Pearson Edexcel

Mark Scheme (Results)

Summer 2024

Pearson Edexcel GCSE
In Design & Technology (1DT0)
1B: Papers & Boards

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2024
Question Paper Log Number 74048
Publications Code 1DT0_1B_2406_MS

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.

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom

Component 1 mark scheme

Section A – Core content

Question number	Answer	Mark
1 (a) (i)	Any **one** property from: • Soft / softness (1) • Absorbent / absorbs water (1) • Insulator of heat / thermal insulator (1)	**(1)**

Question number	Answer	Mark
1 (a) (ii)	Any **one** property from: • Sets rigid / rigid (1) • Hard / scratch resistant (1) • Transparent (1) • Non-toxic / skin safe (1)	**(1)**

Question number	Answer	Mark
1 (a) (iii)	Any **one** property from: • Smooth surface (1) • Printability / takes colour / ink / toner well (1) • Absorbent (1) • Opaque (1) • Flexible / flexibility (1)	**(1)**

Question number	Answer	Mark
1 (a) (iv)	Any **one** property from: • Hard (1) • Tough (1) • Fine grain / close grain / even texture (1) • Non-toxic / food safe (1) • Good heat resistance / thermal insulator / low thermal conductor (1)	**(1)**

Question number	Answer	Additional guidance	Mark
1 (b) (i)	Any **one** advantage of using cast iron for the frying pan (1) and a linked justification of that advantage (1) • It is a good conductor of heat (1) therefore the pan surface gets hot quickly / will transfer heat to the food to cook it (1) • It is dense / heavy (1) therefore it will be quite stable on the oven top / unlikely to get knocked over easily (1) • It has good dimensional stability when heated (1) therefore the pan will not distort / buckle (1) • It holds the heat well (1) therefore meaning it stays hot for some time / longer (1) • It has a high melting point (1) therefore it can withstand the temperatures involved in cooking (1)	Do not accept anything related to melting	**(2)**

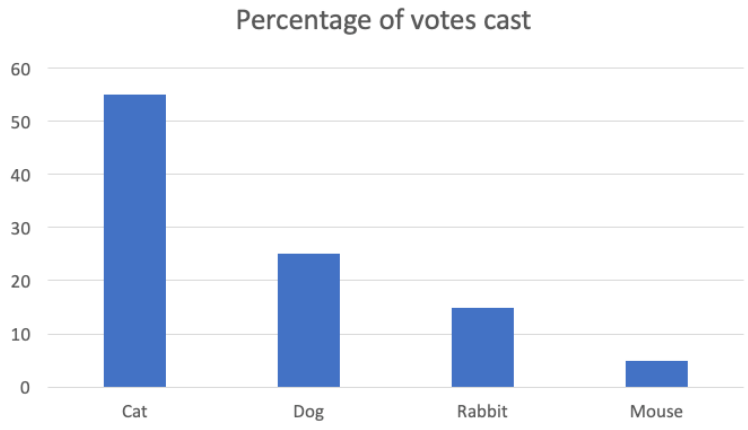
Question number	Answer	Additional guidance	Mark
1 (b) (ii)	A calculation that includes: • correct conversion of units 3 kg = 3000 grams (1) • correct answer 3000 x 2/100 = 60 grams (1) If no conversion of units: 3 x 2/100 = 0.06 grams (worth 1 mark)	Award full marks for correct numerical answer / correct numerical answer without working. Conversion of units could be done after the percentage calculation. Allow for ECF if candidate gets part of transposition wrong.	**(2)**

Question number	Answer	Additional guidance	Mark
2 (a)	Any **one** specific animal fibre from: • Wool (1) • Silk (1) • Mohair (1) • Horsehair (1) • Cashmere (1) • Angora (1) • Alpaca (1)	Do not accept plant fibres, e.g. cotton / cotton wool	**(1)**

Question number	Answer	Mark
2 (b)	Any **one** advantage of using biofuels (1) and a linked justification of that advantage (1) • Biofuels are a renewable / sustainable source of energy (1) which means there will always be a supply / not run out / reduce the rate at which conventional fuels are being used (1) • Less carbon emitted when burnt as fuel (1) which reduces pollution levels / emissions by the delivery vehicles (1) • Biofuels are relatively carbon neutral / smaller carbon footprint (1) which means the absorption of CO^2 during growth is almost equal to the emissions produced when being burnt (1)	**(2)**

