



L-Università
ta' Malta

MATSEC
Examinations Board



Specimen Papers

SEC 33 Design and Technology

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Specimen Assessments

Specimen Assessments: Controlled Paper MQF 1-2



L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER**

SUBJECT: Design and Technology

PAPER: Level 1 – 2

DATE:

TIME: 2 Hours

Directions to Candidates

Answer **all** questions in **all** sections in the space provided.

Non-programmable calculators are allowed.

Show all the working for mathematical calculations.

Coloured pencils and/or markers may be used for sketches.

Section A: Answer all questions. This Section carries 30 marks.

- 1) A shop owner is designing a wooden stand for her showcase in order to display fashion accessories. Identify **ONE** need, which is stated in the above-mentioned scenario.

_____ (1)

- 2) Match the following typical material properties with the appropriate material name in the following table.

Typical Property	<i>Use arrows to match the typical property with the material.</i>	Material
Translucent		Aluminium
Lightweight		Stainless steel
Toughness		Acrylic

(3)

- 3) Describe what research tools one would use to collect data in the following cases and the stakeholder involved.

- a) Immediate public opinion is required about favourite clothing styles among young people:

Research tool: _____ (1/2)

Stakeholder involved: _____ (1/2)

- b) An opinion about a particular use of fibreglass in boats is required:

Research tool: _____ (1/2)

Stakeholder involved: _____ (1/2)

- 4) The wooden mobile device holder was designed to conveniently keep mobile phones upright. Study the product prototypes and in the space provided, write:

- a) **ONE** advantage;

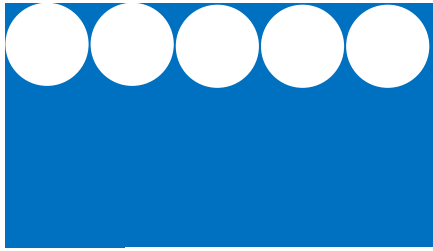
 _____ (1)



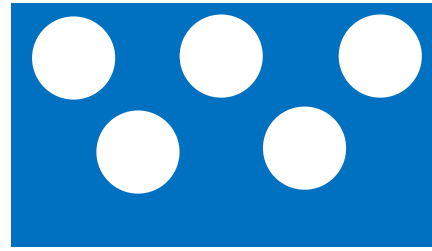
- b) **ONE** disadvantage.

 _____ (1)

5) Mary and Mario were asked to make five circular cuts from a plywood sheet for a D&T project. Their marked layouts are shown below.



Layout 1



Layout 2

a) Mention **ONE** environmental consequence of selecting Layout 2.

_____ (1)

b) Underline the power machines or tools that are appropriate to be used to cut the proposed circles. (1)

jigsaw power saw, vacuum former, circular hole-saw, hand saw, round file

6) 'This new ultra-light mobile phone, which was designed by a sports company, can automatically recharge itself when its user carries it while exercising.'

Identify **TWO** key product features of this mobile phone, in light of the above statement.

_____ (2)

7) Study carefully the following product information: "CMP16-01 is a plastic camping cutlery and plate set that includes 16 pieces, is made of hygienic PET plastic, is available in 2 different colours (CMP16-01-Blue and CMP16-01-Red) and cannot be washed in a dishwasher."

a) Complete the following data sheet, by filling the correct data in the appropriate cells: (3)

Product type	Product code	Material name	Colour	No. of pieces in 1 set
Camping set	CMP16-01-Blue			
Camping set			Red	

b) From the given information, identify **ONE** maintenance aspect of this product. _____ (1)

8) Match the following health and safety hazard signs to their meaning using:



Warning high voltage!



Safety goggles must be worn



No running permitted



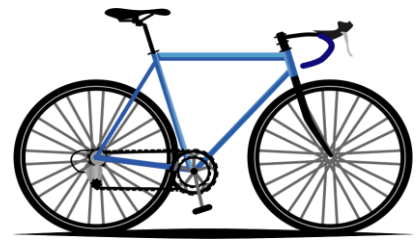
Safety gloves must be worn

(2)

9) Paul is planning to fabricate a steel bicycle using hollow section metal pipes, as shown in the diagram.

- a) What standard form of supply is Paul planning to use to make the bicycle frame?

_____ (1)



- b) The spokes of the bicycle wheel are also made of metal. Suggest a standard form of supply that can be used for the spokes.

_____ (1)

- c) Describe **ONE** mechanical property of the synthetic rubber used for the tyres of this bicycle:

_____ (1)

10) Complete the following health and safety steps to be followed while using a bench drill machine, to drill a sheet of tin metal.

Step 1: _____ the tin sheet using a g-clamp or machine vice.

Step 2: Wear safety _____ and use machine _____ to avoid any injury.

Step 3: Operate the machine safely, following its _____ booklet.

Step 4: _____ the machine and work-area after use.

($\frac{1}{2} \times 4 = 2$)

11) Fill in the blanks using the keywords provided below.

casting

decaling

galvanizing

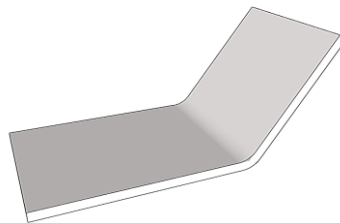
injection moulding

wasting

varnishing

The process of _____ is used to manufacture intricate plastic components that are in very high demand. This process may be followed by a finishing process such as _____, which is used to add unique aesthetic graphics to the manufactured component. (1)

12) The diagram shows a manufactured plastic part, which has been bent longitudinally (in a straight-line) using heat.



a) Mention a suitable manufacturing process used to fabricate this part in small quantities.

_____ (1)

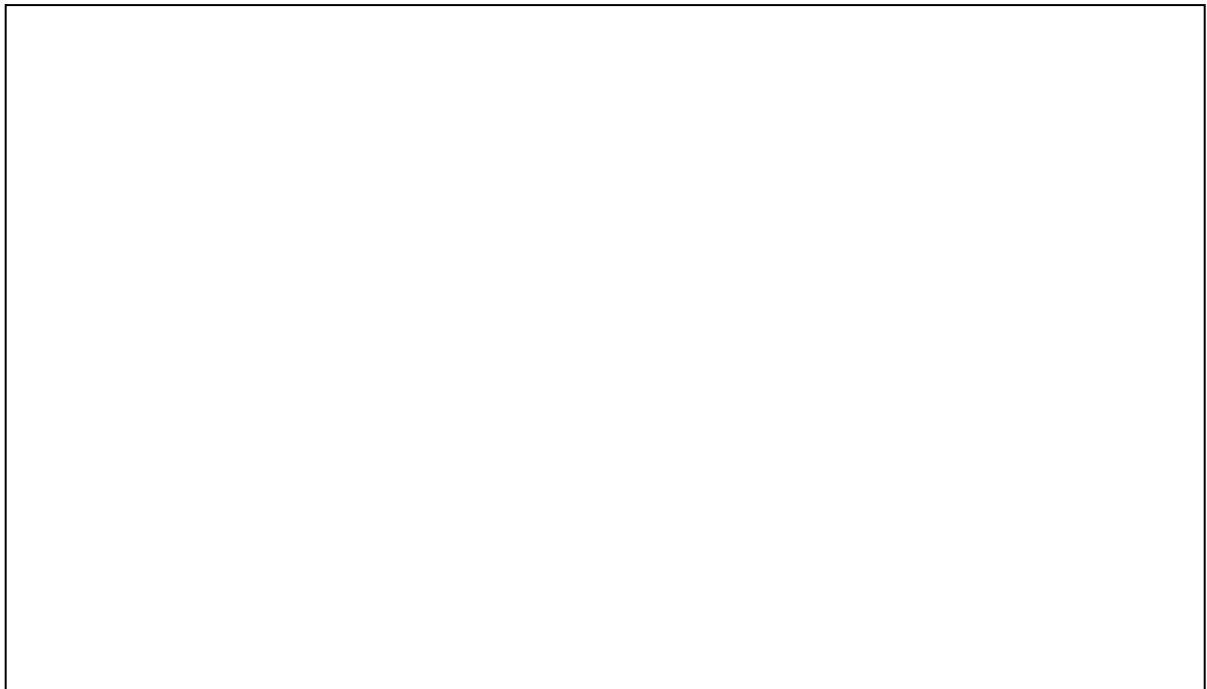
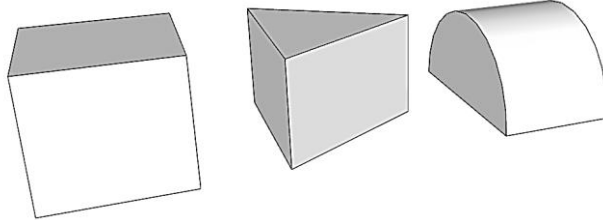
b) Describe what is meant by batch production.

_____ (1)

c) What important preparatory step is always required in order to manufacture such parts accurately every time?

_____ (1)

- 13) A Play school needs to see how to set up its playing area with different foam blocks that kids can climb and play with. Draw a 3D freehand sketch of a compound form made up of all the **THREE** forms shown below, somehow touching each other. These can be positioned in any quantity, orientation or combination. The sketch should be finished with a bold outline of the compound shape. (4)



- 14) The component shown below was produced using an FDM 3D printer.

- a) Underline which type of manufacturing technology best describes how this component was produced: (1)

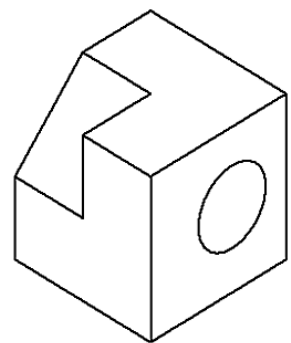
(freehand sketching, digital manufacturing, traditional manufacturing)

- b) Fill in the blanks from the following word bank:

blocks

CAD software

filament

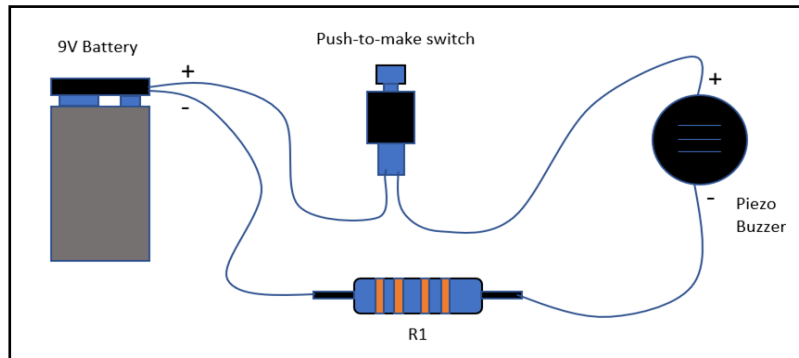


The process to achieve the component above includes the use of 3D _____
to design the part and then the 3D printer builds it layer by layer using a thermoplastic
_____.

(2)

- 15) Translate the given circuit from a layout to a schematic diagram showing polarity.

Layout diagram



Schematic diagram



(1)

Section B: Answer all questions. This section carries 65 marks.

