

The Written Paper

A 2 hour paper split into 3 sections.

- Section A (20 Marks) - Core Technical Principles
- Section B (30 Marks) - Specialist Technical Principles
- Section C (50 Marks) - Designing and Making Principles

You will be given a mixture of **Multiple Choice** (1 Mark), **Short Answer** (between 3 and 8 Marks) including questions that require **analysing** and **evaluating**, and **Extended Answer** (8 Marks) Questions. **Maths questions** can occur in all sections.

The following are command words

- **'Evaluate'** means that you have to make a *judgement from available evidence*.
- **'Discuss'** means you should *present key points*.
- **'State'** means that you should answer in *clear terms* - you do not need to explain.
- **'Illustrate'** means that you need to present *examples*.
- **'Explain'** means that you need to set out *reasons*.

Section A (20 Marks) - Core Technical Principles

This section covers the basic information you need across a wide range of materials and technologies. You should **understand all of this content** though you will not be expected to have an in depth knowledge - that is for the next section. Some of this content you will have covered at KS3.

WHAT TO REVISE	Links to Technology Student.Com	What Should I Know	R	A	G
1.1 New and Emerging technologies	NEW AND EMERGING TECHNOLOGIES - Look near the top of the page on industry, enterprise, sustainability, people, culture, society environment and production techniques and systems. Revision cards for Environment about ¾ way down the page. Revision web at the bottom of the page.	the design and organisation of the workplace including automation and the use of robotics buildings and the place of work tools and equipment. crowdfunding, virtual marketing, fair trade and retail co-operatives automation, computer aided design (CAD), computer aided manufacture (CAM), flexible manufacturing systems (FMS) and just in time (JIT) ethics, design for disabled and elderly and different religious groups continuous improvement efficient working the environment, finite and non-finite energy, disposal of waste - pollution, global warming and lean manufacturing. planned obsolescence and design for maintenance			
1.2 Energy Generation and Storage	ENERGY GENERATION AND STORAGE - Look about ¼ of the way down the page for sections on Energy generation and storage including fossil fuels, nuclear and batteries.	coal, gas, oil wind, solar, tidal, hydro-electrical, biomass			
1.3 Developments in new materials	DEVELOPMENTS IN NEW MATERIALS Look about ¼ of the way down the page for sections on Modern materials, Smart Materials and Composite Materials	Modern Materials - eg Graphene, Metal foams and Titanium. Smart Materials - eg shape memory alloys, thermochromic pigments and photochromic pigments Composite Materials eg glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP). Technical Textiles - eg conductive fabrics, fire resistant fabrics, kevlar and microfibres incorporating micro encapsulation.			
1.4 Systems approach to designing	SYSTEMS APPROACH - Electronic systems including programmable components to provide functionality to products and processes, and enhance and customise their operation	Inputs - The use of light sensors, temperature sensors, pressure sensors and switches. Processes - The use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes. Outputs- The use of buzzers, speakers and lamps, to provide functionality to products and processes.			
1.5 Mechanical Devices	MECHANICAL SYSTEMS Look about ⅓ of the way down the page for further links eg types of motion, forces, levers, cams etc	Levers - first order, second order and third order Linkages - bell cranks, push/pull. Rotary systems - pulleys and belts. simple gear trains, CAMs and followers			
1.6 Materials and their working properties	Materials - Wood, Metals, Plastics and Composites Materials - Papers and Boards about ½ way down the page. Materials - Natural and Manufactured Timbers about ½ way down the page. Materials - Metals about ½ way down the page. Materials - Polymers about ½ way down the	Describe the different materials using the terms below: absorbency (resistance to moisture) density fusibility electrical and thermal conductivity. strength hardness toughness malleability ductility and elasticity. Papers and Boards - bleed proof, cartridge paper, layout paper, grid, tracing paper, corrugated card, duplex board, foil lined board, foam core board, inkjet card, solid white board. Natural Timber - ash, , beech, mahogany, oak, larch, pine, spruce Manufactured Timber - medium density fibreboard (MDF), plywood, chipboard. Metals			

page. Materials - Textiles about ½ way down the page. Poster - Paper and Boards Revision cards for Materials about ⅓ way down the page. Revision web at the bottom of the page.	- low carbon steel, cast Iron, high carbon/tool steel			
	Non ferrous metals - aluminum, copper, tin, .zinc			
	Alloys - brass, stainless steel, high speed steel.			
	Plastics - acrylic (PMMA), high impact polystyrene (HIPS), high density polythene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET),phenol formaldehyde (PF), epoxy resin (ER), melamine-formaldehyde (MF), polyester resin (PR), urea–formaldehyde (UF)			
	Textiles - cotton, wool, silk			
	Synthetic fibres - polyester, polyamide (nylon), elastane (lycra)			
	Blended and mixed fibres - plain weave Non-woven - bonded fabrics, felted fabrics			
	Knitted textiles - knitted fabrics.			

