



Design & Technology

Personal Learning Checklist

GCSE Electronics

Below is a PLC for your GCSE Subject. Each topic appears in the specification and you must revise its contents. Use the RAG system to highlight your areas of strength and development and make a note of where you can get information from to support you with your revision preparation.

When working through the list to not feel overwhelmed by what you need to know. A lot of these points are small parts of the overall topic and it will be the case that most can be ticked off quickly.

Area	R	A	G	Resources
Power Supplies: select different power sources				BBC Bitesize Overview - Click
Power Supplies: understand voltage regulators				
Switches: recall the names of switches				BBC Bitesize switch circuit symbols - Click BBC Bitesize switch bounce - click
Switches: recall SPST, SPDT and throws/poles				
Switches: use them in series or parallel				
Switches: know how to eliminate switch bounce				
Resistors: how to control voltage and current				BBC Bitesize Overview - Click BBC Bitesize Ohms & Resistor Colour Code - Click BBC Bitesize Potential Dividers and LDR's - Click BBC Bitesize Pull Up / Pull Down Resistors (bottom of page) - Click
Resistors: use Ohms law				
Resistors: use potentiometers & variable resistors				
Resistors: know LRDs and Thermistors are resistors				
Resistors: use the colour code and understand tolerance				
Resistors: understand pull up and pull down resistors				
Resistors: know there is a common series for values				
Resistors: know they can come in IC's				
Capacitors: understand they store electrical charge				BBC Bitesize Overview - Click
Capacitors: use the correct units				
Capacitors: identify electrolytic capacitors				
Capacitors: use with a resistor to create a time delay				
Capacitors: use of capacitor to smooth a dc voltage				
Diodes: the function of a diode				BBC Bitesize Overview - Click
Diodes: identify the anode and cathode				
Diodes: how to use to protect components from EMF				
Diodes: used to protect components from battery polarity				



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Area	R	A	G	Resources
LED's: identify anode and cathode legs				BBC Bitesize Overview - Click
LED's: calculate a suitable resistor to use with them				
LED's: describe their function				
LED's: be aware of bi-colour, tri-colour and IR emitters				
Transistors: know when to use a NPN bi-polar transistor				BBC Bitesize transistors (top of page) – Click BBC Bitesize darlington pairs (top of page) – Click
Transistors: identify & name the legs				
Transistors: draw and understand Darlington Pairs				
Transistors: be aware of transistors packaged as IC's				
FET's: know when to use a FET				BBC Bitesize FET's (bottom of page) – Click
FET's: explain what a FET is and name its legs				
Thyristors: know how and when to use a thyristor				BBC Bitesize Thyristors - Click
Thyristors: identify & name the legs				
Thyristors: use a describe its action as a latch				
Thyristors: understand it acts as a bistable circuit				
Relays: describe how they work as an interface				BBC Bitesize Relays - Click
Opto-isolatos: describe how they function				BBC Bitesize Opto Isolators - Click
Op Amps: describe the function of the IC and inputs				BBC Bitesie Overview - Click
Op Amps: explain as a comparator				
Op Amps: explain as an inverting amplifier				
Op Amps: explain how to limit gain by a feedback resistor				
Logic: use in circuit when more than one input is needed				BBC Bitesize Analogue and Digital Signals - Click BBC Bitesize OR/AND Gate - Click BBC Bitesize NOT Gate - Click BBC Bitesize Complex Logic - Click BBC Bitesize Logic IC's - Click
Logic: know the following logic gates AND, OR and NOT				
Logic: know the truth tables for AND, OR and NOT gates				
Logic: understand that logic gates use digital signals				



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Area	R	A	G	Resources
Microcontrollers: know they are PICs				BBC Bitesize Overview - Click BBC Bitesize Flowcharts - Click
MC: know that PICs are Programmable Integrated Circuits				
MC: know what subroutines are and how to use them				
MC: use flowcharts with start and stop in them				
MC: use flowcharts with wait, output in them				
MC: use decision boxes with digital and analogue inputs				
MC: use flowcharts to count				
MC: use flowcharts to produce pulses				
MC: understand decimal and binary numbers can be used				
MC: interface with a transducer driver				
MC: interface with sound and light outputs				
MC: interface with other IC's (4017B, 4026 counters)				
MC: use infrared with a microcontroller				
Circuit Symbols (see last page)				BBC Bitesize Components - Click
Potential Dividers: used to control voltages				BBC Bitesize Overview - Click
PD: construct a constant voltage using fixed resistors				
PD: construct a variable voltage with an LDR/Thermistor				
PD: use variable resistors with LDR/Thermistors				
Electronic Switches: transistors and logic gates				Look at the transistors section and Microcontrollers section
Electronic Switches: Microcontrollers				
Time: Using a capacitor and resistor for a time delay				
Integrated Circuits: Identify pin 1				BBC Bitesize Overview - Click BBC Bitesize DIL sockets - Click
IC: explain DIL sockets and the use of them				
IC: describe the use of an IC socket				
IC: awareness of dedicated IC's (melody generators etc)				