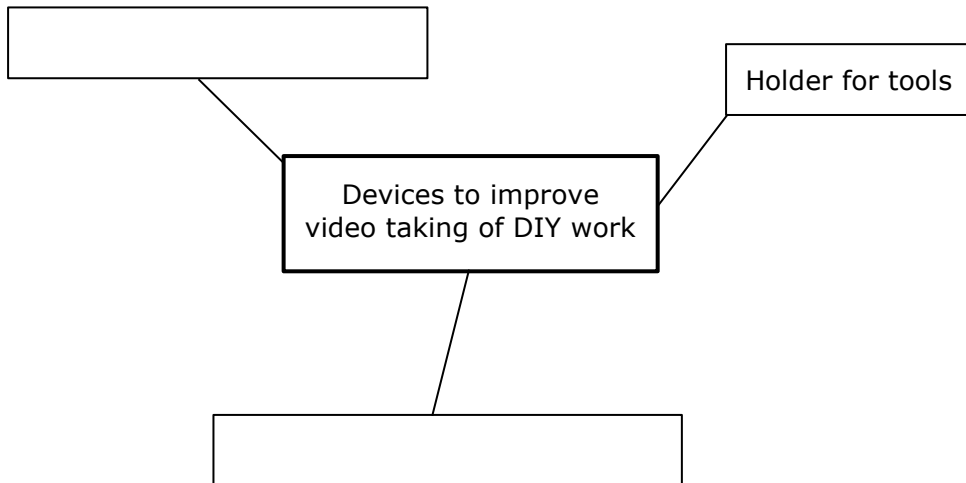
Read carefully the following theme.

Theme: Digital Entertainment through DIY

1) Read carefully the following situation to answer this question:

A gadget production company needs design services to help them create products supporting video taking. Sharing videos about different interests is a very popular hobby and also a means of entertainment nowadays. The gadget company explained that they need a product that helps a 'maker' in producing popular 'how-to' videos about building DIY electronic gadgets. They identified that these makers usually need to use both hands to work on DIY projects and so struggle to film their work at the same time. Similarly, they need good lighting and an appealing, organised workspace.

a) Referring to the situation, complete the following web diagram. One example has been already provided. (2)



b) Describe the role of the mentioned stakeholders, by referring to the given situation.

i) The gadget company is the _____ . (1)

ii) People buying these gadgets are called the target _____ . (1)

iii) A possible contributor could be an expert in _____ . (1)

c) The following persons were interviewed to ask for more information about the needs in this project. Write **ONE** specification, by completing the sentence, based on information gathered from each of the responses below:

i) Nick is a DIY maker and mentioned that adjustable products are very helpful.

The device needs _____ . (1)

ii) George, a gadget shop salesperson, said that gadgets need to be made with quality materials and be durable.

The device needs _____ . (1)

2) Complete a suitable and marketable Initial Design Brief referring to the explored situation in question 1, in order to guide further design work of a product that satisfies this brief. The answer should also include needs and opportunities.

Design and make a device that facilitates taking videos _____
_____. The device must be easy to use and

_____ . (2)

3) Research is an important part of product development.

a) The following quote was found in a publication called 'Film your way to Success', by George Rowe which was published in 2017. Reference this quote appropriately:

"The most important tool for video making is good planning."

_____ (1)

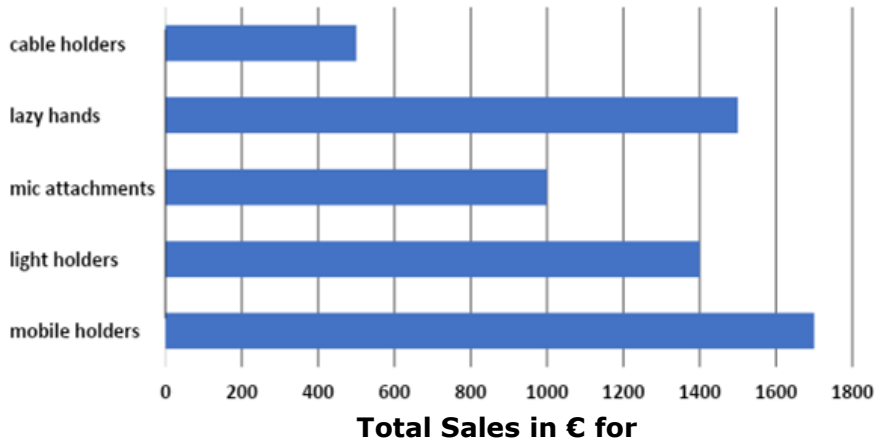
b) Consider the hands-free mechanism showed in the diagram. Write **TWO** annotations referring to useful features of this product, on the diagram itself.



<https://www.xmpow.com/products>

(2)

- 4) The infographic below shows last year's sales for a number of products that a particular popular brand sells. The entrepreneur would like to analyse the demand for video recording gadgets to research the sales of the related items.



- a) What type of infographic is being used to show the data?

_____ (1)

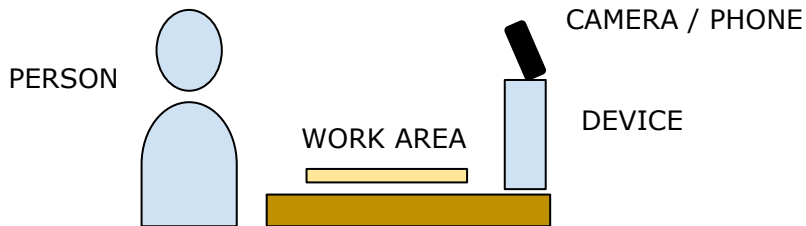
- b) From the infographic, identify the type of gadget that is making most sales from this brand.

_____ (1)

- c) Another aspect researched was product colour preferences. $\frac{1}{4}$ of all participants preferred white gadgets, while the remaining $\frac{3}{4}$ preferred black coloured items. Draw a different type of infographic, which shows this information visually. Your answer should include labelling and shading to the main items listed. (3)

- 5) Consider this design brief in order to design a new device. The information discussed in questions 1-4 may help you answer this design question as general information only.

Design Brief: Design and make a device which can hold a camera/mobile phone on a desk at a height of 30 cm and can also hold some basic items needed for a craft DIY activity of your choice. The phone needs to be fixed in one position, always looking at the work area and at the person doing the crafts as shown in the image below.



- a) From the Design Brief, identify **ONE** design need which is related to each of the following areas:

i) positioning of device;

_____ (1)

ii) the main use of the device;

_____ (1)

iii) a secondary use of the device.

_____ (1)

- b) Referring to the situation and the specifications, draw **TWO** design ideas in the space provided, including annotations, and any design details required. Label your ideas as Idea 1 and Idea 2. (4 x 2 = 8)

A large, empty rectangular box with a thin black border, occupying most of the page. It is intended for students to draw their design ideas.

Use this space for Design Idea 1 and Design Idea 2

- c) With reference to the two ideas designed, write **ONE** advantage for your preferred idea and **ONE** disadvantage for the least preferred idea. Your answer should clearly describe which features and ideas are being referred to.

Idea _____:

Advantage of preferred idea: _____
_____ (2)

Idea _____:

Disadvantage of least-preferred idea: _____
_____ (2)

- 6) The preferred design idea from the previous question was chosen from the project client as the chosen idea for this project. This idea will be marketed to a range of creative and young customers.

- a) Suggest **ONE** effect of this chosen idea on the environment.

_____ (1)

- b) Underline which of the following suggestions may **not** lead to marketing your idea better: (1)

- i) Adding attractive packaging.
- ii) Branding the product using attractive names and graphics.
- iii) Adding materials that are more expensive.

- c) Your client mentioned that in the future, they are considering adding a new emergent technology function to this product. Associate **ONE** emergent technology example with this product.

_____ (2)

- 7) State which of the tests given below is appropriate for testing the following claims.

Test A: Inviting different people to try out the product themselves.

Test B: Checking the durability of products in a lab.

Test C: Ask one company employee's personal opinion.

Test D: Asking different people their preferred colours, designs, etc.

- i) Claim: Everyone prefers black coloured devices. Test _____ (1)

- ii) Claim: Elderly will not be able to use this object, but kids will. Test _____ (1)

- iii) Claim: The hinge is unbreakable. Test _____ (1)

- 8) One useful feature to help during video filming is a count-down timer. This can be achieved using a microcontroller circuit. A microcontroller circuit is shown, Figure 1, that will blink a red light for 5 seconds, then a green light will light-up, and recording will start.

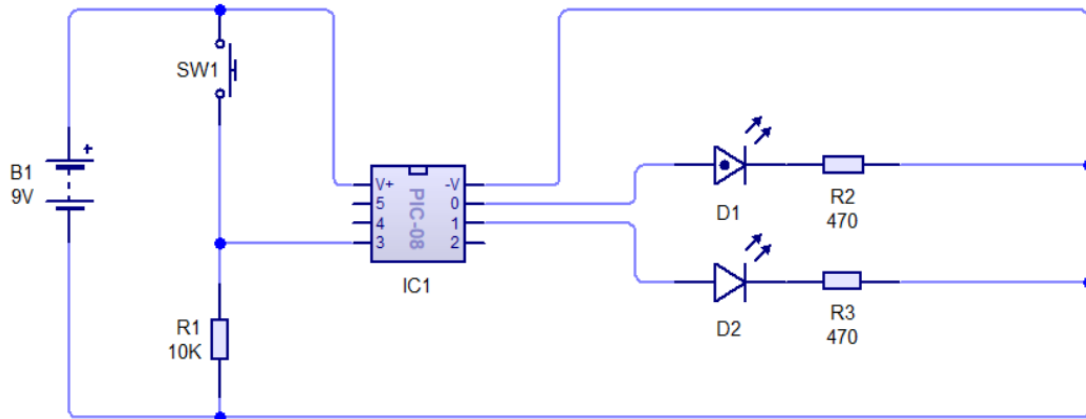


Figure 1

- a) Component _____ will switch on the circuit timing. (1)
- b) In the following sentences, underline the correct answer:
- i) Figure 1 shows a (model circuit, a schematic diagram, a flow chart). (1)
- ii) IC1 is a (resistor, microcontroller IC, light emitting diode). (1)
- iii) D1 is a component that gives out a blinking red light called a flashing (LTT, LED, DED). (1)
- c) When the circuit shown in Figure 1 will be triggered (switched on), the microcontroller will automatically make the red light blink for 5 seconds and then the green light goes on. List **ONE** general advantage of using a microcontroller circuit.

_____ (1)

- d) The following diagram shows how different Inputs, Processes and Outputs will work together in this system. (3)



Components: _____ IC1 _____

- i) Suggest **ONE** component under **each** system type. One example has been given. (2)
- ii) State the type of diagram.

_____ (1)

- 9) The function of the circuit shown in Figure 1 is also shown in the following flowchart, Figure 2. The pins of 8 pin IC1 are shown in Figure 3, below.

