Mark Scheme (Results)

Summer 2023

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.

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Component 1 mark scheme

Section A – Core content

Question number	Answer	Additional guidance	Mark
1 (a) (i)	Any **one** property from: • Electrical insulator / does not conduct electricity (1) • Good heat resistance (1) • Good chemical resistance (1) • Hard (1) • Stiffness / rigidity (1)	Do not accept Insulator on its own	**(1)**

Question number	Answer	Mark
1 (a) (ii)	Any **one** property from: • Low density (1) • Lightweight / light (1) • Soft (1)	**(1)**

Question number	Answer	Mark
1 (a) (iii)	Any **one** property from: • Hard / hardness / scratch resistant (1) • Tough / toughness / impact resistant (1) • Resistant to corrosion / will not rust (1) • Durable (1) • Waterproof / water resistant (1)	**(1)**

Question number	Answer	Additional guidance	Mark
1 (a) (iv)	Any **one** property from: • Rigid / stiffness / hard to bend (1) • Absorbent / accepts ink well / printability (1)	Do not accept hard on its own	**(1)**

Question number	Answer	Mark
1 (b) (i)	Any **one** advantage of the company being operated as a privately-owned company (1) and a linked justification of that advantage (1). • The company can be more flexible in how it works / make / take their own decisions / control the share allocation (1) therefore they can adopt / exploit new technologies without having to consult shareholders / other stakeholders (1) • The company can make changes fast / make quick decisions without having to consult shareholders (1) which means they can respond to market trends / fashions very quickly (1) • Any profits go to the owners rather than shareholders / can be easily re-invested / spent on new and emerging technologies (1) which provides a greater incentive for the company owners to make a success of the business / work hard / more profits (1) • A privately owned company does not need to publish their accounts (1) therefore they can keep their finances more private (1) • The company can close / cease trading / take any money out (1) and start a new company under a new name (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1 (b) (ii)	A calculation that includes: • correct setting out of formula $\frac{30}{100} \times 150{,}000$ (1) • correct answer £45,000 (1) Alternative method • £150,000 x 1.3 = £195,000 (1) • £195,000 - £150,000 = £45,000 (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of transposition wrong. If a candidate shows working out and gives an answer of £195,000 and shows it as an answer, 1 mark can be awarded. If however they just provide an answer of £195,000 without any working out, no marks should be awarded.	**(2)**

Question number	Answer	Mark
2 (a)	• Oblique (1) • Oblique projection (1) • Cavalier oblique (1) • Cabinet oblique (1) • Cavalier projection (1) • Cabinet projection (1)	**(1)**

Question number	Answer	Mark
2 (b)	Any **one** reason for using concrete (1) and a linked justification of that reason (1). • Concrete is fire proof (1) which means if any wax is spilt / drips onto it, it will not burn (1) • Concrete is dense / heavy (1) which means it will be stable / unlikely to be knocked / topple over (1) • The candle holder is cast into shape (1) which means an exact volume can be mixed / minimises waste (1)	**(2)**

Question number	Answer	Mark
2 (c)	Any **one** reason for manufacturing the concrete candle holder to hold a candle of a standardised size (1) and a linked justification of that reason (1) • The candles will be widely available / commonly used (1) which means they can be purchased from many different suppliers / shop around to find the cheapest price / know they can source candles in the future (1) • The candle holder can be sold / manufactured in different countries (1) which means it has much better sales potential / more profits for the company (1) • The candle holder can be mass produced since the candle is a standard sized (1) which minimises production changes / set up costs (1)	**(2)**

Question number	Answer	Additional guidance	Mark
2 (d)	A calculation that includes: • Conversion of units at the start or end (1) • Calculation of the volume of the square prism 8 x 8 x 3 = 192 cm^3 or 192,000 mm^3 (1) • Calculation of the volume of the cylindrical hole 3.142 x 2.5^2 x 1.5 = 29.45625 cm^3 or 29456.25 mm^3 (1) • correct answer 192 – 29.45625 = 162.54375 cm^3 or 162548 mm^3 rounded to 163 cm^3 (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of transposition wrong. If answer is NOT rounded to a whole number do not award full marks	(4)

Question number	Answer	Mark
3 (a)	Any **one** softwood from: • Pine / pine wood (1) • Cedar (1) • Larch (1) • Redwood (1) • Spruce (1)	**(1)**