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Monostable: use a 555 timer to produce a time delay				Technology Student Monostable overview - Click
Monostable: explain how to adjust the time delay				
Monostable: calculate time delay				
Astable: use a 555 timer as a pulse generator				BBC Bitesize Astable Timers - Click
Astable: calculate the frequency of pulses				
Astable: understand mark space ratios				
Astable: understand how to adjust frequency				
Counters: understand decade counters				BBC Bitesize Decade Counter 4017B - Click
Counters: name the legs on a decade counter				
Counters: transferring from a circuit symbol to an IC				
Interface Devices: Selecting the correct ID's for purpose <ul style="list-style-type: none"> - Transistors - Darlington Pairs - Field Effect Transistors - Thyristors 				
Output Devices: Explain applications of <ul style="list-style-type: none"> - LED's - Buzzers - Lamps - Bells - Loudspeakers - Sirens - Piezo Sounders - Solenoids - Seven Segment Displays 				BBC Bitesize <ul style="list-style-type: none"> - LED's - Seven Segment Displays
Transducer Input Devices: applications for <ul style="list-style-type: none"> - LDR's - Thermistors - Piezos - Moisture Sensors - Microphones 				
Calculations (see last page)				
Materials: show a working knowledge of <ul style="list-style-type: none"> - Acrylic - High Impact Polystyrene (HIPs) - Medium Density Fibreboard (MDF) - Softwoods (pine) - Mild Steel 				BBC Bitesize Overview - Click BBC Bitesize woods and manufactured boards - Click BBC Bitesize metals - Click BBC Bitesize plastics - Click BBC Bitesize materials comparisons - Click

Area	R	A	G	Resources
Smart Materials: show a working knowledge of <ul style="list-style-type: none"> - Electroluminescent materials - Shape memory metals - Polymer fibre optic cables - Photovoltaic cells - Piezoelectric cable - Quantum tunnelling Composite (QTC) 				BBC Bitesize smart materials overview & material info - Click
Smart Materials: understand and define them				
Smart Materials: awareness of nanomaterials				
Preparing Materials: Manufacture of PCB's (photo etch)				
PM: Manufacture of PCB's (CNC routing)				
PM: Use of a range of components				
Processes: Explain the following processes <ul style="list-style-type: none"> - Vacuum Forming - Injection Moulding - Line Bending - Laser Cutting - Rapid Prototyping (3D Printing) 				BBC Bitesize overview - Click BBC Bitesize rapid prototyping - Click
Manipulating Materials: <ul style="list-style-type: none"> - Cut shape and form to dimensions - Fitting electronic components - Adding batteries within cases 				
Applying Finishes: <ul style="list-style-type: none"> - Applying finishes to product cases - Use of single core and multi strand wire - Making wires tidy by using spiral wrap - Using colours of wire for polarity - Using strain holes for heavy objects 				
Commercial Manufacture: <ul style="list-style-type: none"> - Describe one-off production and prototypes - Describe batch production - Describe high volume production 				BBC Bitesize – production systems - Click
System Diagrams: Input, Process, Output and Feedback				BBC Bitesize system diagram - Click
System Diagrams: open loop and closed loop				BBC Bitesize Overview - Click
Evaluation: Suggest improvements to products				
Quality: quality assurance and quality control				





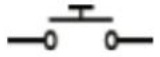


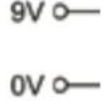









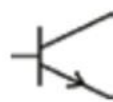

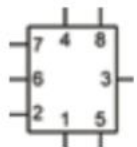





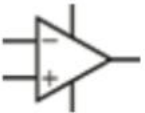

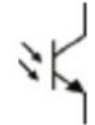










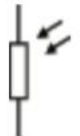

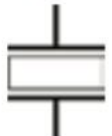
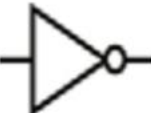