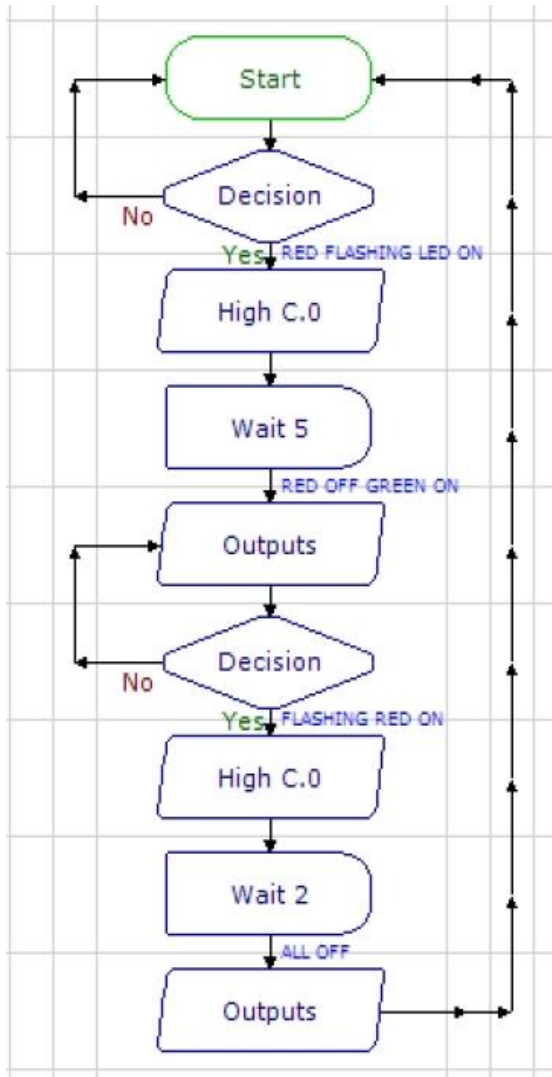


Figure 2

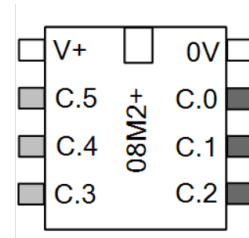


Figure 3

In Figure 2 the following inputs and outputs are used:

Pin	Label	Component
C.3	3	SW1
C.0	0	D1
C.1	1	D2

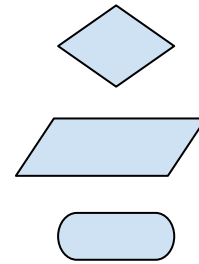
a) Match the following flow chart symbols to their correct meaning.

(3)

Input/output block

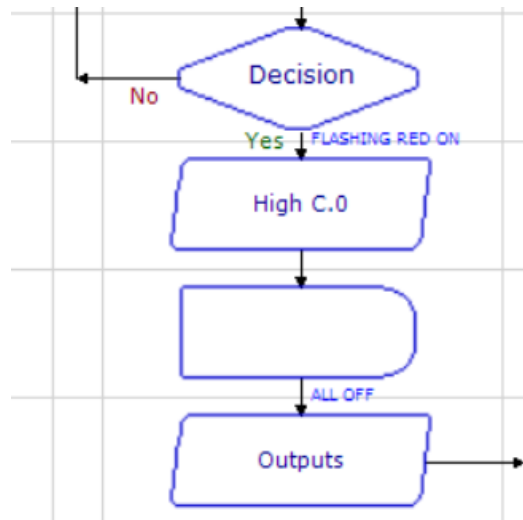
Terminal block

Decision block



b) Part of the flowchart in Figure 2 is shown again below. When the user presses again SW1, the red light flashes again for some time until both lights turn off.

i) Write the command that should be used to make C.0 remain lit for 2 seconds. Write your answer on the diagram below. (1)



ii) What is the use of the command 'High C.O'? Select by underlining the correct answer: (2)

- Red light D1 will switch ON.
- Green light D2 will move up.
- Both lights go on.

10) A case will be created to contain the circuit shown in Figure 1 and make the device more usable. Figure 4 shows an acrylic plastic case including slots for SW1, L1 RED and L2 GREEN.

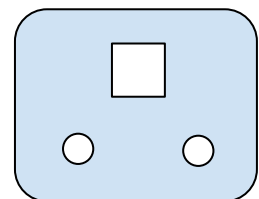


Figure 4

- a) Using a red pencil, highlight **ONE** feature of the case that can be cut using a driller. (1)
- b) Using a green pencil, highlight **ONE** feature that can be cut using a CAM laser cutting process, but **cannot** be cut with a driller. (1)
- c) Underline the correct PPE that is required to protect the eyes during drilling. (1)

heat gloves, safety glasses, surgical mask

11) The following diagram, Figure 5, shows two gears working together. One Gear has 48 teeth while the other has half this amount.

- a) Label **both** gears with the correct number of teeth: (2)

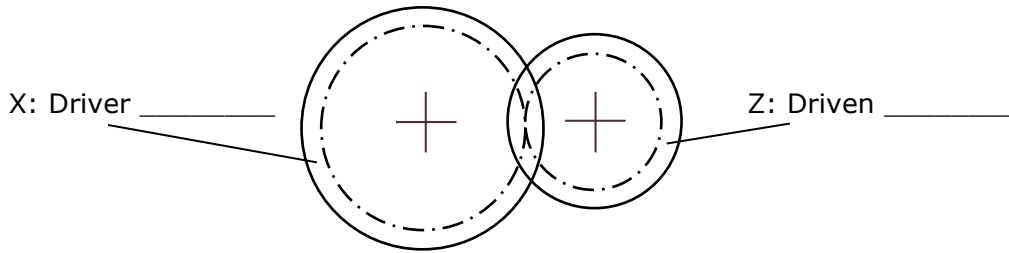


Figure 5

- b) Complete the gear mechanism by drawing the direction of rotation of the driver gear in clockwise, and that of the driven gear in its correct resulting direction. Draw the answer on Figure 5. (2)
- c) Underline which of the following ratios best represents the gear ratio of the gear system shown in Figure 5. (1)

1 : 2, 2 : 1, 1 : 48

12) The controller will be placed in a cardboard package.

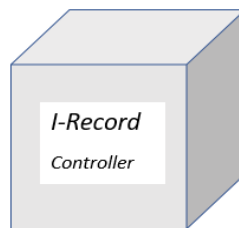
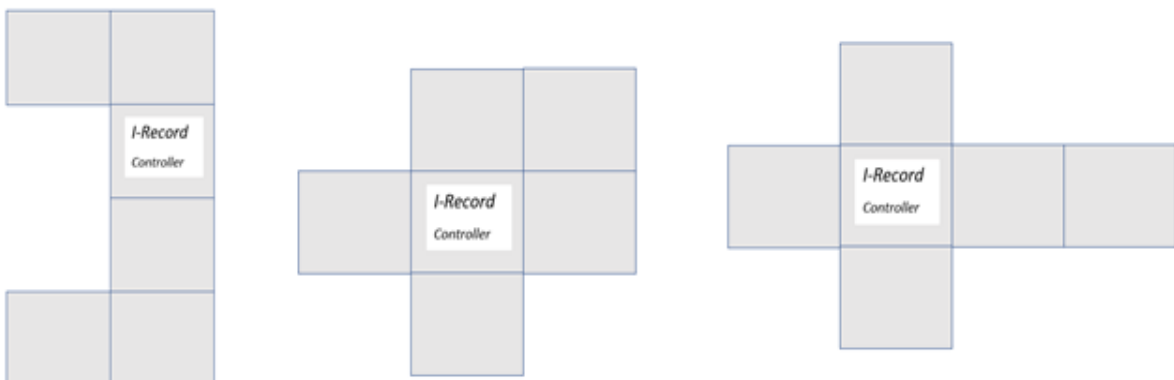
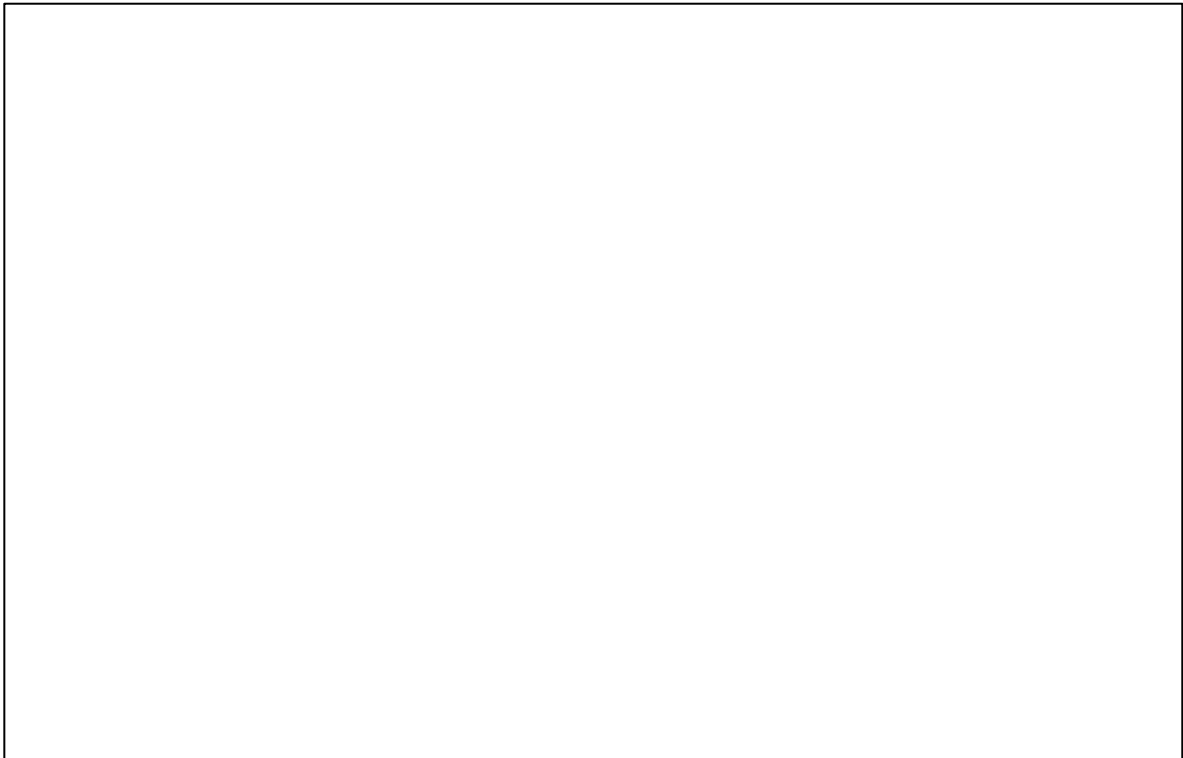
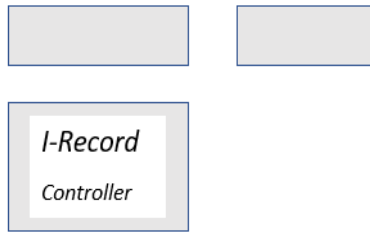


Figure 6

- a) Identify which of the following is the correct surface development that is needed to produce the packaging shown in Figure 6 by circling it using a pencil: (1)



- b) The final form of the packaging was changed to a cuboid. Based on the following orthographic sketch, draw a freehand conceptual 3D sketch of the cuboid in the space provided below, with similar proportions.



(2)

- c) Render your sketch to show light and shade using a pencil.