Question number	Answer	Mark
2 (c)	Any **one** advantage of using CAD (1) and a linked justification of that advantage (1) • Colour / texture / grain / render can be added to the design (1) which means a realistic image is produced / able to see what it looks like / accurate visual representation (1) • Changes can be easily made (1) which means client feedback can be considered / design modified (1) • Files / part files can be output direct to CNC machines (1) which means prototypes can be produced quickly / reduce lead times to full production runs (1) • Files can be saved electronically (1) which means they can be sent to client / manufacturer as an email attachment (1) • Designs can be sent via email (1) which means stakeholders can provide immediate feedback (1) • Images / views can be manipulated / rotated / zoomed-in (1) which means the ideas can be seen from any angle / intricate details seen up close (1) • Design can be seen in 3D (1) which means thickness / proportions can be accurately represented / seen (1)	**(2)**

Question number	Answer	Additional guidance	Mark
2 (d) (i)	A calculation that includes: • correct calculation for the number of votes cast for the Rabbit (165 / 55) * 15 = 45 (1) • correct calculation for the number of votes cast for the Mouse • (165 / 55) * 5 = 15 (1) • Alternative method for second mark 300 – 165 – 75 – 45 = 15	Correct numerical answers only for full marks. Award full marks for correct numerical answers without working.	**(2)**

Question number	Answer	Mark
2 (d) (ii)	A completed bar chart that shows the two correct bars for the Rabbit at 15% and the Mouse at 5%: 	**(2)**

Question number	Answer	Mark
3 (a)	Award **one** mark from: • V-belt (1) • Vee belt (1) • V-shaped (1) • Vee shaped (1)	**(1)**

Question number	Answer	Mark
3 (b)	Any **one** reason for using aluminium rather than mild steel for the pulley (1) and a linked reason for the use (1) • Aluminium is a non-ferrous metal (1) therefore it will not rust if it comes into contact with water (1) • Mild steel is a ferrous metal / contains iron (1) therefore it is likely to rust / corrode (1) • Aluminium is lighter / less dense than mild steel (1) therefore it will have less of an impact on the weight of the boat / quicker to get up to speed (1) • Aluminium has a lower melting point than mild steel (1) which makes it easier / cheaper to cast (1) • Aluminium is softer than mild steel (1) which means it is easier to machine / turn on a lathe (1)	**(2)**

Question number	Answer	Mark
3 (c)	A calculation that includes: • Correct transposition of the formula Output speed = input speed / velocity ratio (1) • Correct calculation of output speed in rpm 2000 / (5/1) = 400 rpm (1)	**(2)**

Question number	Answer	Mark
3 (d)	Any **one** disadvantage of using the solar cell to power the motor (1) and a linked justification of the disadvantage (1) • The sun might not be bright enough / blocked by clouds (1) which means the boat could stop / get stranded in the middle of a lake / pond (1) • The solar cell might not be capable of providing the power required (1) which means the motor will not turn / turn fast enough to make the boat move (1) • A battery / storage system may be required to store electrical charge (1) which means an increase in weight in the boat hull / make the boat heavier / slower to move through the water (1) • Will not work in low light / dark (1) which means limited use in winter / late at night (1)	**(2)**

Question number	Answer	Mark
3 (e)	Any **two** benefits of using balsa wood to manufacture the frame for the model boat (1) and a linked justification of that benefit (1) • It is lightweight (1) making it easier to power with the solar cell (1) • It is soft (1) which means it is easy to cut with a sharp knife / sand to a smooth curve shape / form / work with (1) • It has a low density / buoyant material (1) which means it will float on the water / not sink (1)	**(4)**

Question number	Answer	Mark
4 (a)	Any **two** explanations that reference the way in which conductive inks can be used in products (1) and a linked justification of each way (1) • They can be used to draw / repair electronic circuits (1) which reduces the need for wires / soldering / expensive / dangerous chemicals to be used to make circuits / PCBs / can be drawn on flexible materials (1) • They can be used as antenna / wireless aerials in car windscreens (1) which means cars can have uninterrupted Wi-Fi connectivity / connected to internet for live traffic data / electric charging points (1) • They can be used to create interactive wall / visual displays / products (1) which means when parts of the wall / products are touched / connected electronic outputs are made to work / light up / move / sound (1) • They can be applied using a pen / printer / silk screen printed (1) which means circuits can be produced to decorate fashion / textiles garments / embed electrical components (1) • They reduce the need for dedicated circuit boards (1) which reduces product weight / useful in restricted spaces (1) • Conductive inks will bend / flex (1) therefore they will move without breaking / cracking (1)	**(4)**

Question number	Answer	Additional guidance	Mark
4 (b)	A calculation that includes: • correct working out of weight (40/100) x 9 or 9 x 0.4 (40 x 9) /100 (1) • correct answer 3.6 grams (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