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Area	R	A	G	Resources
Wider Issues: environment, social and moral issues				
Wider Issues: disposal of electronic components				
Wider Issues: designing for maintenance				
Wider Issues: Product Life Cycle				
Wider Issues: Automation in manufacture				
Wider Issues: Planned Obsolescence				
Wider Issues: Fashionable electronic products				
Wider Issues: Social development of electronics				
CAD: Define (Computer Aided Design)				BBC Bitesize CAD use - Click
CAD: Evaluate effectiveness of CAD				
CAD: Awareness of use in design and modelling of circuits				
CAM: Define (Computer Aided Manufacture)				BBC Bitesize CAM use - Click
CAM: Uses (PCB making, case making etc)				
CAM: Evaluate				
Health and Safety: recognise hazards in manufacture				BBC Bitesize Overview - Click
H&S: understand precautions used in manufacture				
H&S: understand risk assessment				
Construction: Describe how to make a functional PCB				BBC Bitesize breadboard and stripboard - Click BBC Bitesize CNC Machines - Click BBC Bitesize making PCB's photo etch method - Click
Construction: Understand breadboard and its uses				
Construction: Understand stripboard and its uses				
Construction: Understand through hole construction				
Construction: Understand surface mount construction				
Construction: Understand pick and place machines				
Construction: Understand soldering baths				
Construction: Understand industrial manufacture process				
Testing: Understand the use of multimetres				BBC Bitesize Overview - Click
Testing: Understand the use of logic probes				
Testing: Understand the use of LED testers				

Circuit Symbol Knowledge

Learn the symbols and the names.

					
Cell	Light emitting diode	Push to make switch	Diode	Bell	Voltage rails
					
Battery	Flashing light emitting diode	Push to break switch	Thyristor	Microphone	Earth
					
Resistor	Bi-colour light emitting diode	Single pole single throw switch	NPN transistor	Buzzer	555 timer IC
					
Variable resistor	Tri-colour light emitting diode	Single pole double throw switch	Field effect transistor	Loudspeaker	Operational Amplifier
					
Potentiometer	Photo transistor	Capacitor	AND gate	Lamp	Voltage regulator
					
Thermistor	Opto-isolator	Electrolytic capacitor	OR gate	Motor	Crossing of conductors
					
Light dependent resistor	Ammeter	Piezo crystal oscillator	NOT gate	Voltmeter	Joined Conductors

Calculations

Know how to use the formulae and apply them. They will be in the front of the exam paper.

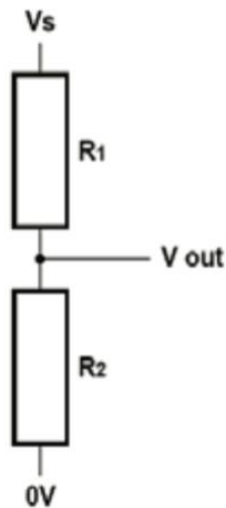
Potential Difference

$$\text{Potential Difference} = \text{Current} \times \text{Resistance} \quad (V = I \times R)$$

Series Resistors

$$R_{\text{total}} = R1 + R2 + R3 \text{ etc}$$

Potential Divider



$$V_{\text{out}} = \frac{R2}{R1 + R2} \times V_s$$

where V_{out} = signal value
 V_s = supply voltage
 $R1$ and $R2$ are resistance values

Time Constant

$$\text{Time Constant} \approx \text{Resistance} \times \text{Capacitance} \quad (T \approx R \times C)$$

Astable Frequency for 555

$$f = \frac{1.44}{(R1 + 2R2) \times C}$$

Mark Space Ratio

$$= \frac{\text{Time high}}{\text{Time low}}$$

Time High

$$= 0.693 \times (R1 + R2) \times C$$

Time Low

$$= 0.693 \times R2 \times C$$

Inverting Op.Amps

$$\text{Gain} = \frac{-R_f}{R_{in}} \quad \begin{array}{l} \text{Where } R_f = \text{feedback resistor value} \\ \text{Where } R_{in} = \text{input resistor value} \end{array}$$

BBC Bitesize - [Potential Difference](#) (Top of page)

BBC Bitesize - [Resistors in Series](#) (Middle of page)

BBC Bitesize - [Resistors in Parallel](#) (Bottom of page)

BBC Bitesize - [Potential Dividers](#)

BBC Bitesize - [Time Constant](#)

BBC Bitesize - [Astable Pulse Frequency](#) (Top of page)

BBC Bitesize - [Mark Space Ratio](#) (Bottom of page)

BBC Bitesize - [Operational Amplifier Gain](#)