



L-Università
ta' Malta

MATSEC
Examinations Board



Marking Scheme

SEC Engineering Technology Unit 2

Main Session 2023

17th May 2022

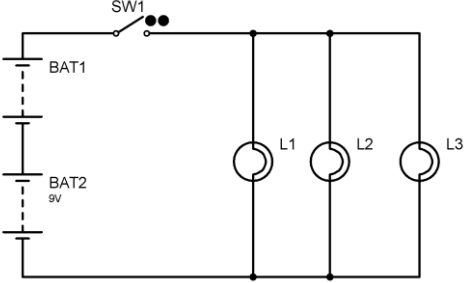
Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

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.

Marking Scheme (Main Session 2023): SEC Engineering Technology Unit 2

Criteria Reference	The candidate should be able to:	Question Number	Maximum marks that can be achieved	Allocation of marks	Examples of expected answer.						
K-1	MQF 1: Categorise different materials as insulators, conductors.	1a	1	0.25 marks for each correct answer.	<table border="1"> <thead> <tr> <th>Conductor</th> <th>Insulator</th> </tr> </thead> <tbody> <tr> <td>Gold</td> <td>Paper</td> </tr> <tr> <td>Steel</td> <td>Wood</td> </tr> </tbody> </table>	Conductor	Insulator	Gold	Paper	Steel	Wood
	Conductor	Insulator									
	Gold	Paper									
Steel	Wood										
MQF 2: Define the term semi-conductor.	1b	1	1 mark for a correct answer.	<p>Example of a correct answer: Semiconductors are materials which have a conductivity between conductors and insulators. Semiconductors can be pure elements, such as silicon or germanium, or compounds. In a process called doping, small amounts of impurities are added to pure semiconductors causing large changes in the conductivity of the material.</p> <p>Any other suitable answer is to be accepted.</p>							
MQF 3: State the parameters affecting resistance of a material.	1c	2	1 mark for naming each correct parameter.	<p>Candidates are expected to state TWO parameters affecting resistance.</p> <p>Examples of correct answers:</p> <ul style="list-style-type: none"> - Resistivity of a material: The higher the resistivity of the material used, the greater the resistance. - Length and cross-sectional area affect resistance accordingly. (Accept if candidates give length/cross-sectional area separately.) <p>Any other suitable answer is to be accepted.</p>							

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K-3	MQF 1: Differentiate between open and closed circuit.	2a	1	1 mark for the correct answer.	An open circuit is an electrical circuit in which the continuity is broken, therefore current does not flow. On the other hand, a closed circuit is a circuit without interruption, providing a continuous path in which current can flow.
	MQF 2: Draw series and parallel circuits.	2b	1	0.5 marks for batteries and switch connected in series. 0.5 marks for bulbs connected in parallel.	Examples of correct answers:  Any other suitable answer is to be accepted.
	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: S1 in series with L1 OR S2 in series with L2 Parallel circuit: (S1 + L1) in parallel with (S2 + L2) in parallel with battery (B1) Any other suitable answer is to be accepted.

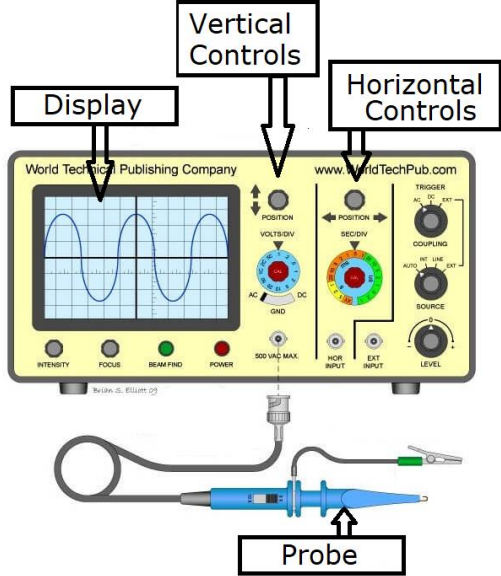
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C-2	MQF 1: Find the total resistance in a series circuit.	3a	2	<p>0.5 marks for correct conversions.</p> <p>1 mark for equation and working.</p> <p>0.5 marks for correct answer.</p>	<p>$R1 = 1,000\Omega$ $R2 = 5,600\Omega$ $R4 = 220\Omega$</p> <p>$RT = R1 + R2 + R3$</p> <p>$RT = 1000 + 5600 + 220$ $RT = 6820\Omega = 6.82K\Omega$</p>
	MQF 2: Find the total resistance in a parallel circuit.	3b	2	<p>0.5 marks for correct conversions.</p> <p>1 mark for equation and working.</p> <p>0.5 marks for correct answer.</p>	<p>$R1 = 3300\Omega$ $R2 = 220\Omega$</p> <p>$RT = 1 / (1/R1 + 1/R2)$ $RT = 1 / (1/3300 + 1/220)$ $RT = 1 / 0.004848485$ $RT = 206.25\Omega$</p>
	MQF 3: Find the total resistance of a circuit containing series and parallel subcircuits.	3c	2	<p>1 mark for working.</p> <p>1 mark for correct answer.</p>	<p>$R1 = 10000\Omega$ $R2 = 560\Omega$ $R3 = 5600\Omega$ $R4 = 2600\Omega$</p> <p>i. $R3 + R4 = 5600 + 2600 = 8200\Omega$ ii. $R2 (R3 + R4) = 560 8200 = 524.2\Omega$ iii. $R1 + (R2 (R3 + R4)) = 10000 + 524.2 = 10524.2\Omega = 10.524k\Omega$</p>