(1)

END OF PAPER

Specimen Assessments: Controlled Paper MQF 1-2 – Marking Scheme

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARDL-Università
ta' Malta**SECONDARY EDUCATION CERTIFICATE LEVEL
MARKING SCHEME FOR SAMPLE CONTROLLED PAPER**


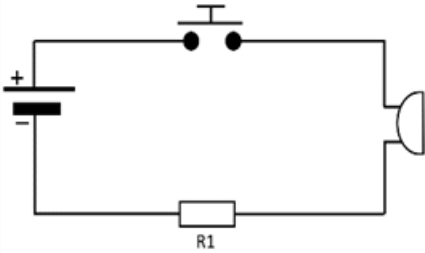
SUBJECT: Design and Technology

PAPER: Level 1-2




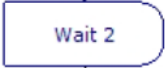
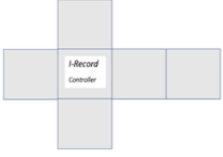
DATE:

TIME: 2 Hours

Section A		Marks	Comments										
1)		1	Accept other correct relevant answers.										
2)	<table border="1"> <thead> <tr> <th>Typical Property</th> <th>The use of arrows to match the typical property with the material is expected.</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>Translucent</td> <td rowspan="3"> </td> <td>Aluminium</td> </tr> <tr> <td>Lightweight</td> <td>Stainless steel</td> </tr> <tr> <td>Toughness</td> <td>Acrylic</td> </tr> </tbody> </table>	Typical Property	The use of arrows to match the typical property with the material is expected.	Material	Translucent		Aluminium	Lightweight	Stainless steel	Toughness	Acrylic	3	
Typical Property	The use of arrows to match the typical property with the material is expected.	Material											
Translucent		Aluminium											
Lightweight		Stainless steel											
Toughness		Acrylic											
3)	a)	1/2 1/2											
	b)	1/2 1/2											
4)	a)	1											
	b)	1											
5)	a)	1											
	b)	1	1/2 mark each										
6)		2	1 mark each										
7)	a)	3	Deduct 1/2 mark for each incorrect answer.										
	b)	1											

8)			2	
9)	a)	Tube	1	Accept pipe.
	b)	Rod	1	Accept round bar.
	c)	Rubber is elastic, soft and flexible.	1	Accept any answer that refers to plasticity, elasticity or durability.
10)		Step 1: hold, secure, fasten. Step 2: goggles or gloves. Step 3: user manual. Step 4: clear, tidy, clean.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
11)		Injection moulding; decaling	1	$\frac{1}{2}$ mark each
12)	a)	Thermoforming/ in-line hot wire bending.	1	Accept 'line bender'
	b)	Batch production means making a limited number of similar parts.	1	
	c)	jig, marking / measuring / setting machine guide	1	
13)		Sketch the 3 forms using appropriate freehand 3D sketching in a suitable configuration accounting for any overlaps. Outline the final compound form appropriately and clarity.	3	Accept configurations that have different orientations and quantities.
			1	
14)	a)	Digital manufacturing.	1	
	b)	CAD Software. Filament.	1 1	
15)			1	
Total:			35	

Section B			Marks	Comments
1)	a)	Accept answers that refer to devices for good lighting, devices that help to hold a video taking device. Accept also other means of organising the work done like labelled items, interesting appealing items on display.	2	
	b)	i) client ii) target market or target customers iii) accept experts in: DIY projects, filming equipment or similar appropriate roles.	1 1 1	
	c)	to be adjustable to be made of quality materials/ be durable	1 1	
2)		Design and make a device that facilitates taking videos of DIY projects . The device must be easy to use and adjustable for use with various devices and appealing to the target users .	2	Accept other suitable relevant versions.
3)	a)	Rowe, G. (2017), Film your way to Success	1	
	b)	Accept annotations referring to features like adjustability, locking, docking, holding, the base as a stable connector, and similar features.	2	
4)	a)	Bar chart	1	
	b)	Mobile holders	1	
	c)	Award: 2 marks for the appropriate infographic. E.g. pie chart, single bar chart. 1 mark for shading, presentation and clarity.	3	
5)	a)	i) Award 1 mark for reference to: height of camera, placement on desk, filming angle, or similar correct variations. ii) Award 1 marks for reference to: filming the activity or similar correct variations. iii) Award 1 mark for reference to: holding/organizing other items or similar correct variations.	3	
	b)	Award marks for each idea as follows: - 1 mark for idea suitability - 1 mark for sketch communication and colour - 1 mark for product / device function - 1 mark for annotations / dimensions	8	4 marks for each idea
	c)	Award 2 marks for a suitable advantage and reference to related features. Award 2 marks for a suitable disadvantage and reference to relevant shortcomings.	4	
6)	a)	Award 1 mark for answers referring to relevant environmental considerations.	1	
	b)	iii	1	
	c)	Award: 1 mark for mentioning a suitable emergent technology example (such as VR and Bluetooth)	2	

		1 mark for a brief mention of its application.		
7)		i) D; ii) A; iii) B	3	
8)	a)	SW1	1	
	b)	i) schematic diagram; ii) microcontroller IC; iii) LED	3	
	c)	Award 1 mark for reference to any of the following: Timing is programmed without needing more component; require less components; they are easy to programm; changing timing easily.	1	
	d)	i) SW1; D1 or D2 ii) block system diagram	2 1	
9)	a)	<p>Input/output block → </p> <p>Terminal block → </p> <p>Decision block → </p>	3	
	b)	<p>i) </p> <p>ii) Red light D1 will switch ON.</p>	1 2	
10)	a)	Accept any of the small inner circles.	1	
	b)	Accept the outer profile or the inner square cut only.	1	
	c)	Safety glasses.	1	
11)	a)	X: 48 teeth; Z: 24 teeth	2	
	b)	Driver – Clockwise rotation; Driven – Anti clockwise rotation.	2	
	c)	1 : 2	1	
12)	a)		1	
	b)	Award: 1 mark for suitable 3D sketch technique 1 mark for suitable proportion	2	
	c)	Award 1 mark for suitable shading technique	1	
Total:			65	

Specimen Assessments: Controlled Paper MQF 2-3



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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER**

SUBJECT: Design and Technology
PAPER: Level 2 – 3
DATE:
TIME: 2 Hours

Directions to Candidates

Answer **all** questions in **all** sections in the space provided.

Non-programmable calculators are allowed.

Show all the working for mathematical calculations.

Coloured pencils and/or markers may be used for sketches.

Useful Information

Formula:

$$\text{Velocity ratio for gears} = \frac{\text{Driver (Teeth / d)}}{\text{Driven (Teeth / d)}}$$

Section A: Answer all questions. This Section carries 30 marks.

- 1) A shop owner is designing a stand for her showcase. Identify **ONE** further need, which is **not** directly stated in the above-mentioned scenario.

_____ (1)

- 1) Complete the missing data from the following material data sheet.

Name	Type	Class	Origin	Processing
Wool			Organic	Fibres > _____ >S.F.
	Graphic	Boards	Mixed	

(2)

- 2) Describe what research tools one would use to collect data in the following cases and the stakeholder involved.

- a) Immediate public opinion is required about favourite clothing styles among young people:

Research tool: _____ (1/2)

Stakeholder involved: _____ (1/2)

- b) An opinion about a particular use of fibreglass in boats is required:

Research tool: _____ (1/2)

Stakeholder involved: _____ (1/2)

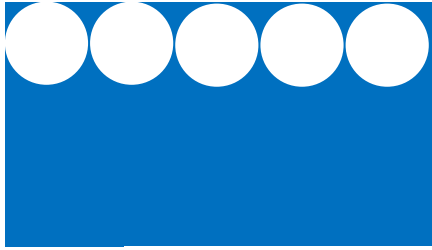
- 3) The wooden mobile phone holder shown in the figure was designed to conveniently keep mobile phones upright and be made of a resistant material.

Write a product evaluation for this holder considering the holder's stability and environmental sustainability.

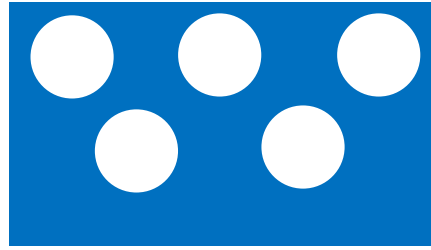


_____ (2)

- 4) Mary and Mario were asked to make five circular cuts from an MDF sheet for a D&T project. Their marked layouts are shown below. Layout 2 was selected.



Layout 1



Layout 2

- a) Discuss this design decision in terms environmental values.

(1)

- b) Suggest a power machine or tool that could be used to cut the proposed circles.

(1)

- 5) 'This new ultra-light mobile phone can automatically recharge itself when its user carries it while exercising.'

Explain **TWO** marketability features of this product, in light of the above statement.

(2)

- 6) A student has designed a plastic camping cutlery and plate set and needs to document its product use and maintenance recommendations.

- a) Describe **ONE** product use recommendation that highlights safety for users.

(1)

- b) Describe **ONE** product maintenance measure that users should follow.

(1)

7) Label the following health and safety hazard signs.



_____ (1/2)



_____ (1/2)

8) Describe the following material properties in relation to the given material.

a) Thermal Conductivity of aluminium: _____
_____ (1)

b) Toughness of nylon: _____
_____ (1)

c) Opacity of paint: _____
_____ (1)

9) Paul is planning to fabricate a steel bicycle as shown in the picture.



a) Suggest a suitable standard form of material that should be used to fabricate the frame of the bicycle.
_____ (1)

b) Give **ONE** reason for your choice.
_____ (1)

10) Explain **ONE** health and safety measure to be followed while using a bench drill machine to drill a sheet of tin metal.

_____ (1)

11) Fill in the blanks using the keywords provided below.

casting decaling galvanizing
injection moulding wasting varnishing

The process of _____ is used to manufacture intricate plastic components that are in very high demand. This process may be followed by a finishing process such as _____, which is used to add unique aesthetic graphics to the manufactured component. (2)

12) Look carefully at this piece of material, which has a constant cross-sectional profile and is 2 m in length.



a) Suggest a suitable manufacturing process used to fabricate, in large quantities, the plastic component shown.

_____ (1)

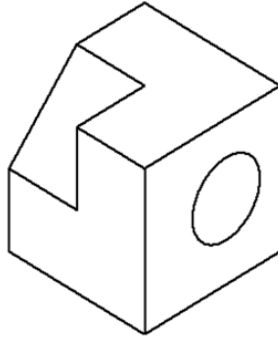
b) Give **ONE** reason to justify the choice of manufacturing process.

_____ (1)

13) A logo is needed for a company called 'STAR' that sells hand tools. Their brief suggests a design that is related to tools and reminds customers of the company name.