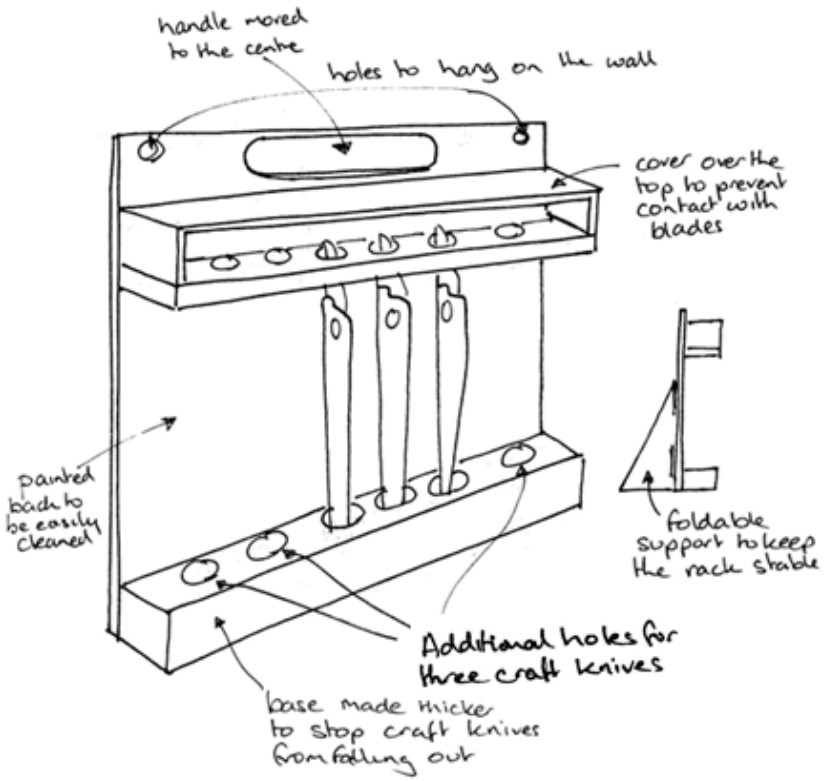
Question number	Indicative content	Mark
4 (c)	• Designers should consider / try to use fewer materials when designing new products / developing new technology so as to minimise the impact on the natural resources available • Designers should try to use as many recyclable materials as possible to reduce the need for new / virgin grade materials • Products / technology should be lighter therefore costing less to transport / distribute post manufacture • Fewer toxic materials / processes should be used therefore causing less damage to the environment during / post use / less to be taken into account when disposing of the item / recycling • The carbon footprint of the product / technology should be considered so that minimal impact on the environment can be made / use locally available materials / less transportation • LCA should be carried out during the design process to make sure that the product / technology can be assessed in terms of its carbon footprint • Consideration should be given to the origin of the raw materials in terms of mining for minerals / oil exploration / cutting down of trees / mining for ore • Designers should try to use biodegradable materials if possible / appropriate • Carry out research into new / emerging materials to assess environmental impact / carbon footprint • Designers could make use of standardised parts / modular components • Designers create products that are easily dismantled / disassembled / repaired allowing materials / parts to be recycled / reused	**(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.

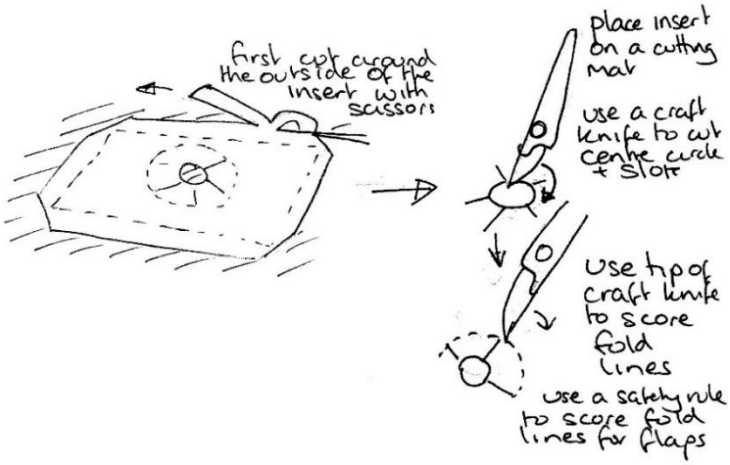
Section B – Papers and Boards

Question number	Answer	Mark
5 (a)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and sketches that include: • be able to hold an additional three craft knives (1) and to stop the craft knives from moving as the rack is carried around a workshop (1) e.g. extra three holes / slots alongside / longer / double sided (but not at the expensive of being able to hang it up on a wall) / blind hole for craft knives / frame around it to hold it in place • protect the user from potential cuts when carrying the rack (1) and have a surface finish that is easy to clean (1) e.g. craft knives placed blade down / protective covers / hinged flap / varnish / waxed / painted • be more stable when placed on a bench (1) and be capable of being hung up on a wall (1) e.g. wider base / triangular back supports / holes to hang it up on / dowels to go through carrying handle to allow hanging on the wall / nails / pegs / screws in the wall **See next page**	**(6)**

