Pearson
Edexcel

Mark Scheme (Results)

November 2020

Pearson Edexcel GCSE
In Design & Technology
(1DT0) 1D: Systems

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Section A – Core content

Question number	Answer	Mark
1 (a) (i)	Any **one** property from: • good resistance to corrosion (1) • good fluidity / casts well (1) • machinability (1)	**(1)**

Question number	Answer	Mark
1 (a) (ii)	Any **one** property from: • water proof / water resistant (1) • durable / long lasting (1) • plasticity / softened when heated (1) • tough / impact resistance (1)	**(1)**

Question number	Answer	Mark
1 (a) (iii)	Any **one** property from: • excellent for scoring / bending / folding (1) • rigid (1) • hygienic / safe for food use / non-toxic (1) • pure with no smell or taste (1) • good printability (absorbency) / takes ink well (1) • stiffness (1)	**(1)**

Question number	Answer	Additional guidance	Mark
1 (a) (iv)	Any **one** property from: • hard / resistant to wear / indentation (1) • tough / impact resistance (1) • good compressive strength (1)	Do not accept strong / high strength	**(1)**

Question number	Answer	Additional guidance	Mark
1 (b)	A calculation that includes: • correct working 1.35 x 3.55 = 4.7925 (1) • correct answer to the nearest penny / 2 decimal places £4.79 (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

Question number	Answer	Mark
1 (c)	Any **one** advantage for using polyester for the school tie (1) and a linked justification of that advantage (1). • It is stain resistant (1) so it will not mark / stain if food / drink gets spilt on it (1) • It hangs / drapes well (1) which means it will look nice / presentable when worn / tied (1) • It dries quickly (1) so it can be washed overnight and be ready for school the next day (1) • It is resistant to abrasion (1) which means it will not get damaged / scarred if it rubs on a blazer / desk (1) • It can be recycled (1) which means it does not have to end up in landfill (1) • It does not shrink (1) therefore will not lose shape when it gets washed / wet (1) • Polyester has good colour retention (1) so colour will not fade over time / resists fading in sunlight (1) Do not accept generic statements related to the fabric construction rather than the polyester fibres.	**(2)**

Question number	Answer	Additional guidance	Mark
2 (a)	Any one manufactured timber from: • MDF / Medium Density Fibre board (1) • Plywood (1) • Chipboard (1) • Blockboard (1) • Laminboard (1)	Do not accept hardboard	**(1)**

Question number	Answer	Mark
2 (b)	Any **one** reason for using SMAs (1) and a linked justification of that reason (1). • If they have been plastically deformed / bent into a shape that is not right / not big enough they can be heated (1) which means they go back to their original shape / can be used again to test a new shape / saves resources (1) • Once the correct shape / size / profile has been achieved the material can be heated (1) which means it will go back to its original shape / can be used for something else (1) • It is easier to reset / straighten the SMA wire in comparison to copper wire (1) because it can be heated rather than pulled through a die (1)	**(2)**

Question number	Answer	Additional guidance	Mark
2 (c) (i)	A calculation that includes: • correct working 3/5 x 35 (1) • correct answer 21 mm (1) Alternative method 35/5 x 3 = 21 mm (2)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

Question number	Answer	Additional guidance	Mark
2 (c) (ii)	A calculation that includes: • correct working $\pi \times 3.5^2$ (1) • correct answer $38cm^2$ (1) Accept 38.4895 for 1 mark	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong e.g. they have used mm instead of cm	(2)

Question number	Answer	Mark
2 (d)	Any **one** reason for using copper for the flowers (1) and a linked justification of that reason (1). • It is malleable / easily bent / formed (1) which means it will hold its shape once formed / stay in that shape permanently without any other form of treatment (1) • It is a ductile material (1) which means it can be drawn out into the required long thin wires (1) • It is a nice colour (1) and can be left without any additional surface finishing / will tarnish / natural finish (1) • It will not rust (1) which would result in the jewellery changing colour / leaving a mark / stain on any clothing (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3 (a)	Any **one** property from: • good electrical insulator (1) • lightweight (1) • durable / long lasting / hard-wearing (1)	Do not accept tough / impact resistant	**(1)**