Design this logo by drawing a working sketch. (2)

14) Refer to the following figure.



a) Suggest a specific device/process that may be used to obtain a rapid prototype of this component using digital manufacturing. (1)

_____ (1)

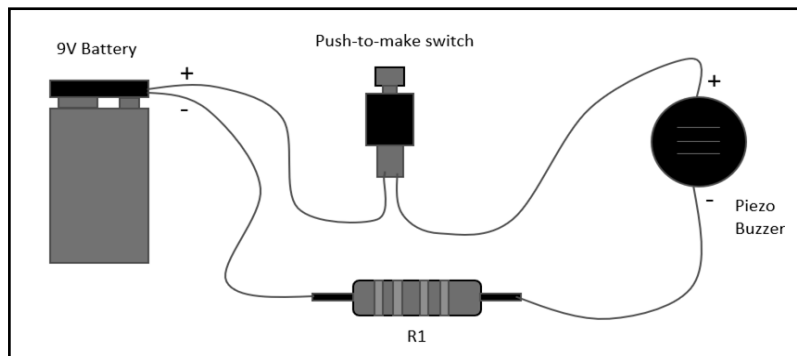
b) Give **ONE** advantage and **ONE** limitation of digital manufacturing in comparison to traditional manufacturing processes. (1)

Advantage: _____ (1)

Limitation: _____ (1)

15) The circuit shown in the Layout diagram below needs to be drawn as a Schematic diagram. Translate the given circuit from a layout to a schematic diagram showing polarity. (1)

Layout diagram



Schematic diagram



(Total: 30 marks)

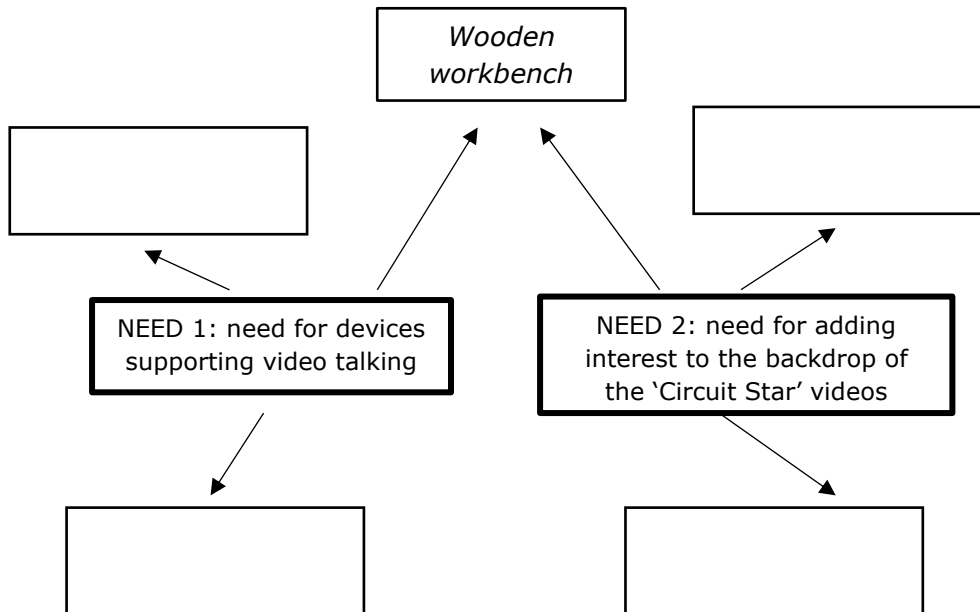
Section B: Answer all questions. This section carries 70 marks.

READ the following theme and situation carefully before answering this paper.

Theme: Digital Entertainment through DIY

Situation: Social media channels, where individuals share videos online of their DIY project work have become a mainstream form of entertainment. Many 'makers' record videos from their own home or garage using basic recording equipment and lights, like mobile phone cameras and self-built lighting rigs. An important success factor for these videos is also the way a room is set up to provide an interesting backdrop (room setup) to the work being shown. The popularity of this trend suggests a growing market for devices and products that enable individuals to start this new activity. A gadget production company needs design help to create such products.

- 1) Your client introduced you to Nick, who is a maker, producing popular 'how-to' videos about building DIY electronic gadgets for his channel called 'Circuit Star'. During filming, he uses both hands to work on his projects.
- a) Referring to the situation in this paper, complete the following web diagram, which may guide to explore the needs outlined. One example that relates to the 2 identified needs (Need 1 and 2) has been already provided. (2)



- b) Nick is self-employed in this venture, but the client wants products that appeal to people like Nick. Complete the following sentences, which describe the role of the mentioned stakeholders, by referring to the given situation.
- i) The gadget production company is the _____ . (1/2)
- ii) A possible contributor could be an expert in _____ . (1/2)

- c) Nick has experience in this area so he may be also interviewed as an area expert, while others that may buy product can be called the target market.

Explain **ONE** need of the following stakeholders, in this situation.

- i) Nick as a target customer;

_____ (1)

- ii) shop owners / retailers selling such items.

_____ (1)

- d) Focus your attention to NEED 1, mentioned in part (a) above, only.

Complete a suitable and marketable Initial Design Brief in order to guide the project towards a product that satisfies these and the given market. Mention needs and opportunities.

Design and make a device that facilitates taking videos _____
 _____. The device must be easy to use and
 _____ (2)

(Total: 7 marks)

2)

- a) Research is an important part of product development. The following quote was found in a publication called 'Film your way to Success', by George Rowe which was published in 2017. "The most important tool for video making is good planning."

Reference this quote appropriately:

_____ (1)

- b) The following hands-free mechanism is being analysed to help looking into adjustable stands.

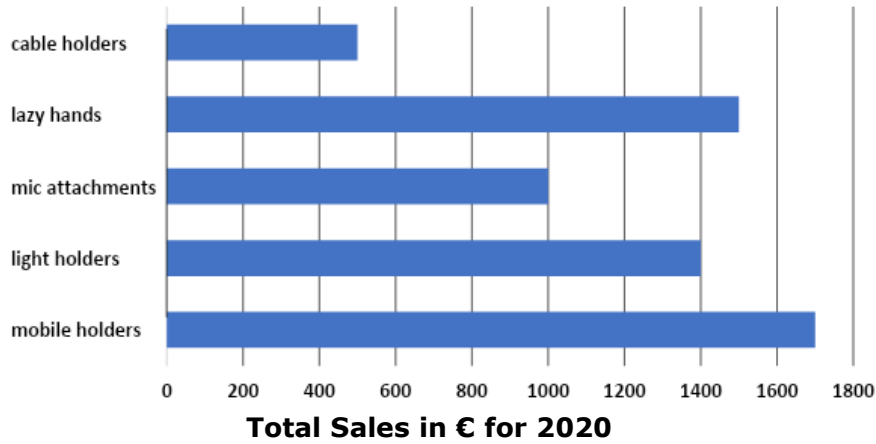
Write **TWO** annotations referring to manufacturing and usability of this product, on the diagram itself. (2)



<https://www.xmpow.com/pr>

(Total: 3 marks)

3) The table below shows last year’s sales for a number of products that a particular popular brand sells. The entrepreneur would like to analyse the demand for video recording gadgets to research the sales of the related items.



a) i) From the table above, identify the type of gadget that is making most sales from this brand.

_____ (1)

ii) Does the given data give enough information about what products are mostly needed by such users? Justify.

 _____ (2)

b) Describe a procedure to test the following hypotheses.

i) Most users dislike plastic products because these tend to break.

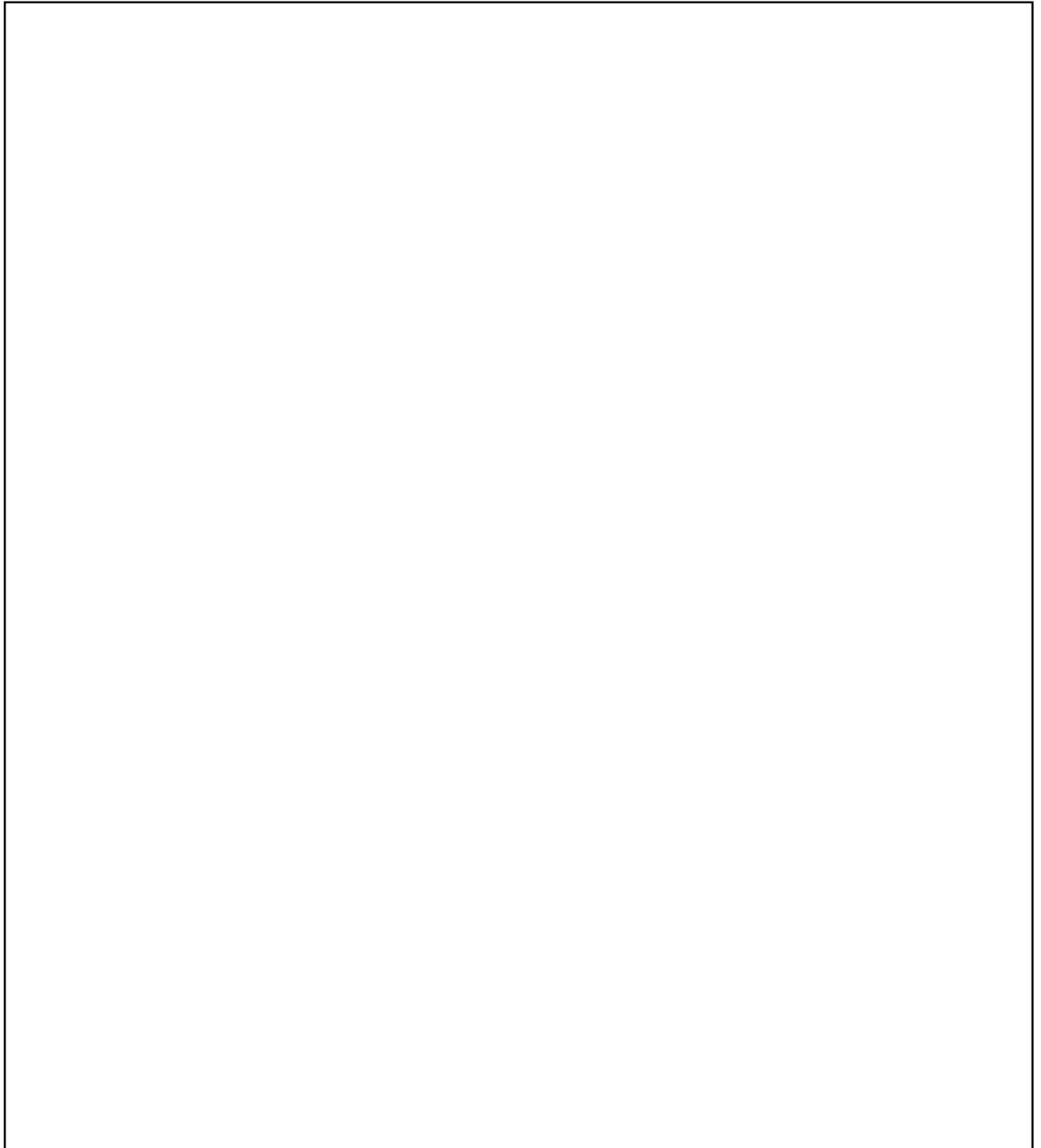
 _____ (2)

ii) The majority of general hardware stores sells these products.

 _____ (2)

(Total: 7 marks)

- 4) Below are two project specifications related to the situation presented in Section B.
Specification 1: *The stand must be freestanding, making it easy to take videos hands-free and be fully adjustable.*
Specification 2: *The product needs to be secure to hold a camera/mobile device onto it and safe to use in order to avoid accidents or injuries.*
- a) By referring to the situation, design brief, these specifications and other information covered in the previous questions, draw **ONE** design idea, including dimensions and annotations. Your design should be drawn in the space provided as Design Idea 1. (5)



Design Idea

b) Evaluate your idea based on the situation and the identified specifications through **ONE** advantage and **ONE** disadvantage.

