Pearson Edexcel

Mark Scheme (Results)

November 2020

Pearson Edexcel GCSE
In Design & Technology (1DT0)
1C: Polymers

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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)**

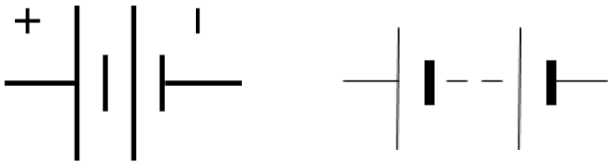
Question number	Answer	Mark
3 (c)	Any **one** explanation that references the use of robotic materials (1) and a linked justification of that use (1). • They can be used to sense movement by the hand (1) and so can act as steering / directional controllers (1) • They can sense pressure / being squeezed (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)**

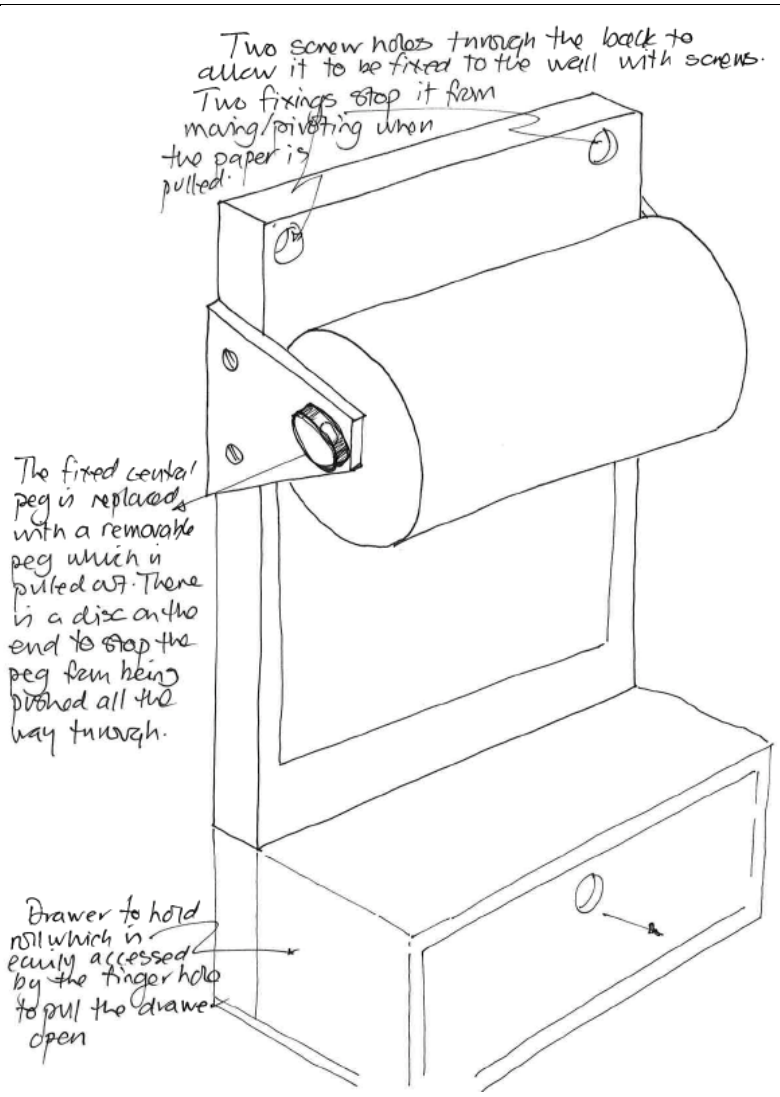
Question number	Answer	Additional guidance	Mark
4 (c) (ii)	A calculation that includes: • correct substitution / transposition 350 = 1000 x 0.7 hours hours = 1000 x 0.7 / 350 = 2 hours (1) • correct answer in minutes 120 (1)	Award full marks for correct numerical answer without working. Allow for ECF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