Question number	Answer	Mark
3 (b)	Any **one** reason for using a softwood for the frame rather than a hardwood (1) and a linked reason for the use (1) • Softwoods are faster / quicker growing (1) which means there will be a greater supply of timber / more sustainable (1) • Softwoods are cheaper (1) which means the overall cost of the frame will be lower / more likely to sell (1) • Softwoods are less dense than hardwoods / have a more open grain (1) therefore they are easier to machine / cut (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3 (c)	A calculation that includes: • correct working out of waste left 300 – 270 = 30 cm (1) • correct answer 30/300 or 1/10th or 10/100th (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 (d)	Any **one** disadvantage of using mild steel for the fixing (1) and a linked reason for the disadvantage (1) • Mild steel will rust / corrode in the outside conditions / damp soil (1) which means the joint / frame will come apart / fail / become weak (1) • Mild steel has lower tensile strength / shear strength (1) which means the screw could shear / break / snap if overtightened (1)	**(2)**

Question number	Answer	Mark
3 (e)	Any **two** benefits of using corrugated board for the box (1) and a linked justification of the benefits (1). • Corrugated board is lightweight (1) therefore it will not add too much cost to the postal delivery charges / will not add unnecessary weight when lifting (1) • Corrugated board has good impact resistance / is fluted (1) therefore it is good at protecting the frame / parts inside / prevents damage to parts during transportation (1) • Corrugated board is widely recyclable / biodegradable / can be made from recycled materials (1) therefore it will not need to go into general waste / landfill / can be recycled and used again / better for the environment (1) • Corrugated board is absorbent / takes ink well / printability (1) therefore the box can be printed with the company's logo / brand / advertising / recyclable logos on it / stack height (1) • Corrugated board is a cheap / readily available materials (1) therefore it helps to keep down the cost of packaging / overall production costs (1)	**(4)**

Question number	Answer	Mark
4 (a)	Any **one** working property of polyester (1) and a linked justification of that property (1). • Polyester is waterproof / shrink resistant (1) which means it will protect the laptop inside from being damaged by the rain / liquids (1) • Polyester has good tensile strength (1) which means the strap / bag will support the weight of the laptop inside (1) • Polyester is a durable material (1) which means it will resist wear as the bag rubs against the clothes being worn by the user (1) • Polyester is stain/chemical resistant (1) which means it will not be affected by any liquids / coffee spilt on it (1) • Polyester is stretch resistant (1) which means it will not deform/change shape due to any loading/weight of the laptop inside (1)	**(2)**

Question number	Answer	Additional guidance	Mark
4 (b)	A calculation that includes: • correct working out of recycled polyester 100% – 60% = 40 % (1) • correct working out of grams of recycled polyester 40/100 x 320 = 128 grams (1) Alternative method • correct working out of new polyester 60/100 x 320 = 192 (1) • correct working out of grams of recycled polyester 320 – 192 = 128 grams (1)	Award full marks for correct numerical answer without working. Allow for ECF if candidate gets part of calculation wrong.	**(2)**

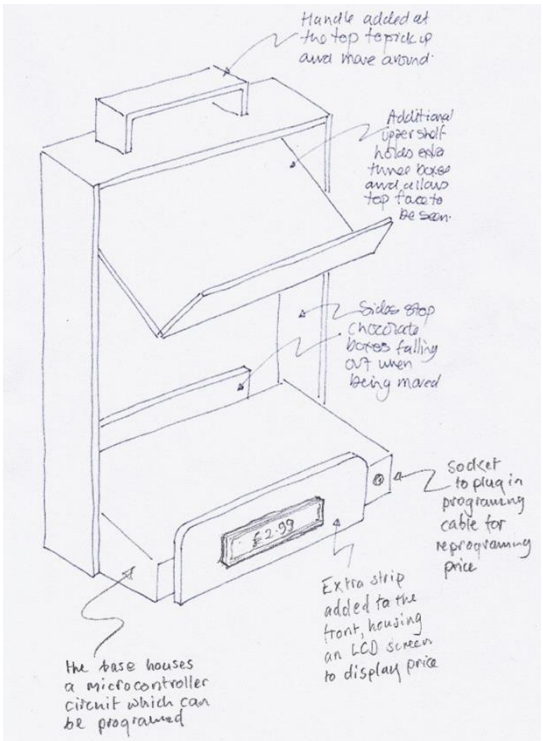
Question number	Answer	Mark
4 (c)	Any **one** explanation that references why carrying out a LCA can help to reduce the environmental impact (1) and a linked justification (1). • Materials would be sourced from local suppliers (1) which means there would be fewer miles / reduced travel / pollution created by not buying materials from overseas suppliers (1) • More recycled polyester / materials would be used in the bag (1) which will reduce the demand for new materials / impact of drilling for oil / conservation of finite resources (1) • The company would consider the types of vehicles used to distribute their products / use greener transport (1) which would reduce the pollution / greenhouse gas emissions from traditional fuelled vehicles (1) • The company would consider how the bag / customers can recycle the at the end of its useful working life / broken down / separated into different parts (1) which means materials / parts could be recycled / reused rather than being dumped in landfill / incinerated (1) • The company would use more sustainable sources of energy (1) which reduces the carbon footprint in the manufacture of the bag (1) • The company could consider how to adapt the design of the bag (1) which means they could reduce the amount of raw materials used in its manufacture (1) • The company should consider / review the manufacturing processes / techniques used for the manufacture (1) which means they could reduce the number of processes / machines / energy used (1)	**(2)**