Question number	Answer	Mark
3 (b)	Any **one** reason for using corrugated board (1) and a linked justification of that reason (1). • Excellent impact resistance (1) meaning it will cushion / absorb shock / withstand being thrown about in transit / protect the product (1) • Excellent strength to weight ratio (1) therefore it provides good protection without adding additional cost to the postal costs (1) • It is recyclable (1) which means it does not have to end up being sent to landfill (1) • Corrugated board is a cost-effective material / cheap (1) which means it maximises the profits / returns (1)	**(2)**

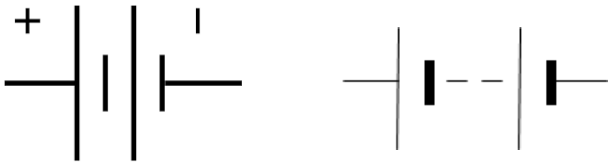
Question number	Answer	Mark
3 (c)	Any **one** explanation that references the use of robotic materials (1) and a linked justification of that use (1). • They can be used to sense movement by the hand (1) and so can act as steering / directional controllers (1) • They can sense pressure / being squeezed (1) therefore eliminating the use of additional buttons (1) • Can be used to communicate with users (1) which means that some sensations can be generated back to the hands / vibrations / pulses (1) • Robotic materials can be used for computational purposes within the material (1) therefore reducing the number of internal components (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3 (d)	A calculation that includes: • correct working $\frac{19 - 12.50}{12.50} \times 100$ (1) • correct answer 52% (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

Question number	Answer	Mark
3 (e)	Any **two** explanations that references environmental issues (1) and a linked justification of the issues (1). • New materials are required to make the bodies for new games controllers (1) therefore putting pressure on the extraction / mining of finite resources to make plastics (1) • Many old controllers are not correctly disposed of / dumped (1) which adds to landfill / increased demand on space / takes hundreds of years to break down (1) • Games controllers should be properly disposed of / WEEE regulations (1) which means they are broken down / rare materials / elements taken out for recycling /because they contain hazardous substances / reducing the amount of materials going to landfill / incineration (1) • Demand for energy used for materials / during manufacture / fuel for transportation (1) which results in additional demand on finite resources / pollution generated (1)	**(4)**

Question number	Answer	Mark
4 (a)	**One** electronic sensor given from: • Thermistor (1) • Thermocouple (1) • Thermometer (1)	**(1)**

Question number	Answer	Mark
4 (b)	Any **one** disadvantage that references the wearing of the uniform (1) and the linked justification of the disadvantage (1). • Lack of breathability (1) which means they will sweat / be hot to wear (1) • They are heavy to wear (1) which will sap their energy / slow them down / only able to wear them for a short time / restrict mobility (1) • Lack of flexibility / stiffness / bulky (1) which makes it difficult for them to move around easily (1)	**(2)**

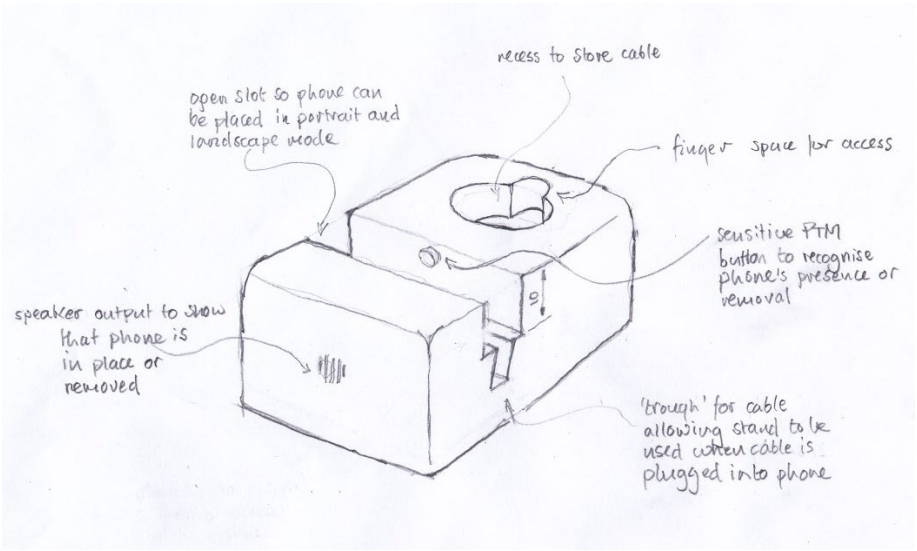
Question number	Answer	Mark
4 (c) (i)		**(1)**