(3)

c) Following your critical evaluation, suggest **ONE** further specification that would make this product more appealing to professionals in terms of quality and look.

(2)

d) Considering the new specification in part (4)(c) and the previous design and evaluation, draw a further idea showing a possible improvement which responds to the further specification which you added. Include annotations that highlight the improvements in this iteration. (3)

e) The design has developed to a point that a new, more developed design brief that highlights the new needs and opportunities explored, is needed. Write a developed design brief, in the space provided below.

(2)

(Total: 15 marks)

5) Design ideas need to be approved from the project stakeholders.

a) Suggest **ONE** effective way to communicate your product in a marketable way to relevant stakeholders.

(1)

b)

i) Mention **ONE** implication of Design and Technology considered when designing your idea.

(1)

ii) Justify its effect to your design idea being proposed.

(1)

c) Suggest **ONE** way in which your idea may be further improved referring to any emergent technology area, which could be relevant for future design iterations.

(2)

(Total: 5 marks)

- 6) One way to record videos that include someone showing how to make a DIY project is to have a device that moves the camera from side to side to also get moving shots. This may be achieved with a video taking 'dolly'. A video taking dolly will need to be programmed electronically to move the camera in different positions, remotely while filming. The camera attached to this dolly will be controlled with a wired controller but the dolly is required to move along or stop at two different positions and move gradually LEFT or RIGHT.

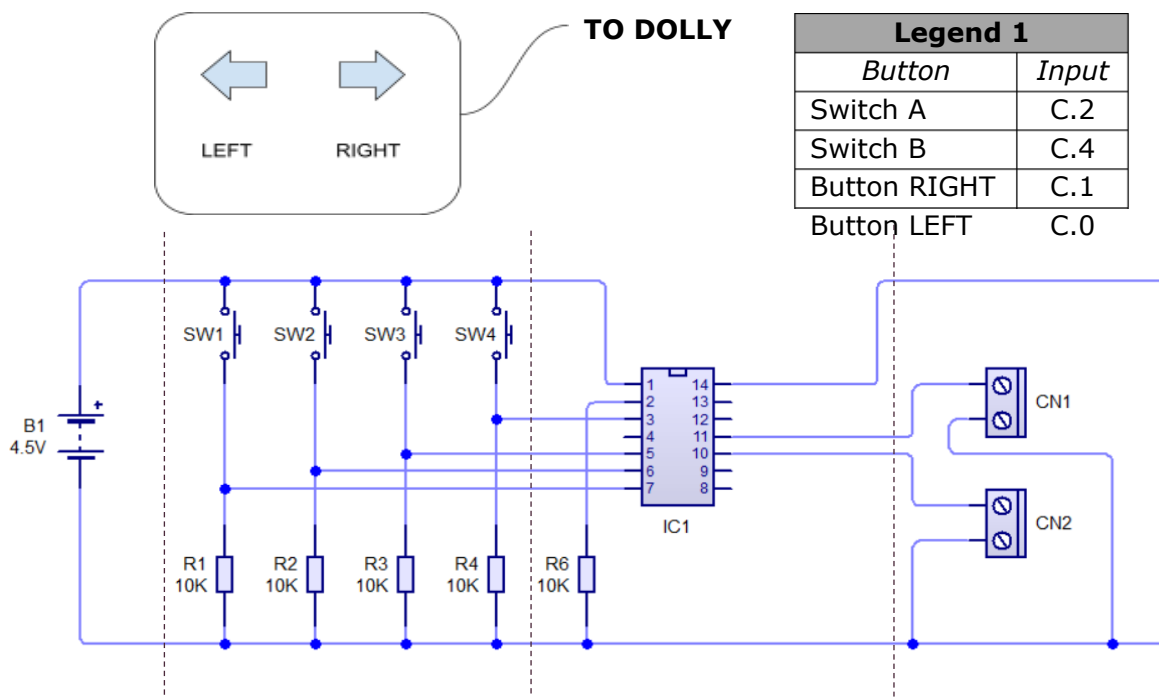
The following simple diagram shows the planned positions of the dolly.



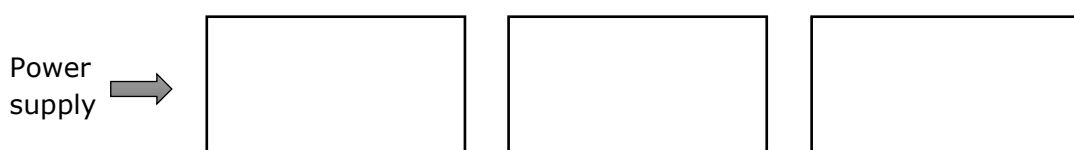
The dolly wired controller will be made of a hollow box as shown below with the following TWO inputs as listed in Legend 1.

The user will be able to move the dolly by pressing the LEFT or RIGHT buttons.

The circuit below shows an initial proposal for the circuit needed to be integrated with the mechanical device. CN1 and CN2 are used to connect the motor part of this circuit later on.



- a) Complete the block diagram highlighting the system designed above. Label each block with the appropriate system name and add arrows. Include **ONE** component from each system block using the component codes from the circuit above, in the spaces provided.



Components: _____ (3)

b) Referring to the circuit above, answer the following questions in short.

i) Suggest a specific type of component suitable for SW1, which will be used for the controller button: _____ (1)

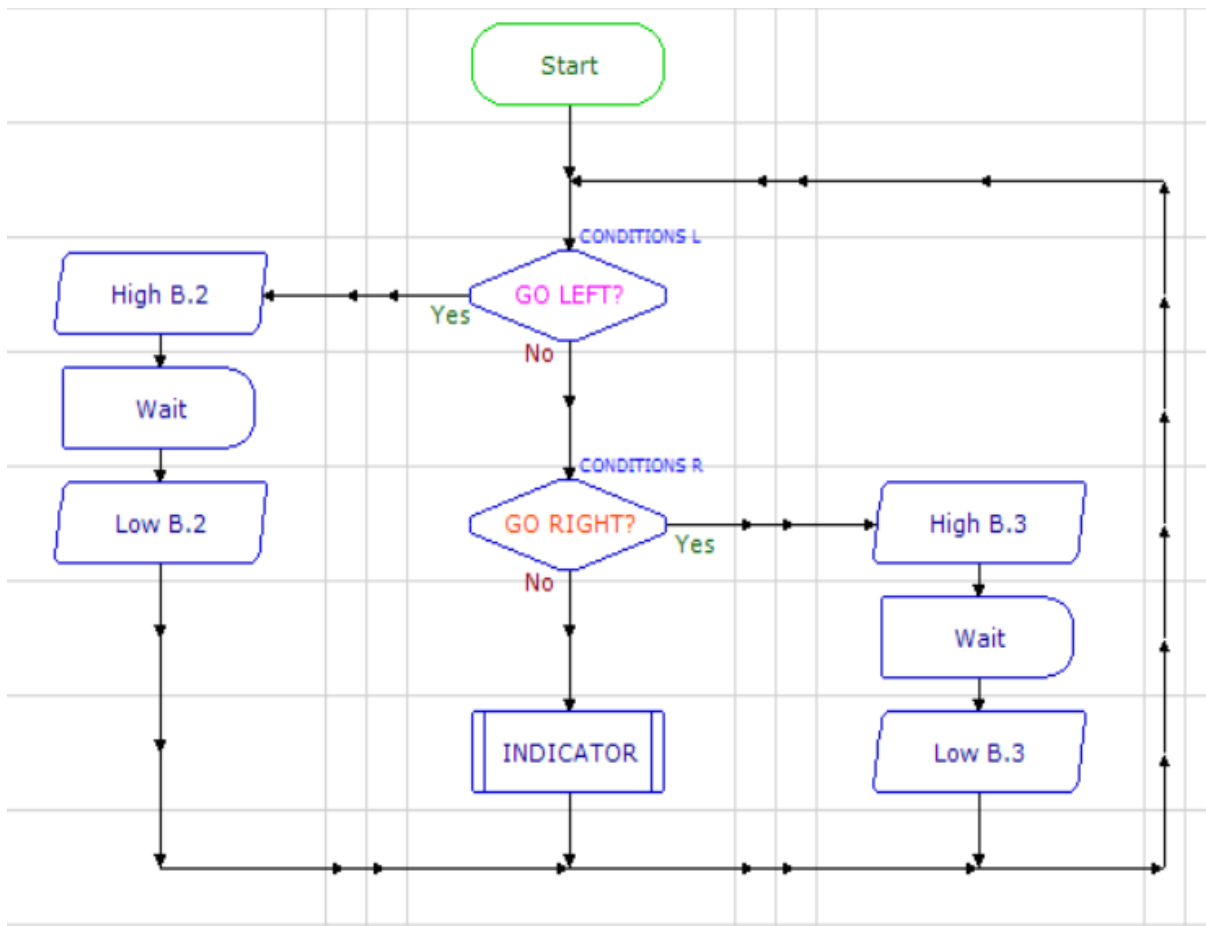
ii) A micro-switch shall be used for SW3, to be activated when the dolly arrives at position 'A' on the track. Give **ONE** reason why such a component was chosen.

_____ (1)

(Total: 5 marks)

7) This question relates also to the circuit in question 6. The following flow chart shows the PIC program planned for the dolly circuit system. Study carefully the circuit and this flowchart, to answer the following questions.

Note: The subroutine 'INDICATOR' is not relevant here, but is further described later on.



- a) Below is a screenshot from a PIC programming software highlighting the status (I – Input or O – Output) of the pins of a '14M2' PIC microcontroller IC, being used. Referring also to the flowchart above, complete the data sheet below by filling in the table provided. (2)

The screenshot shows two columns of pin status indicators. The left column shows pins C.4 to C.0, all marked with 'I' (Input). The right column shows pins B.5 to B.0, all marked with 'O' (Output). To the right is a table titled 'Data sheet' with the following content:

Action	Pin	Status
Press button L	C.0	I
Press button R	C.1	
Arrive at A	C.2	I
Arrive at B	C.4	
Motor turns CW (Left)	B.2	O
	B.3	

Data sheet

- b) Read the data sheet carefully shown above. To go LEFT the programme needs to have the following conditions:
- LEFT button is being pressed; (high)
 - RIGHT button is NOT being pressed; (low)
 - Dolly has NOT arrived on switch A low)

Complete the data sheet below in order to set up this function. Refer to the data sheet shown in part (a) and write your answers in the spaces indicated by the arrow using "1", "0" or "-" for each input terminal. (2)

The screenshot shows a legend at the top: a green box with '1' = On, a red box with '0' = Off, and a grey box with '-' = Ignore. Below is a 'Properties...' window with two columns of pin status indicators. The left column shows pins C.4 to C.0, and the right column shows pins B.5 to B.1. The status indicators are as follows:

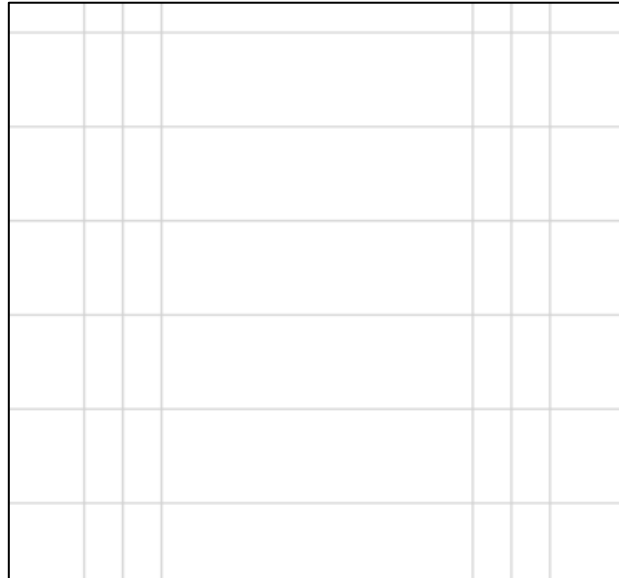
Pin	Status
C.4	-
C.3	-
C.2	0
C.1	
C.0	
B.5	-
B.4	-
B.3	-
B.2	-
B.1	-

An arrow points to the status indicator for pin C.1, which is currently empty.