	Example of candidate response:  Notes: Holes to hang on the wall Handle moved to the centre Cover over the top to prevent contact with blades Painted back to be easily cleaned Foldable back support to keep the rack stable Additional holes for 3 craft knives Base made thicker to stop craft knives from falling out.	

Question number	Answer	Mark
5(b)	Any **two** explanations that include a way the matching game meets or fails to meet the requirement (1) and a linked justification of that way (1) • Children learn about what fruits / vegetables look like on the inside (1) as the cut-through views of the fruits / vegetables have to be matched with the whole views (1) • There are several different fruits / vegetables (1) therefore there is quite a lot to be able to discuss with parents about the types of fruits and vegetables / some have to be peeled to be eaten / others just eaten (1) • There are only a few fruits and vegetables shown / featured in the game (1) therefore it only provides a narrow range of healthy foods / discussion points (1) • The cards only show pictures (1) therefore a limited range of information is available / limits the educational benefit / value (1)	**(4)**

Question number	Answer	Mark
6 (a)	Any **two** explanations for finishing the house with an embossed design (1) and a linked justification (1) • Embossing can be done on to a printed image (1) which means features can stand out / be enhanced (1) • Embossing raises the surface of the cardboard (1) which means that the walls / roof can be textured as if they were bricks / tiles / slates / improves tactile qualities (1) • Embossing can be done using embossing powders on to the cardboard (1) which means the raised sections can be coloured / will be thicker than the original card (1) • Embossing can give the perception of a higher quality product (1) which would allow for a higher retail price (1) • Embossing may affect the strength / rigidity of the board (1) which results from the deforming of the board from being a flat sheet (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: • Cut outline with scissors / guillotine / paper trimmer (1) • Place insert on to a cutting mat (1) • Use a craft knife / compass cutter to cut out the circle in the centre (1) • Score fold lines / ensure score lines are straight (1) • Partially fold up circle flaps ready to insert the candle (1) Example of candidate response:  Notes: First cut around the outside of the insert with scissors Place insert on a cutting mat Use a craft knife to cut centre circle and slots Use tip of craft knife to score fold lines Use a safety rule to score fold lines for flaps.	Cap at 3 marks if no sketches or all sketches and no notes	**(4)**

Question number	Answer	Mark
6 (c)	Any **one** explanation of a physical characteristic of folding box board (1) and a linked justification for that reason (1) • Folding box board is a cream / white colour (1) which means that it would not affect the colour of any design which is added to the main body of the house (1) • Folding box board is stiff / rigid (1) which means it will hold its shape well when formed into the main body of the house (1) • Folding box board has good printability (1) meaning that any images printed on it will be sharp / true colours (1) • Folding box board can be folded / scored / bent without splitting / tearing / delaminating (1) meaning that the box will maintain structural integrity (1)	**(2)**

Question number	Answer	Mark
6 (d)	Any **two** explanations that include a method (1), plus **two** linked justifications of that method (1) + (1) Cutting (1) • Scissors / a craft knife can be used to cut along the lines (1) which means the triangular sections would be removed as whole pieces (1) CAM / CNC machining / laser cutting / plotter cutting (1) • A design would be produced in CAD (1) which would then be followed by a cutter / laser beam to cut out the whole shape (1) Die cutting (1) • The cardboard could be placed between a die and a cutting board (1) which would cut out the design as a whole when pressure is applied (1)	**(6)**

Question number	Answer	Mark
7 (a)	• Laminate / laminated / lamination / laminating (1)	**(1)**

Question number	Answer	Mark
7 (b)	Any **two** working properties of corrugated cardboard explained (1) plus a linked justification of the property (1) • Corrugated cardboard is flexible (1) which means that it is capable of being bent to make the shape of the back rest (1) • Corrugated cardboard has good compressive strength / rigidity (1) which will prevent the chair / chair back from buckling / collapsing when it is sat on / being leaned against / in use (1) • Corrugated cardboard is light in weight / low density (1) which means the chair will not be too heavy / can be moved around easily by children (1)	**(4)**