Question number	Answer	Mark
5 (a)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and sketches that include: • allow an empty kitchen to be removed easily (1) and replaced securely (1) e.g. removable central peg / slot cut in side panel / cap on one end of peg to stop it falling out / off • be held vertically on a wall (1) and not move when the kitchen roll is pulled off (1) e.g. two screws fixed into the wall / two mirror plates which fix the holder rigid / firm and does not allow for any rotation / movement / proprietary wall fixings • provide easily accessible (1) storage space for a spare kitchen roll (1) e.g. drawer / shelf with clear access / method to open drawer Example of candidate response.	**(6)**



Annotated notes:

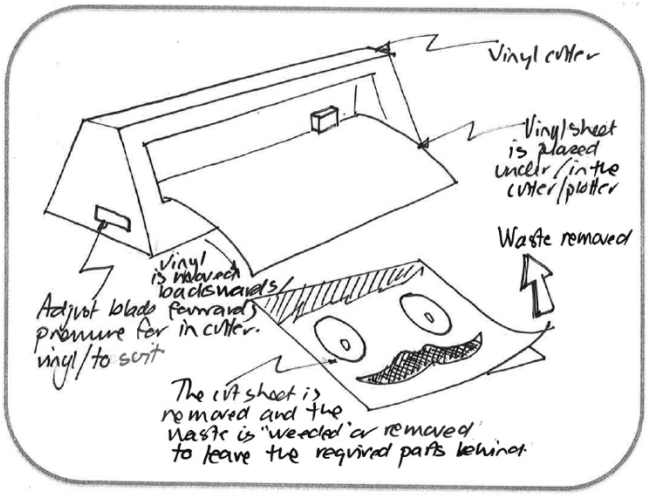
Two screw holes through the back allow it to be fixed to the wall with screws. The two fixings stop it from moving / pivoting when the roll is pulled down.

Drawer to hold spare roll which is easily accessed by the finger hole to pull the drawer open.

The fixed central peg is replaced with a removable peg which is pulled out. There is a large disc on the end to stop it from being pushed all the way through.

Question number	Answer	Mark
5(b)	Any **two** explanations that include a way the markers meet or fails to meet the requirement (1) and a linked justification of that way (1). • They have a sharp pointed end (1) which means they will be able to be pushed into the soil (1) • The text identifies the planted item (1) therefore allowing the gardener to easily locate the plant / seed to be able to provide the necessary aftercare (1) • The text is quite small / quite fragile (1) which means the letters might be difficult to read that show what vegetables have been planted / easily broken off / will not be able to see (1) • The acrylic might fade in colour / get badly scratched (1) which means they might become difficult to see in the ground / get lost in the soil (1)	**(4)**

Question number	Answer	Mark
6 (a)	Any **two** factors which include an explanation (1) and a linked justification (1) • Urea formaldehyde is made from oil (1) which is a finite resource (1) • Changes / fluctuations in global oil price (1) which means it could simply be too expensive to buy / turn into urea formaldehyde (1) • Storms / hurricanes could stop drilling / exploration (1) which results in loss of production / supply / causes demand issues (1) • Reducing / diminishing oil supplies (1) which means that there might not be enough produced / available to make / refined to turn into polymer based materials (1) • Urea formaldehyde is a very difficult material to recycle (1) which means that supplies cannot be topped up with recycled / reclaimed material (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: • Vinyl inserted into the cutter / plotter (1) • Pressure of the blade is adjusted to suit the material (1) • Material is cut from CAD file (1) • Material is removed from the machine (1) • Waste is removed 'weeded' (1) Example of candidate response:  Annotated notes: 1. Vinyl sheet is placed under/in the plotter/cutter 2. Adjust blade pressure for vinyl to suit 3. Vinyl is moved backwards/forwards in the cutter 4. The cut sheet is removed and the waste is 'weeded' or removed to leave the required parts behind 5. Waste removed	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 buying the same sized sheets (1) and a linked justification for that reason (1). • The sheets will fit the machine they have (1) which means they know the limitations of the design area / sheet they can cut (1) • They can limit the amount of waste they produce (1) which will reduce costs / save material in the long run / reduce the amount of material they throw away (1) • They will know the cost of the sheet / material (1) therefore they can offer a fixed price structure to their customers (1) • The sheet will be able to be cut without having to adjust the position of the pinch rollers (1) which will reduce set-up time (1) • The manufacturer will be able to lay plan / nest the components to be cut on standard sized sheet (1) therefore minimising the waste (1)	**(2)**