Section B (30 Marks) - Specialist Technical Principles

This section covers the in-depth knowledge and understanding you need in relation to electrical and mechanical systems and components. You should also have knowledge of Materials. Other DT subjects will have a different content in this section.

WHAT TO REVISE	Links to Technology Student.Com	What Should I Know	R	A	G
2.1 Selection of materials and components	Revision cards for Materials about ⅓ way down the page	Aesthetics: surface finish, texture and colour.			
		Environmental factors: recyclable or reused materials.			
		Availability: ease of sourcing and purchase.			
		Cost: bulk buying.			
		Social factors: social responsibility.			
		Cultural factors: sensitive to cultural influences			
		Functionality: application of use, ease of working.			
		Ethical factors: purchased from ethical sources such as FSC.			
2.2 Forces and stresses	Forces, Moments and Equilibrium	Tension, compression, bending, torsion and shear.			
		lamination, bending, folding, webbing, fabric interfacing.			
2.3 Ecological and social footprint	Revision cards for Obsolescence about ⅔ way down the page Ecological and Social Footprint about ½ way down the page.	Deforestation, mining, drilling and farming.			
		Mileage of product from raw material source, manufacture, distribution, user location and final disposal.			
		That carbon is produced during the manufacture of products.			
		The 6 R's - Reduce, refuse, re-use, repair, recycle and rethink.			
		Social issues in the design and manufacture of products			
		Safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others			
2.4 Sources and origins	Sources and Origins about ⅔ way down the page.	<p>ONE OF THE FOLLOWING</p> <ul style="list-style-type: none"> Paper and board (how cellulose fibres are derived from wood and grasses and converted into paper). Timber based materials (Seasoning, conversion and creation of manufactured timbers). Metal based materials (extraction and refining). Polymers (refining crude oil, fractional distillation and cracking) Textile based materials (obtaining raw material from animal, chemical and vegetable sources, processing and spinning). 			
2.5 Using and working with materials	Materials and their working properties Powerpoint Presentation	<p>ONE MATERIAL AREA FROM THE FOLLOWING</p> <p>Paper and Boards</p> <ul style="list-style-type: none"> Flyers/leaflets and card based food packaging. How to cut, crease, score, fold and perforate card. <p>Timber based materials</p> <ul style="list-style-type: none"> Traditional timber children's toys and flat pack furniture. Seasoning to reduce moisture content of timbers How to cut, drill, chisel, sand and plane Metal based materials Cooking utensils and hand tools. Annealing to soften material to improve malleability How to cut, drill, turn, mill, cast, bronze and weld <p>Polymers</p> <ul style="list-style-type: none"> Polymer seating and electrical fittings Stabilisers to resist UV degradation. <p>Textile based materials</p> <ul style="list-style-type: none"> Sportswear and furnishings Flame retardants reduce combustion and fire hazards How to sew, pleat, gather, quilt and pipe Electronic and mechanical systems 			

		<ul style="list-style-type: none"> • motor vehicles and domestic appliances • Photosensitive PCB board in PCB manufacture and anodizing aluminium to improve surface hardness • How to cut, drill and solder 			
2.6 Stock forms, types and sizes	Electronics and Systems about ¾ way down the page.	<p>ONE MATERIAL AREA FROM THE FOLLOWING</p> <p>Paper and Boards</p> <ul style="list-style-type: none"> • sheet, roll and play sold by size eg A3, thickness, weight and colour • standard components eg fasteners, seals and bindings cartridge paper and corrugated card. Timber based • planks, boards and standard moldings sold by length, width, thickness and diameter • standard components eg woodscrews, hinges, KD fittings. <p>Metal based</p> <ul style="list-style-type: none"> • sheet, rod, bar and tube sold by length, width, thickness and diameter. • standard components eg rivets, machine screws, nuts, and bolts. Polymers • sheet, rod, powder, granules, foam and films sold by length, width, gauge and diameter • standard components eg screws, nuts and bolts, hinges. 			
		<p>Textiles</p> <ul style="list-style-type: none"> • yarns and fabrics sold by roll size, width, weight and ply • standard components eg zips, press studs, velcro. sold by quantity, Electrical and Mechanical • volt and current rating standard components eg E12 resistor series, dual in line IC packages (DIL), microcontrollers (PIC). 			
2.7 Scales of Production	<p>Revision cards for Production Methods and Commerce about ⅔ way down the page</p> <p>Scales of Production about ⅔ way down the page. Flow or Wave Soldering</p>	<ul style="list-style-type: none"> • prototype • batch • mass • continuous. 			
2.8 Specialist Techniques and processes	Materials - Working with woods, metals and polymers about ¾ way down the page.	<p>A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes including</p> <ul style="list-style-type: none"> • die cutting, perforation, turning, sawing, milling, drilling, brazing, welding, lamination, soldering, 3D printing, vacuum forming, blow moulding, casting, injection moulding, extrusion • batik, sewing, bonding, creasing, pressing, drape forming, bending, folding <p>Commercial processes</p> <ul style="list-style-type: none"> • Papers and boards (offset lithography and die cutting). • Timber based materials (routing and turning). • Metal based materials (milling and casting). • Polymers (injection molding and extrusion). • Textile based materials (weaving, dyeing and printing). • Electrical and mechanical systems (pick and place assembly and flow soldering) <p>Quality Control</p> <ul style="list-style-type: none"> • Papers and boards (registration marks). • Timber based materials (dimensional accuracy using go/no go fixture). • Polymers (dimensional accuracy by selecting correct laser settings). • Textile based materials (dimensional accuracy checking a repeating print against an original sample). • Electrical and mechanical systems (UV exposure, developing and etching times in PCB manufacture) 			
2.9 Surface treatments and finishes	Surface treatments and finishes very near the bottom of the page.				