Question number	Indicative content	Mark
4 (d)	• Improved battery capability has meant that it is possible to work for longer without the need to be plugged into mains power making it much easier to work on the move rather than needing to be based in an office / home • Laptops have become smaller / lighter which has meant that they have become much more portable due to advances in materials technology / miniaturisation allowing users to take them home / travel with them easier which means they can work anywhere • Many laptops now have built in cameras / speakers which means that remote working / video conference / zoom / teams has meant that the workforce can attend virtual meetings with little additional equipment / can join meetings from anywhere that has a Wi-Fi connection • The processing power / increase in RAM / speeds of modern laptops make them much more capable of handling demanding software such as graphics / CAD based packages • With Wi-Fi / internet ready / enabled laptops more computing can be carried out in 'cloud' based environments reducing the need for bigger more powerful processor based computers / meaning that more people can work without having to be connected to office / work place networks • The ability to connect more devices such as printers / stylus pens / keyboards / mouse / tablets via blue tooth / wireless has reduced the need for USB ports meaning that laptops can be made thinner / tapered / more devices attached • The ability to attach / connect additional screens / use of docking stations / has allowed for greater / improved working capability / office simulations	**(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.

Component 1 mark scheme – 1DT0/1D

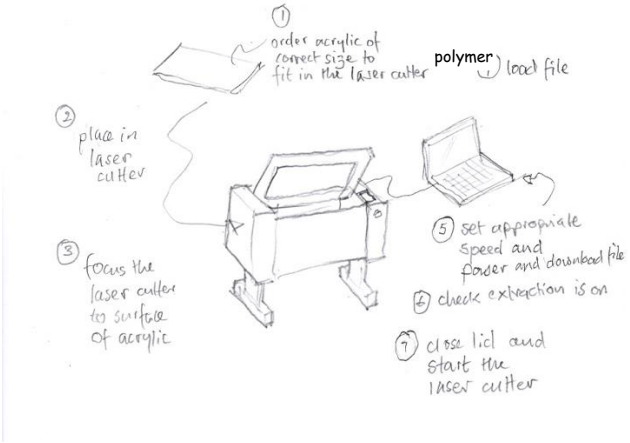
Section B – Systems

Question number	Answer	Mark
5 (a)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and/or sketches that include: • be able to hold an additional three boxes of chocolates (1) and allow the top face of each individual chocolate box to be seen (1) e.g. shelf / longer / wider base / with clear sight lines to be able to see EACH box (no stacking boxes on top of each other) • include an electronic method to show the price of a box of chocolates (1) that allows the price to be changed (1) e.g. keypad, touchscreen, PTM switches (e.g. up/down), RFID, microcontroller / PIC / microprocessor / LCD screen / 7-segment LED display / dot matrix LED display • be portable (1) so that it can be moved to another place without the chocolate boxes falling off (1) e.g. handle(s) / wheels / strap / lips around the edges Example of candidate response.  	**(6)**

	Annotated notes: Handle added at the top to pick up and move around Additional upper shelf holds extra three boxes and allows top face to be seen Sides stop chocolate boxes falling out when being moved Extra strip added to the front, housing an LCD screen to display price The base houses a microcontroller which can be programmed Socket to plug in programming cable for reprogramming price	

Question number	Answer	Mark
5(b)	Any **two** explanations that include a way the wooden puzzle meets or fails to meet the requirement (1) and a linked justification of that way (1). • The steel ball needs to be moved from the start to the finish via the grooves (1) which the young children need to tilt and turn the puzzle to control the direction of the steel ball (1) • The children can see the steel ball through the acrylic screen (1) which means they can see where the ball is / where it needs to move to (1) • The puzzle has a clear lid on it to stop the steel ball falling out (1) which means the steel ball can only travel in the grooves / cannot go anywhere else so not that difficult / stops the ball getting lost rendering the game useless / stops cheating (1) • The steel ball can only travel in the grooves / slots (1) therefore there is very little control needed since the balls can only travel in straight lines up / down / across (1) • When the ball is moved to touch the copper contacts the LED lights up (1) which provides a reward / some amusement for the user (1)	**(4)**