- c) There is a need to add a green LED that flashes for 2 seconds high and 1 second low continuously. This subroutine is already part of the main programme in the flowchart as subroutine: 'INDICATOR'.

Design your programme as a flowchart in the grid provided below.

(3)



- d) Explain why this LED is switched off when the motor is working in any direction.

(2)

(Total: 9 marks)

- 8) A D.C. motor shall be used to move the dolly mechanism. The initial design includes gears connecting the motor to the dolly wheels. The driver and the driven gears, have the same number of teeth. The motor spins at 120 rpm.

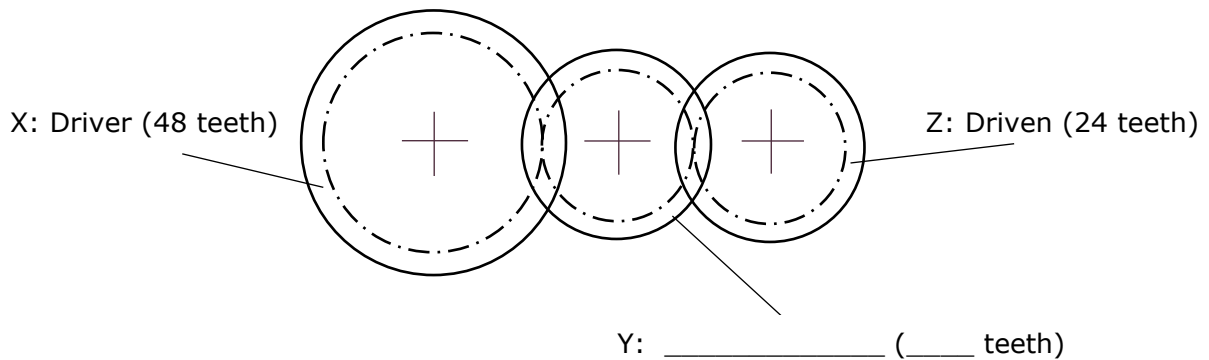
- a) Describe a modification to this gear train that would make the output motion more suitable for the slow movement of the camera.

(2)

- b) Following this modification the quality of the filming improved. Give **TWO** reasons why.

(2)

c) The diagram shown below shows a gear train that could be used for another different system.



i. Complete the labelling of gear Y in the diagram. (1)

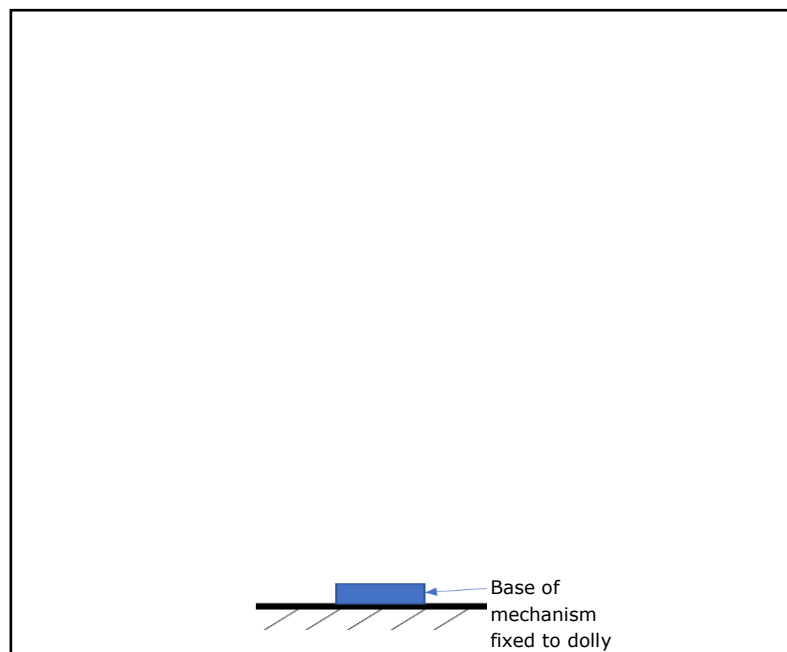
ii. Calculate the velocity ratio of the gear Y in relation to the driver.

(2)

(Total: 7 marks)

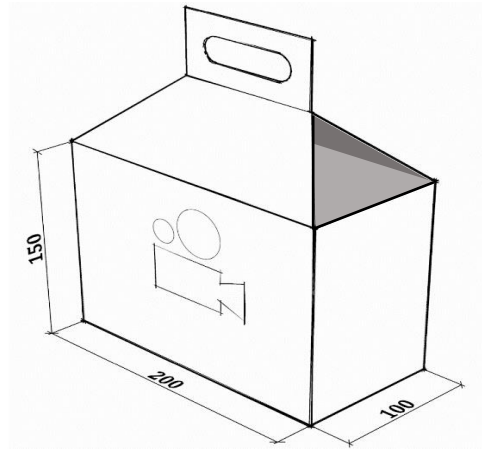
9) A mechanical system is also being considered to position the camera at different heights. The camera needs to stay horizontal and be stable while the dolly moves, while making it easy to adjust.

Design a mechanical system to obtain this function assuming the position your system attaches to the dolly is a fixed point and the camera holder is attached at the top end of your system. Your solution may be shown as an annotated 2D sketch. (4)



(Total: 4 marks)

10) An initial design of a portable cardboard container to store video camera accessories has been proposed on the right. The handle configuration is meant to make carrying around the items from one filming location to another more convenient.

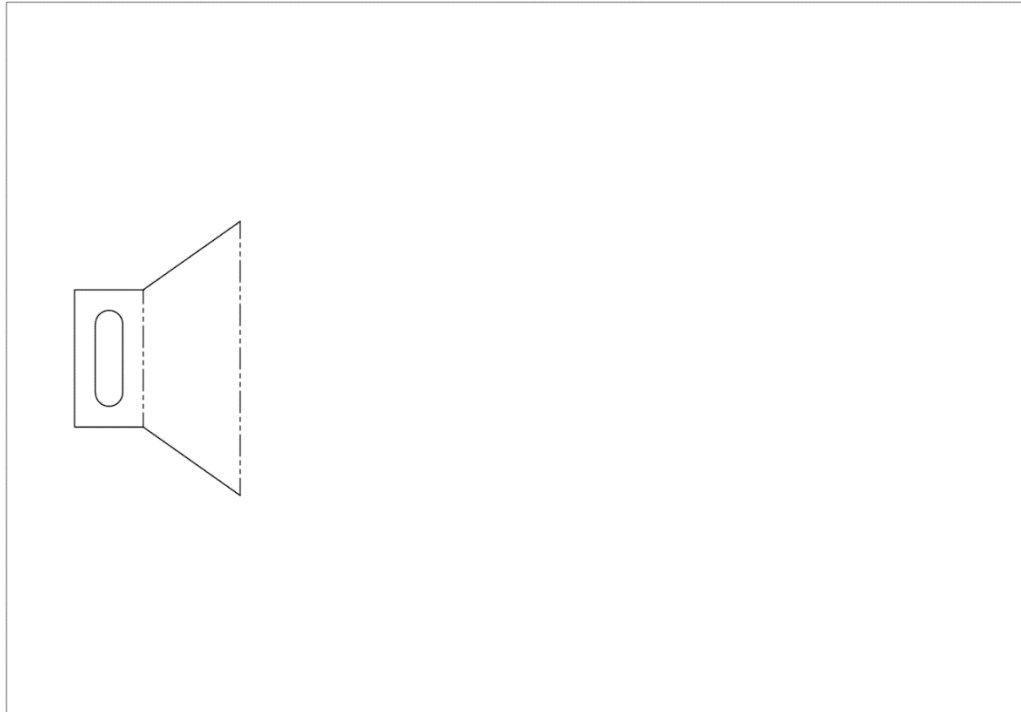


- a) In the space provided below, draw an estimated working sketch of the container, showing a PLAN and a FRONT ELEVATION with the shown video camera symbol centrally printed on it. Add adequate dimensions and label the handles. Use a suitably estimated scale to fit the views proportionally in the space provided.



(4)

- b) The container is to be developed from a single cardboard sheet. Starting from the given base, sketch an estimated, proportional surface DEVELOPMENT of the container, adding glue flaps where adequate. Mark **all** folding lines and outlines to be cut appropriately.



(3)

- c) Propose **ONE** material type and its standard form that can be placed inside and at the bottom of the cardboard container to keep the base flat.

Material type: _____ (1)

Standard Form: _____ (1)

(Total: 9 marks)

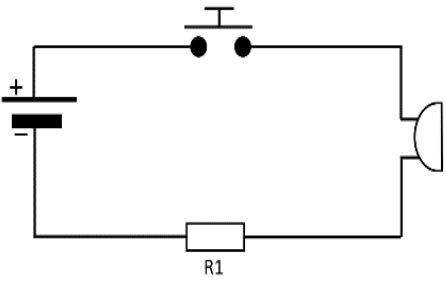
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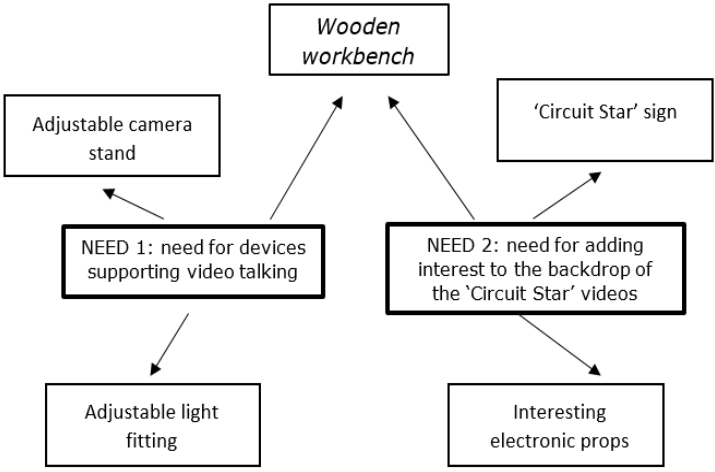
**SECONDARY EDUCATION CERTIFICATE LEVEL
MARKING SCHEME FOR SAMPLE CONTROLLED PAPER**