Question number	Answer	Additional guidance	Mark
7 (c)	A calculation that includes: • Calculation of the length of the semi-circle (1) $\pi D/2 = \pi$ (2 x 9) / 2 = 28.278 cm • Calculation of the total length of the part required (1) 28.278 cm + (2 x 16) = 60.278 cm • Calculation of how many whole strips can be cut from long length of the sheet (1) 244 / 30 = 8 • Calculation of how many whole strips can be cut from width of the sheet (1) 122 / 60.278 = 2 • Calculation of the number of whole pieces that can be cut from a single sheet (1) 8 x 2 = 16 pieces Alternative method from Step 3 (Step 1 and 2 same as above) • Calculation of small sheet area 60.278 x 30 = 1808.34 cm^2 (1) • Calculation of total sheet area 244 x 122 = 29768 cm^2 (1) • Calculation of number of sheets 29768 / 1808.34 = 16.46 rounded to 16 (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 include an advantage of using a paper engineered joint (1), plus **two** linked justifications of that advantage (1) + (1) • A minimum amount of material needs to be removed from the back of the chair (1) which means there is less chance of the corrugated board tearing (1) therefore reducing the risk of any collapse of the chair / injury to the child (1) • A paper engineered joint does not require adhesive (1) meaning that there is no drying time (1) therefore the chair can be used as soon as it is assembled (1) • A paper engineered joint relies on friction / interference fits (1) meaning there is no permanent connection between the back rest and the seat (1) therefore the chair can be dismantled for storage / transportation (1) • A paper engineered joint can be strengthened using tape (1) which would maintain / retain the fold in the tabs (1) thereby preventing the fold from opening if a locking slot is not used (1)	**(6)**

Question number	Answer	Mark
8 (a)	Any **one** explanation that includes a benefit of using solid white board (1) and a linked justification of that benefit (1) • Solid white board is available in large flat sheets (1) which means the self-assembly box can be as a single piece rather than being made up from smaller bits being glued together (1) • Solid white board has a very smooth / flat surface (1) which means it can have a range of surface finishes applied / takes printed images well (1) • Solid white board is relatively rigid (1) which reduces the need for internal support / bracing (1)	**(2)**

Question number	Answer	Mark
8 (b)	Any explanation of using a stock weight material for the self-assembly boxes (1) plus **two** linked justifications of that advantage (1) + (1) • Fewer different thickness / weights of materials have to be bought (1) which means less money tied up in stock / more readily available (1) therefore providing better cash flow for the company (1) • Stock weight materials are readily available from a range of suppliers (1) which means stock levels can be maintained (1) therefore ensuring there is always sufficient volume of solid white board ready to respond to consumer demand (1) • Features such as tabs / slots can be designed to fit / accommodate different stock weights of material (1) which means boxes can be quickly / readily manufactured using different stock weight materials (1) therefore allowing the company to meet consumer demand (1) • Pre-programmed settings can be used on CNC / printing machinery (1) which means more consistent results (1) therefore reducing waste / better quality outcomes (1)	**(3)**

Question number	Answer	Mark
8 (c)	Any **two** explanations that includes a way waste can be reduced during the manufacture of the self-assembly boxes (1) and a linked justification (1) • Lay planning can be used to position nets / developments on the board (1) which means that the solid whiteboard is used most economically (1) • The nets / developments can be designed so that they tesselate (1) which means there is less waste in the form of offcuts (1) • The most economical size / area of board can be used (1) which means that whole numbers of boxes will fit on the board without excessive waste (1)	**(4)**

Question number	Indicative content	Mark
8 (d)	Impact on **cost factors** in relation to: • Solid white board will stay flat when shipped as self-assembly boxes as it is a stable material • Solid white board is made using bleached wood pulp which gives it a high quality appearance • Solid white board has a smooth surface which makes it ideal for the self-assembly boxes • Solid white board can be printed on using a range of techniques • Solid white board is an easy material to cut using die cutters / CNC cutters however because the boxes have score lines they need to be cut individually which increases production time • Multiple nets could be cut at the same time using a die cutter but additional processing would be needed for the fold / score lines to be added meaning more equipment and is required • Solid white board has a pure white surface which allows it to be used for a wide range of different applications which leads to greater demand • Solid white board is hygienic and can be used for foods unlike other materials • Solid white board is an absorbent material therefore the self-assembly boxes cannot be used for situations where they would get wet without varnishing / lamination being applied meaning it would need to be replaced • Solid white board is suitable for a range of surface treatments such as foil blocking / embossing / debossing which would add value to the self-assembly boxes	**(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.