Question number	Answer	Mark
6 (d)	Any **two** explanations that include a property (1), plus **two** linked justifications of that property (1) + (1). • It is an electrical insulator (1) which means it will not conduct electricity (1) therefore the user will not get an electric shock when they touch the switch (1) • It has good heat resistance (1) which means it will not melt (1) and it will not catch fire (1) • It is a hard material (1) which means it can withstand constant use (1) therefore it can be touched / moved lots without wearing away (1)	**(6)**

Question number	Answer	Mark
7 (a)	One name given from: • Tensol® cement (1) • Liquid cement (1) • Dichloromethane (1)	**(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 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 / 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 requiring 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 parts 50 x 3 x 2 = 300 cm^2 (1) • Calculation of semi-circular arc surface area / circumference 2 πrh = 2 x 3.142 x 20 x 3 = 377.04 cm^2 (1) • Calculation of half cylinder surface area 377.04 / 2 = 188.52 cm^2 (1) • Total surface area 300 + 188.52 = 488.52 rounded to 489 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 extruding (1), plus **two** linked justifications of that use (1) + (1). • Long continuous lengths can be produced (1) which means you can cut to any length (1) therefore minimising / reducing waste (1) • An excellent surface finish is achieved (1) which means no additional finishing is required (1) therefore reducing overall costs / reduces manufacturing time (1) • Thin wall sections can be achieved (1) which means the profile can be bent / flexed (1) therefore allowing it to be shaped / curved around the back shape (1)	**(6)**

Question number	Answer	Mark
8 (a)	Any **one** explanation that includes a reason for having a textured surface (1) and a linked justification of that reason (1). • The ice cream tub will be cold / wet / slippy (1) therefore the textured surface will make it easier to hold / grip the spoon (1) • The texture increases the surface area (1) therefore making it easier to hold / grip the spoon (1)	**(2)**

Question number	Answer	Mark
8 (b)	Any **one** explanation that includes a reason for using polymer granules (1), plus **one** linked justification of that reason (1) + (1). • The granules are small (1) which means they are easily fed into the injection moulding machine / hopper / heater (1) allowing them to be fed through the machine / heater element without clogging up the machine / mixed uniformly (1) • Coloured pigments can be easily added to the granules (1) which means different coloured spoons can be manufactured (1) therefore matching the flavour of the ice cream (1)	**(3)**

Question number	Answer	Mark
8 (c)	Any **two** explanations that include a reason (1) and a linked justification of that reason (1). • It means that the spoons can be composted (1) therefore reduces the amount of waste going into landfill / incineration (1) • Biodegradable polymers are made from sustainable resources (1) which means there will always be resources available to make them (1) • It reduces the demand on oil (1) therefore meaning current stock levels last longer (1) • The spoons may be dropped as litter (1) therefore over time they would break down / decompose / reduce their environmental impact (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** • Can be supplied to any ice cream manufacturer who make this size of ice cream tub • Can be manufactured in any colour to reflect flavour of ice cream • Colour can also be altered so that it does not cause any offence to any countries / cultures • Can be manufactured and supplied in batches so that they are used right away • If they are not used within the year there is a chance that they will start to break down / degrade • The spoons should be disposed of separately from the rest of the waste / litter because they do not need to be recycled as they will naturally break down in compost bins • The spoons can also be used to eat the ice cream from a cone / tub rather than being supplied specifically for the ice cream tubs as shown • The textured finish helps to improve the grip so it does not slip out of your hand when eating cold ice / wet ice cream	**(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.