Question number	Answer	Additional guidance	Mark
4 (c) (ii)	A calculation that includes: • correct substitution / transposition 350 = 1000 x 0.7 hours hours = 1000 x 0.7 / 350 = 2 hours (1) • correct answer in minutes 120 (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

Question number	Indicative content	Mark
4 (d)	**Candidates might refer to some/all of the following in their response, but candidates should be rewarded for other pertinent contextualised answers** • Saves time travelling and reduces cost / expense of travelling / lost time because of travelling • Reduction in pollution caused because of travelling • Can be recorded to be replayed and shown to those who could not attend • Serves as a record of what was discussed and agreed • Allows files to be shared over the internet • More opportunities for collaborative design • Allows for screens to be shared so others can work on ideas and add notes • Requires an investment into physical hardware • Needs access to the internet which might not always be available • Susceptible to internet reliability and security so might be difficult to access in certain areas and not always able to discuss confidential / sensitive material • It relies on a certain etiquette in terms of not interrupting	**(6)**

Level	Mark	Descriptor
	0	
Level 1	1 - 2	• Attempts to interrogate and deconstruct information but connections and logical chains of reasoning are flawed. • An unbalanced appraisal of the information/issues, containing judgements that show a limited awareness of the interrelationships between factors or competing arguments.
Level 2	3 – 4	• Interrogates and deconstructs information and provides some connections and logical chains of reasoning. • A balanced appraisal of the information/issues, containing judgements that show an awareness of the interrelationships between factors or competing arguments.
Level 3	5 - 6	• Interrogates and deconstructs information and provides sustained connections and logical chains of reasoning. • A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments.

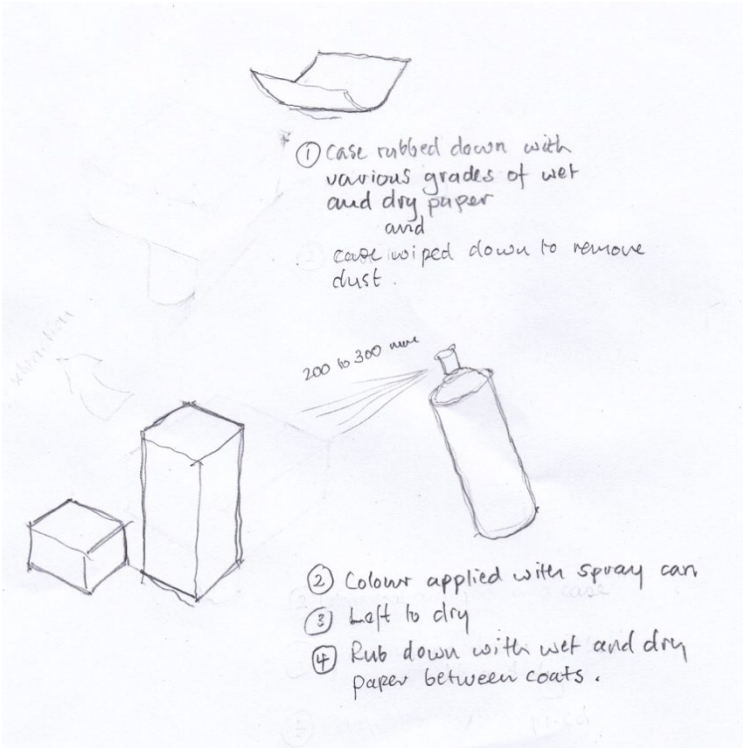
Section B – Systems

Question number	Answer	Mark
5 (a)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and sketches that include: • provide a means of holding the phone in both the portrait and landscape positions when on charge (1) so that the cable does not get in the way (1) e.g. open slot/wider block and hole/ridges/back rest/cable hole/channel • provide an easily accessible storage space (1) for the cable when it is not in use (1) e.g. small drawer / shallow slot / with knob to open / pull finger slot to get cable out • provide a means of alerting the user with an audible output (1) when the phone is removed from the stand (1) e.g. micro switch / PTM switch / PTB switch / buzzer / loudspeaker / siren Example of candidate response.  	**(6)**

	Annotated notes: • open slot so phone can be placed in portrait and landscape position (1) • Recess to store cable (1) • Finger space for access (1) • 'trough' for cable allowing stand to be used when cable is plugged into phone (1) • Sensitive PTM button to recognise phone's presence or removal (1) • Speaker output to show that phone is in place or removed (1)	