Question number	Answer	Mark
6 (a)	Any **two** benefits of using a buzzer in the circuit (1) and a linked justification (1) • The buzzer will give an audible / loud output (1) which means a sound is heard when the wire and wand touch (1) • The buzzer will make an immediate noise (1) which means it will make the player jump (1) • Buzzers can be manufactured / are very small (1) which means they can fit into the polymer case / base with ease (1) • The buzzer does not need to be programmed (1) meaning the circuit is not very complex (1)	**(4)**

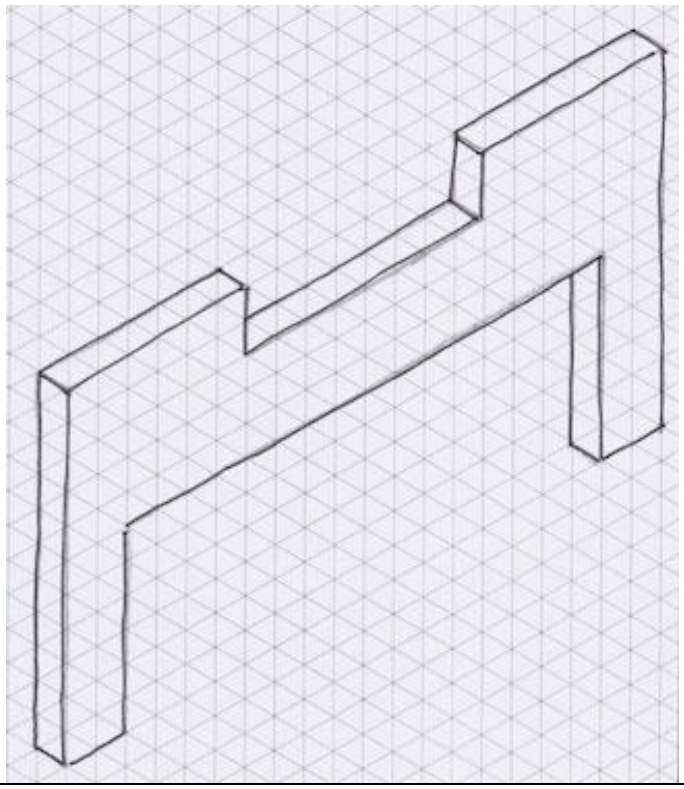
Question number	Answer	Additional Guidance	Mark
6 (b)	**Marks will be awarded for understanding of design and technology, not graphical skills.** Notes and/or sketches that include: • Load size of polymer sheet appropriate to the laser cutter on the bed (1) • Ensure polymer sheet is flat / check bed is clear of debris (1) • Load / convert electronic file (1) • Set appropriate speeds / power / enter material type and thickness (1) • Focus laser / adjust axes / auto focus / position laser head (1) Example of candidate response:  Annotated labelling: • Place acrylic of appropriate size in laser cutter • Check material is flat to bed • Focus the laser cutter to surface of acrylic • Load file • Set appropriate speeds and power / material type / thickness	Cap at three marks if no sketches or all sketches and no notes	**(4)**

Question number	Answer	Mark
6 (c)	Any **one** explanation that includes a way of avoiding offence to potential buyers (1) and a linked justification for that way (1) • Careful consideration must be given to the choice of colours used for the instruction booklet (1) as different colours are used to represent different things in some countries / bring bad luck / have different connotations (1) • The use / choice of language / images must be considered (1) as some words / images when interpreted / seen have very different meanings / use / range of different languages / fonts (1)	**(2)**

Question number	Answer	Additional Guidance	Mark
6 (d)	Any **two** manufacturing methods (1), plus **two** linked justifications of that manufacturing method (1) + (1) Method • Vacuum forming (1) Explanation • The case would be formed in a single operation (1) which produces a consistent outcome free of seams or joints (1) Method • 3D printing (1) Explanation • Can be linked to 3D CAD software (1) which allows a full range of additional design features to be included/manufactured all at once (1) Method • Produced using hand tools / fabrication / assembly (1) Explanation • The case could be manufactured using simple workshop tools / laser cut (1) meaning the different sides / panels could be cut from offcuts / conserving material (1) Method • Injection moulding (1) Explanation • Complex moulds can be manufactured (1) allowing all design features to be included / ribs / holes (1)	Do not accept laser cutting as a method	**(6)**