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C-3	MQF 1: Find the total capacitance in a parallel circuit.	4a	2	0.5 marks for correct conversions. 1 mark for equation and working. 0.5 marks for correct answer.	C1 = 22uF C2 = 560uF CT = C1 + C2 = 22u + 560u = 582uF
	MQF 2: Find the total capacitance in a series circuit.	4b	2	0.5 marks for correct conversions. 1 mark for equation and working. 0.5 marks for correct answer.	C1 = 47uF C2 = 1000uF CT = 1 / ((1/47) + (1/1000)) CT = 1 / 0.022277 CT = 44.89uF
	MQF 3: Find the value of a missing parameter in a RC circuit.	4c	2	0.5 marks for total capacitance. 0.5 marks for conversion. 0.5 marks for equation and working. 0.5 marks for a correct answer.	CT = C1 + C2 = 6800nF + 3200nF = 10000nF CT = 0.00001F T = CR → R = T / C R = 0.2 / 0.00001 R = 20000Ω = 20KΩ



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K-6	MQF 1: Identify different types of signals.	5a	1	0.25 marks for each correct answer.	<ul style="list-style-type: none"> i. Triangular ii. Sine iii. DC iv. Square
	MQF 2: Define parameters of a given signal and their SI units.	5b	1	0.25 marks for each correct answer.	<ul style="list-style-type: none"> i. Parameter (i): Amplitude SI Unit of Parameter (i): Volts ii. Parameter (ii): Periodic Time SI Unit of Parameter (ii): Seconds
	MQF 3: Label important features of an oscilloscope.	5c	2	0.5 marks for each correct answer.	 <p>The diagram shows a yellow oscilloscope with a blue probe. Labels with arrows point to the following components: 'Display' (the screen showing a sine wave), 'Vertical Controls' (a group of controls including POSITION, VOLTS/DIV, and AC/DC/GND), 'Horizontal Controls' (a group of controls including POSITION, SEC/DIV, and TRIGGER), and 'Probe' (the blue probe connected to the input).</p>

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K-9	MQF 1: Identify electronic symbols.	6a	1	0.25 marks for each correct answer.	<ul style="list-style-type: none"> i. Capacitor ii. Transistor iii. Resistor iv. Battery
	MQF 2: Match SI units to their respective parameters.	6b	1	0.25 marks for each correct answer.	<ul style="list-style-type: none"> i. Ohms – Resistance ii. Watts – Power iii. Amps - Current iv. Volts - Voltage
	MQF 3: Identify different packaging of the same electronic components.	6c	2	0.5 marks for each correct answer.	<ul style="list-style-type: none"> i. Operation amplifier IC <ul style="list-style-type: none"> Packaging 1 – Single in line Packaging 2 – Dual in line ii. Transistor <ul style="list-style-type: none"> Packaging 1 – Surface mount Packaging 2 – Through hole
K-10	MQF 1: Label different tools used in electronic circuit construction.	7a	1	0.25 marks for each correct answer.	<ul style="list-style-type: none"> i. Side cutter ii. Wire stripper iii. Long nose plier iv. De-soldering pump
	MQF 2: Identify correct steps to use a soldering iron effectively.	7b	1	0.2 marks for each correct step mentioned.	<p>Examples of correct answers:</p> <ul style="list-style-type: none"> i. Clean soldering iron tip ii. Free board from oxidization iii. Apply the required heat to component pin and copper track iv. Apply the correct amount of solder v. Allow the solder joint to solidify appropriately. <p>Any other suitable answer is to be accepted. Steps should be listed in the order as mentioned above.</p>

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	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 third hand and track cutter. Example of correct answer: Third hand: A third hand is a tool used to create a proper joint with soldering. They are a pair of mechanical hand-like clutches which hold materials near each other so the user can work (solder) them. Any other suitable answer is to be accepted.
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: Chemical spill Hazard 2: Inhaling dangerous fumes Hazard 3: Burns Hazard 4: Cuts
	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. work in a well-ventilated area. ii. make use of adequate PPE. iii. use tools according to their instructions iv. use safe work practice