Question number	Answer	Mark
5(b)	Any **two** explanations that include a way the seven-segment LED display meets or fails to meet the requirement (1) and a linked justification of that way (1). • The moisture level is shown as a whole number and not a level on a scale (1) therefore it is quicker / easier to read (1) • There is only 1 seven-segment LED display (1) therefore only a limited range of readings of between 0-9 can be shown (1) • The device will give a bright display (1) which will be visible in the dark (1) • If the device is in bright sunlight (1) it may be difficult to see the display (1)	**(4)**

Question number	Answer	Mark
6 (a)	Any **two** factors which include an explanation (1) and a linked justification (1) • Many scarce elements are supplied from places that are politically unstable / far away / emerging economies (1) so supplies could be interrupted by political tensions / sanctions / tariffs / nations will want to reserve them for their own industries / so supplies to others cannot be controlled (1) • Many elements are derived from a single geographical source (1) meaning that there may be no alternative suppliers to turn to (1) • Increasing sales of electronic products in emerging markets (1) puts more pressure on limited supplies of some elements (1)	**(4)**

Question number	Answer	Additional guidance	Mark
6 (b)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and sketches that include: • Case is sanded down (1) • Dust removed with damp cloth and left to dry / case is degreased (1) • Primer / paint applied with brush / spray (1) • Case left to dry (1) • Case rubbed down once dry and second coat applied (1) Example of candidate response:  Annotated notes: 1. Case rubbed down with various grades of abrasive paper and case wiped down to remove dust 2. Colour coat applied with spray can 3. Left to dry 4. Rub down with wet and dry paper between coats	Cap at 3 marks if no sketches or all sketches and no notes	**(4)**

Question number	Answer	Mark
6 (c)	Any **one** explanation that includes a reason for including a 100Ω resistor in the circuit (1) and a linked justification for that reason (1). • The resistor needs to drop (5V – 3V = 2V) (1) which means that 2/20mA = 100Ω (1) • Any other resistor than a 100Ω resistor would allow too much / not enough current (1) therefore the LED would not light / blow due to too little / much current (1)	**(2)**

Question number	Answer	Additional guidance	Mark
6 (d)	Any **two** explanations that include a property (1), plus **two** linked justifications of that property (1) + (1). • Good electrical insulator (1) that means it will not conduct electricity (1) therefore there will not be any short circuits (1) • It is tough / durable / impact resistant (1) that means it can withstand knocks and bumps (1) therefore ensuring that it lasts a long time in the garden (1) • It could be fully transparent / semi-transparent (1) so it allows light through (1) to light the garden effectively (1) • Waterproof (1) which means it will not be affected by any rain that falls on it (1) meaning it will last a long time / protect the components below the lens (1)	Do not accept repeated justifications	**(6)**

Question number	Answer	Additional guidance	Mark
7 (a)	One name given from: • Lever micro switch (1) • Micro switch (1) • SPST micro switch (1) **Do not accept 'roller micro switch' , any other form of micro switch.**	Accept all variations e.g. minor spelling errors, hyphenation	**(1)**

Question number	Answer	Mark
7 (b)	Any **two** explanations that include an advantage of using a template (1) plus a linked justification for the advantage (1). • They can be quickly drawn / traced around (1) therefore saving time / speeds up production time (1) • Each one will be identical (1) therefore ensuring that each / subsequent part will marry up / line up (1) • The template could also be used to mark out additional features such as holes / fixing points (1) therefore ensuring that all the other parts will fit correctly into place (1) • They require little skill when using them (1) therefore they can be used by workers with little / limited skill / require no specific technical knowledge (1)	**(4)**

Question number	Answer	Additional guidance	Mark
7 (c)	A calculation that includes: • Conversion of units either at the start or at the end (1) • Calculation of the surface area of the two straight parallel sides 50 x 5 x 2 = 500 cm^2 (1) • Calculation of semi-circular arc surface area / circumference 2 πrh = 2 x 3.142 x 20 x 5 = 628.4 cm^2 (1) • Calculation of half cylinder surface area 628.4 / 2 = 314.2 cm^2 (1) • Total surface area 500 + 314.2 = 814.2 rounded to 814 cm^2 (1)	Award full marks for correct numerical answer without working. Allow ecf if candidate gets part of calculation wrong.	**(5)**