Section C (30 Marks) - Designing and Making Principles

This section covers the in-depth knowledge and understanding you need in relation to electrical and mechanical systems and components. Other DT subjects will have a different content in this section.

WHAT TO REVISE	Links to Technology Student.Com	What Should I Know	R	A	G
3.1 Investigation, primary and secondary data	Revision cards for Anthropometrics, Ergonomics and Inclusive Design about ½ way down the page Primary Sources of Data about ¾ way down the page.	<ul style="list-style-type: none"> market research, interviews and human factors including ergonomics focus groups and product analysis and evaluation the use of anthropometric data and percentiles. 			
3.2 Environmental, social and economic challenge		<ul style="list-style-type: none"> deforestation - possible increase in carbon dioxide levels leading to potential global warming the need for fair trade. 			
3.3 The work of others	The work of designers, design movements and design companies Revision cards for Art Movements and Designers and Companies about ¾ way down the page	3 from the following designers <ul style="list-style-type: none"> Harry Beck, Marcel Breuer, Coco Chanel, Norman Foster, Sir Alec Issigonis, William Morris, Alexander McQueen, Mary Quant, Louis Comfort Tiffany, Raymond Tempier, Marcel Breuer, Gerrit Reitveld, Charles Rennie Macintosh, Aldo Rossi, Vivienne Westwood. 3 from the following companies <ul style="list-style-type: none"> Alessi, Apple, Braun, Dyson, Gap, Primark, Under Armour , Zara. 			
3.4 Design strategies	Designing and Making Principles about ¾ way down the page.	<ul style="list-style-type: none"> sketching modelling testing and evaluation of their work to improve outcomes. 			
3.5 Communication of Design Ideas	Communicating Design Ideas near the bottom of the page.	<ul style="list-style-type: none"> freehand sketching, isometric and perspective 2D and 3D drawings system and schematic diagrams annotated drawings that explain detailed development or the conceptual stages of designing exploded diagrams to show constructional detail or assembly working drawings: 3rd angle orthographic, using conventions, dimensions and drawn to scale audio and visual recordings in support of aspects of designing: eg interviews with client or users mathematical modelling computer based tools 			
3.6 Prototype development	Revision cards for Model Making about ½ way down the page	<ul style="list-style-type: none"> modelling: working directly with materials and components, eg card modelling, producing a toile when designing garments, constructing a circuit using breadboard 			
3.7 Selection of materials and components	Manufacturing Specification	<ul style="list-style-type: none"> functional need cost availability 			
3.8 Tolerances	Tolerances near the bottom of the page.	<ul style="list-style-type: none"> Work accurately using tolerances. How a range of materials are cut, shaped and formed to designated tolerances. Why tolerances are applied during making activities? 			
3.9 Materials management	Material Management near the bottom of the page.	<ul style="list-style-type: none"> The importance of planning the cutting and shaping of material to minimise waste eg nesting of shapes and parts to be cut from material stock forms. How additional material may be removed by a cutting method or required for seam allowance, joint overlap etc. Use appropriate marking out methods, data points and coordinates The value of using measurement and marking out to create an accurate and quality prototype. The use of data points and coordinates including the use of reference points, lines and surfaces, templates, jigs and/or patterns 			
3.10 Specialist tools and equipment	You may want to explore several sections on www.technologystudent.com Computer Numeric Control (CNC)	<ul style="list-style-type: none"> How to select and use specialist tools and equipment, including hand tools, machinery, digital design & manufacture, appropriate for the material and/or task to complete quality outcomes. How to use them safely to protect themselves and others from harm 			
11 Specialist techniques and processes	Finishes to wood and metals Look about ½ way down the page for some revision cards. Surface treatments and finishes very near the bottom of the page	<ul style="list-style-type: none"> How to select and use specialist techniques and processes appropriate for the material and/or task and use them to the required level of accuracy in order to complete quality outcomes. How to use them safely to shape, fabricate and construct a high quality prototype, including techniques such as wastage, addition, deforming and reforming. Surface treatments and finishes <ul style="list-style-type: none"> Students should know and understand that surface treatments and finishes are applied for functional and aesthetic purposes. How to prepare a material for a treatment or finish. How to apply an appropriate surface treatment or finish. 			