Question number	Answer	Mark
7 (a)	Any **one** response from: • Wire strippers (1) • Wire stripper (1)	**(1)**

Question number	Answer	Additional guidance	Mark
7 (b)	Any **two** explanations that include an advantage of using CAM (1) plus a linked justification for the advantage (1). • The centre hole will be accurately placed / machined in the centre (1) which means that the axle will be concentric to the outside edge (1) • The wheel will be perfectly round / clean edge / smooth cut (1) which means it will roll without any deviation (1) • All the wheels will be the same size / identical (1) which means that when they fit onto the axle the toy will be at the right height (1) • The file / wheel can be nested / lay planned using the CAD software used to draw the wheel (1) which results in the most efficient use of the acrylic material / minimising waste (1) • Cutting speed / feed rates can be set to produce a perfect finish (1) which means there will be less secondary finishing required / burning (1)	Do not accept any responses related to 24/7 manufacture or comparisons to being hand made	**(4)**

Question number	Answer	Mark
7 (c)	A drawing that includes: • Correct overall length at 100mm (1) • Correct overall height at 55mm (1) • Correct overall thickness at 5mm (1) • Position of the top cut out (1) • Position of the bottom cut out (1) Example of candidate response 	**(5)**

Question number	Answer	Mark
7 (d)	Any **two** explanations that includes a disadvantage (1), plus **two** linked justifications of that disadvantage (1) + (1). • The template could be the wrong size to start with (1) which means any parts marked out using it would be wrong (1) therefore the parts would not fit the rest of the toy (1) • There is a chance it could get lost (1) which means that any other front pieces would need to be marked out by hand (1) therefore they could be the wrong size / different sizes (1) • The template could wear / get damaged as it is used (1) which means the longer it is used the smaller each of the parts get (1) therefore resulting in parts that will not fit / be the right size (1) • The template needs to be located correctly in the first place (1) which means initial errors can be compounded / template might slip / move during marking out (1) therefore resulting in parts that may be the same shape but a different size / meaning material is wasted (1)	**(6)**

Question number	Answer	Mark
8 (a)	Any **one** explanation that includes a benefit of using a variable resistor (1) and a linked justification of that benefit (1). • Using a variable resistor means that the voltage / trigger voltage at the base of the transistor can be adjusted / set (1) which means that the sensitivity of the circuit can be changed (1) • Using a variable resistor creates an adjustable potential divider / circuit (1) which can be used to change the level of darkness / light causing the LED strip to switch on / off (1)	**(2)**

Question number	Answer	Mark
8 (b)	Any **one** explanation of a cost factor (1), plus **one** linked justification of that cost factor (1) + (1). • The tolerance of the resistors will have a bearing on the cost (1) which means resistors with a lower tolerance will be more expensive (1) which would increase the cost of the light (1) • The levels of supply for resistors may vary (1) due to increased demand / pandemics (1) therefore resulting in higher prices / shortages (1) • The availability / manufacturing location of resistors will be a factor (1) which means the prices may vary (1) therefore resulting in higher / lower prices (1)	**(3)**

Question number	Answer	Mark
8 (c)	Any **two** explanations of quality control checks (1) and a linked justification of those checks (1). • The tracks / pads would be tested to ensure there were no breaks in them / dry solder joints (1) which would result in no current flow / loss of connection / continuity (1) • Testing equipment would be used to check that current / voltage / resistance / continuity levels were correct / within tolerance (1) so that the transistor switches on/off / LED strip functions correctly (1) • The light intensity of the LED strips could be checked (1) so they would not be too bright / would be bright enough (1) • The LDR would be covered over / made dark (1) to ensure that the LEDs turn on / variable resistor could be trimmed (1)	**(4)**

Question number	Indicative content	Mark
8 (d)	**AO3 (9 marks)** • The light comes on automatically in the dark providing a level of protection / security as it will be on when you get home in the dark winter months / provide more security for pupils moving around a school site / leaving the school • LED lighting causes less light pollution / less intense form of lighting / softer lighting behind the polymer panel so creating a more welcoming feel when arriving at a building / on an estate • The light uses LED lights which have low energy consumption / therefore the lights are good choice for all users as they will help to reduce energy use / consumption therefore cheaper to run • LED lights are more energy efficient leading to lower running costs for schools and councils and they could use the money to the benefit their pupils / residents • Energy efficient technologies are trending / increasingly fashionable all around the world because lower energy consumption would benefit the environment • LED lighting is becoming increasingly popular due to running costs / longer life span of LEDs • Trends / fashions / growing concerns around the use / manufacture of products given the negative environmental impact of transporting products around the world	**(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.