Question number	Answer	Mark
7 (d)	Any **two** explanations that includes a reason for using vacuum forming to form the body shell (1), plus **two** linked justifications of that use (1) + (1). • The shell has no undercuts / has a draft angle (1) which means the mould / former / shell can be removed easily (1) therefore there will be no damage to the shell (1) • Once the mould / former has been made it can be used repeatedly (1) that means they are all the same (1) therefore parts will fit together (1) • The vacuum forming process has lower set up costs / shorter lead time than many other processes (1) which means it is easier to switch between batches (1) therefore it is more responsive to changes in design / consumer demand (1)	**(6)**

Question number	Answer	Mark
8 (a)	Any **one** explanation that includes a reason for anodising the aluminium (1) and a linked justification of that reason (1). • Anodising creates a durable finish/improves abrasion resistance (1) meaning that parts will not be damaged when assembled/disassembled/in flight/when landing (1) • Effective corrosion resistance in harsh environments (1) as it provides a thicker oxide layer/protective layer (1) • It will make it more visually appealing / interesting (1) therefore will encourage more people to buy it (1)	**(2)**

Question number	Answer	Mark
8 (b)	Any **one** explanation that includes a reason for using through hole components (1), plus **one** linked justification of that reason (1) + (1). • Through-hole components are capable of withstanding shocks/vibrations (1) which means that components are less likely to shake loose / fallout (1) meaning it can be used in varying weather conditions (1) • Through-hole components can be soldered from either side (1) which means the connection is more secure (1) leading to a more reliable product (1) • It is simpler to mount through hole components manually (1) which means that repairs will be easier/suitable for prototypes (1) therefore the product can be made to last longer (1) • Through-hole components can tolerate more power (1) which means that bigger motors can be used (1) therefore improving the performance/capability of the drone (1)	**(3)**

Question number	Answer	Mark
8 (c)	Any **two** explanations that include a requirement (1) and a linked justification of that requirement (1). • Records must be kept to ensure compliance (1) for traceability purposes (1) • Materials selected cannot contain more than the maximum permitted level of any restricted substance (1) makes it safer for workers in the factory / assembly line / to prevent harm to the environment on disposal (1) • Material use / compliance must be declared in instructions / user guidance documents (1) as it is a legal requirement / prevents litigation / transparency (1)	**(4)**

Question number	Indicative content	Mark
8 (d)	**AO3 (9 marks)** **Candidates might refer to some/all of the following in their response, but candidates should be rewarded for other pertinent contextualised answers** • Drones are becoming increasingly popular with children • Mass manufacture and high demand has reduced cost of remote controlled drones which has made them more accessible for children. • Popular present for children which relies upon a lot of environmental resources but they may lose interest • More a luxury than essential product • Contains dangerous components such as batteries which are difficult to recycle / can contaminate the environment • Not high quality because they are only expected to last for two years • Consumer society and built-in product obsolescence generates a lot of waste which ends up in landfill • Children grow out of products quickly because their tastes change so it would not be necessary to design a long-lasting product • Rechargeable batteries mean you do not have to replace disposable batteries which helps the environment • Potential for misuse in flying in restricted spaces/invasion of privacy • Potentially dangerous so not suitable for some children • Consumer society has more leisure time • New legislation makes it difficult/expensive to fly	**(9)**

Level	Mark	Descriptor
	0	
Level 1	1 - 3	• Attempts to interrogate and deconstruct information but connections and logical chains of reasoning are flawed. • An unbalanced appraisal of the information/issues, containing judgements that show a limited awareness of the interrelationships between factors or competing arguments. • A conclusion may be presented but it is likely to be generic assertions rather than supported by relevant judgements.
Level 2	4 – 6	• Interrogates and deconstructs information and provides some connections and logical chains of reasoning. • A balanced appraisal of the information/issues, containing judgements that show an awareness of the interrelationships between factors or competing arguments. • A conclusion is presented that is partially supported by relevant judgements.
Level 3	7 - 9	• Interrogates and deconstructs information and provides sustained connections and logical chains of reasoning. • A well-balanced appraisal of the information/issues, containing judgements that show a thorough awareness of the interrelationships between factors or competing arguments. • A conclusion is presented that is fully supported by relevant judgements.