Draw series and parallel circuits.	2b	1	0.5 marks for series circuit. 0.5 marks for parallel circuit.	Examples of correct answers:   Any other suitable answer is to be accepted. If Ω is written instead of Ohms, it is considered as a suitable answer.

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
	MQF 3: Identify parallel and series sub-circuits in a given circuit.	2c	2	1 mark for identifying series sub-circuit. 1 mark for identifying parallel sub-circuit.	Candidates are to identify **ONE** series and **ONE** parallel sub circuit. Examples of correct answers: Series circuit: R1 in series with R2 Parallel circuit: (R1 + R2) in parallel with R3
		Q3	**6**		
C-2	MQF 1: Find the total resistance in a series circuit.	3a	2	1 mark for working. 1 mark for correct answer.	R1 = 560 Ω R2 = 2,200 Ω R3 = 680 Ω RT = R1 + R2 + R3 RT = 560 + 2200 + 680 RT = 3440 Ω = 3.44 kΩ
	MQF 2: Find the total resistance in a parallel circuit.	3b	2	1 mark for working. 1 mark for correct answer.	R1 = 1,500 Ω R2 = 1,000 Ω RT = 1 / (1/R1 + 1/R2) RT = 1 / (1/1500 + 1/1000) RT = 1 / 0.0016667 RT = 600 Ω
	MQF 3: Find the total resistance of a circuit containing series and parallel subcircuits.	3c	2	1 mark for working.	R1 = 1,000 Ω R2 = 1,200 Ω R3 = 680 Ω R4 = 560 Ω R5 = 1,500 Ω

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
				1 mark for correct answer.	R2 + R3 = 1200 + 680 = 1880 Ω R4 + R5 = 560 + 1500 = 2060 Ω (R2 + R3) || (R4 + R5) = 1880 || 2060 = 982.9Ω RT = R1 + ((R2 + R3) || (R4 + R5)) = 1000 + 982.9 = 1982.9 Ω RT = 1.98 kΩ
		Q4	**6**		
C-3	MQF 1: Find the total capacitance in a parallel circuit.	4a	2	1 mark for working. 1 mark for correct answer.	C1 = 2.2 uF C2 = 270 nF = 0.27µF CT = C1 + C2 = 2.2 µ + 0.27 µ = 2.47 µF
	MQF 2: Find the total capacitance in a series circuit.	4b	2	1 mark for working. 1 mark for correct answer.	C1 = 2.2 µF C2 = 3300 nF = 3.3 µF CT = 1 / ((1/2.2) + (1/3.3)) CT = 1 / 0.7576 CT = 1.32 µF
	MQF 3: Find the value of a missing parameter in a RC circuit.	4c	2	1 mark for working. 1 mark for a correct answer.	R1 = 1.2 kOhms = 1200 Ω T = RC → C = T / R C = 2.64 / 1200 C = 0.0022 F = 2200 µF
		Q5	**4**		
K-6	MQF 1: Identify different types of signals.	5a	1	0.5 marks for each correct answer.	i. Sine Wave ii. DC Wave

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
	MQF 2: Define parameters of a given signal and their SI units.	5b	1	0.25 marks for each correct answer. Do not award marks if the parameter and the SI Unit do not match.	Any **TWO** of the following parameters: Parameter 1: Amplitude SI Unit of Parameter 1: Volts Parameter 2: Periodic Time SI Unit of Parameter 2: Seconds Parameter 3: Frequency SI Unit of Parameter 3: Hertz
	MQF 3: Label important features of an oscilloscope.	5c	2	0.5 marks for each correct answer.	
		Q6	**4**		
K-9	MQF 1: Identify electronic symbols.	6a	1	0.25 marks for each correct answer.	i. Motor ii. SPST switch iii. Operational Amplifier iv. Capacitor

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
	MQF 2: Match SI units to their respective parameters.	6b	1	0.25 marks for each correct answer.	i. Ohms – Resistance ii. Farads – Capacitance iii. Amps – Current iv. Watts – Power
	MQF 3: Identify different packaging of the same electronic components.	6c	2	0.5 marks for each correct answer.	i. Operation amplifier IC Packaging 1 – Dual in Line Packaging 2 – Single in Line ii. Transistor Packaging 1 – Surface mount Packaging 2 – Through hole
		Q7	**4**		
K-10	MQF 1: Label different tools used in electronic circuit construction.	7a	1	0.25 marks for each correct answer.	i. Wire Stripper ii. PCB Driller iii. Third Hand iv. De-soldering pump
	MQF 2: Identify correct steps to use a soldering iron effectively.	7b	1	0.25 marks for each correct step mentioned.	Candidates are expected to identify the remaining **FOUR** steps. Examples of correct answers: i. Free board from oxidization ii. Apply the required heat to component pin and copper track iii. Apply the correct amount of solder iv. Allow the solder joint to solidify appropriately Any other suitable answer is to be accepted. Steps should be listed in the order as mentioned above.

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Examples of expected answer
	MQF 3: Outline the functions of different tools for circuit construction.	7c	2	1 mark for each correct answer.	Candidates are to outline the functions of a soldering iron and a side cutter. Example of correct answer: Soldering iron: A soldering iron supplies heat to allow solder to flow between two workpieces that will ultimately join once the soldering iron is removed. Any other suitable answer is to be accepted.
		Q8	**6**		
C-5	MQF 1: Identify suitable warning signs for given hazardous scenarios.	8a	2	1 mark for each correct answer.	i.  ii. 
	MQF 2: Identify hazards that might be present when manufacturing a PCB.	8b	2	0.5 marks for each correct answer.	Candidates are to identify the following: Hazard 1: Burns Hazard 2: Chemical spill Hazard 3: Dangerous fumes from solder Hazard 4: Airborne fragments

Criteria Reference	**The candidate should be able to:**	**Question Number**	**Maximum marks that can be achieved**	**Allocation of marks NOT to be subdivided any further than indicated below**	**Examples of expected answer**
	MQF 3: Identify ways to eliminate or minimize the risks involved when manufacturing a PCB.	8c	2	0.5 marks for each correct answer.	Candidates are to identify the following: i. Wear appropriate PPE. ii. Keep the work area safe and clean. iii. Use chemicals according to its Data Safety Sheet iv. Work in a well-ventilated area.