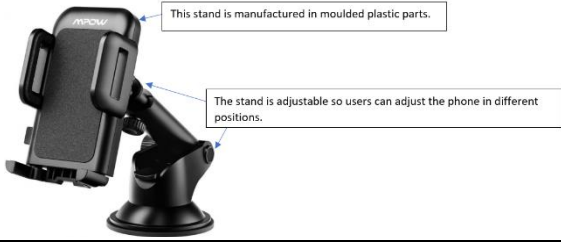
SUBJECT: Design and Technology
PAPER: Level 2-3
DATE:
TIME: 2 Hours

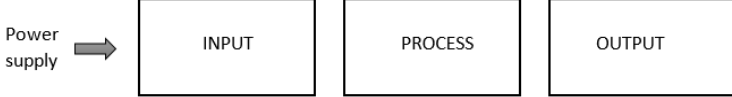
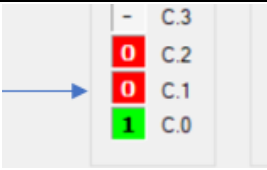
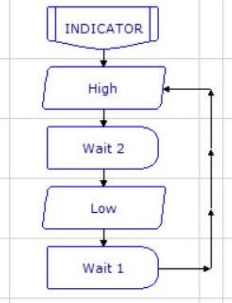
Section A					Marks	Comments														
1)		Needs may refer to size, items and theme.			1	Accept other correct relevant answers.														
2)		<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Class</th> <th>Origin</th> <th>Processing</th> </tr> </thead> <tbody> <tr> <td>Wool</td> <td>Textiles</td> <td>Protein-based-fibres</td> <td>Organic</td> <td>Fibres > yarn >S.F.</td> </tr> <tr> <td>Cardboard</td> <td>Graphic</td> <td>Boards</td> <td>Mixed</td> <td>Pulp > S.F.</td> </tr> </tbody> </table>	Name	Type	Class	Origin	Processing	Wool	Textiles	Protein-based-fibres	Organic	Fibres > yarn >S.F.	Cardboard	Graphic	Boards	Mixed	Pulp > S.F.		2	For the graphic material, accept other correct relevant answers.
Name	Type	Class	Origin	Processing																
Wool	Textiles	Protein-based-fibres	Organic	Fibres > yarn >S.F.																
Cardboard	Graphic	Boards	Mixed	Pulp > S.F.																
3)	a)	Tool: Online questionnaire/vox pop/survey Stakeholder: Teenagers			1/2															
	b)	Tool: Interview Stakeholder: Expert boat builder/fibreglass			1/2															
4)		Award 1 mark for reference to stability and 1 mark for reference to environmental sustainability.			2															
5)	a)	Award 1 mark for reference to reduction of waste.			1															
	b)	Band saw; Fret saw, hole cutter, laser cutter			1	Any one														
6)		Award 1 mark each for reference to ease of recharging and suitability for carrying while exercising.			2															
7)	a)	Award 1 mark for reference to precautions against heat, sharp edges and age appropriateness.			1	Accept other correct relevant answers.														
	b)	Award 1 mark for reference to cleaning procedures/materials.			1															
8)		Mandatory to wear safety heat gloves Caution high voltage			1/2 1/2															
9)	a)	The ability of aluminium to transfer thermal energy from one (hot) side to a cold side.			1															
	b)	The ability of nylon to absorb impact energy without breaking or shattering.			1	Accept answers related to the use of the material, e.g. a nylon mallet is capable of absorbing impact without breaking or shattering.														
	c)	The ability of paint to block or allow visible light through it.			1															

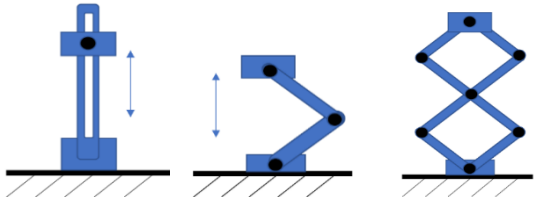
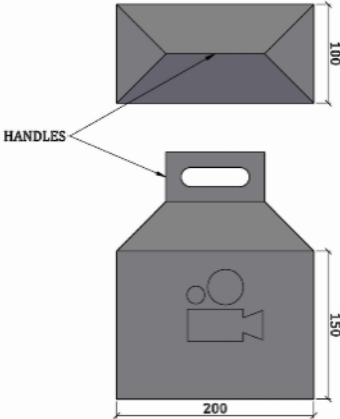
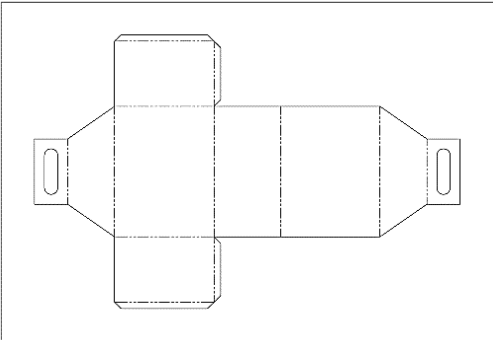
10)	a)	Hollow section	1	
	b)	Light weight	1	Accept strength
11)		Award 1 mark for reference to correct holding of material or use of PPEs.	1	
12)		Injection moulding, decaling	2	
13)	a)	Extrusion	1	
	b)	High ability to produce components with constant cross-sectional area	1	
14)		Award 1 mark for suitability of design in relation to hand tools and 1 mark for integrating the 'STAR' concept.	2	
15)	a)	additive layer manufacturing/ 3d/fdm printing/ CAM/ CNC milling	1	
	b)	Advantage: Customisation Limitation: speed	½ ½	
16)			1	

Total: 30 marks

1)	a)		2	Award ½ mark for each appropriate entry related to Need 1 and Need 2.
	b)	i) client ii) video-taking / video-taking equipment	½ ½	
	c)	i) Reference to facilitating video taking. ii) Reference to appealing products.	1 1	Accept other correct relevant answers.
	d)	Design and make a device that facilitates taking videos <u>at home, can hold mobile video and light equipment</u> . The device must be easy to use <u>and adjust by amateur content creators and offer upgradability</u> .	2	
	Total:		7	

2)	a)	Rowe, G. (2017), Film your way to Success	1	
	b)	<p>Award 1 mark each for reference to materials, dimensions, manufacturing processes, etc. for manufacturing, and reference to adjustability, movement, holding, etc. for usability.</p> 	2	Accept other correct relevant answers.
Total:			3	
3)	a)	i) mobile holders	1	
		ii) No Justification should refer to the fact that the table only shows information about sales and not demand.	1 1	
	b)	i) A suitable test could be an interview /vox pop / questionnaire to gather opinions of different users about plastic.	1 1	Do not accept answers related to testing of plastic durability
		ii) A suitable test could be to visit a number of general hardware stores to confirm that more than half of them actually sell these products.	1 1	
Total:			7	
4)	a)	<p>Award marks as follows:</p> <ul style="list-style-type: none"> - 1 mark for idea suitability - 1 mark for sketch communication and colour - 1 mark for product / device function - 1 mark for annotations / dimensions - 1 mark for explaining need in an annotation 	5	
	b)	Award 1 mark for suitable advantage, 1 mark for suitable disadvantage and 1 mark for their critical evaluation with respect to the idea.	3	
	c)	The stand needs to be produced from high quality thermoplastic components and finished with a brushed metal look including stainless steel fittings.	1 1	
	d)	<p>Award marks as follows:</p> <ul style="list-style-type: none"> - 1 mark for idea added feature - 1 mark for sketch communication - 1 mark for annotations 	3	
	e)	Award 1 mark for inclusion of added features and 1 mark for further reference to advantages to users.	2	
Total:			15	
5	a)	Video presentations, live demonstrations, presentation documents, project proposals	1	Any one
	b)	i) Award 1 mark for reference to any of the following implications: effects of technology, sustainability, disruption, innovation.	1	E.g. sustainability

		ii) Award 1 mark for the appropriate justification of the effect of the implication mentioned.	1	E.g. In order to consider environmental sustainability, a renewable material was chosen for the design																					
	c)	Award 1 mark for reference to any example from the following areas: resources, communication, industry concept, automation. Award 1 mark for the appropriate association of this technology to the development of the idea.	1 1																						
Total:			5																						
6)	a)	 <p>Components: For INPUT: SW1, SW2, SW3, SW4 (Any ONE) For PROCESS: IC1, R1, R2, R3, R4, R6 (Any ONE) For OUTPUT: CN1, CN2 (Any ONE)</p>	3	Award 1/2 mark for each correct entry.																					
	b)	i) Push switch	1	Accept Push-to-make																					
		ii) Award 1 mark for any reference to mechanical triggering when in contact with mechanism.	1	Accept any other valid answer.																					
Total:			5																						
7)	a)	<table border="1"> <thead> <tr> <th>Action</th> <th>Pin</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Press button L</td> <td>C.0</td> <td>I</td> </tr> <tr> <td>Press button R</td> <td>C.1</td> <td>I</td> </tr> <tr> <td>Arrive at A</td> <td>C.2</td> <td>I</td> </tr> <tr> <td>Arrive at B</td> <td>C.4</td> <td>I</td> </tr> <tr> <td>Motor turns CW (Left)</td> <td>B.2</td> <td>O</td> </tr> <tr> <td>Motor turns ACW (Right)</td> <td>B.3</td> <td>O</td> </tr> </tbody> </table>	Action	Pin	Status	Press button L	C.0	I	Press button R	C.1	I	Arrive at A	C.2	I	Arrive at B	C.4	I	Motor turns CW (Left)	B.2	O	Motor turns ACW (Right)	B.3	O	2	Award 1/2 mark for each entry
Action	Pin	Status																							
Press button L	C.0	I																							
Press button R	C.1	I																							
Arrive at A	C.2	I																							
Arrive at B	C.4	I																							
Motor turns CW (Left)	B.2	O																							
Motor turns ACW (Right)	B.3	O																							
	b)		1 1																						
	c)	 <p>Award: 1 mark for correct flowchart symbols and arrows 1 mark for correct Wait times 1 mark for correct repetition loop arrows</p>	3																						
	d)	The LED is switched OFF since when either Decisions 'Go Left' or 'Go Right' are 'Yes', the circuit would skip the sub routine 'Indicator'.	2																						
Total:			9																						

8)	a)	Change the ratio by using a larger / more teeth in the driven gear	1 1	Accept also reducing the driver gear
	b)	Camera is more steady/stable The mechanism has increased torque	1 1	
	c)	i. Idler (24 teeth)	1	
	c)	ii. $\frac{\text{Driver (Teeth/d)}}{\text{Driven (Teeth/d)}} = \frac{48 \text{ (Teeth)}}{24 \text{ (Teeth)}} = 2$	2	
Total:			7	
9)		Award 2 marks for any appropriate mechanical 2D sketches as shown below and 2 marks for communication and annotations describing components and function. 	4	Similar mechanisms can be accepted
Total:			4	
10)	a)		4	
Total:			7	
	b)		3	
	c)	Material type: corrugated plastic, acrylic PMMA plastic, PVC plastic, corrugated cardboard Standard form: sheet	1 1	
Total:			9	
Total: 70 marks				

Specimen Assessments: Private Candidates Controlled Paper MQF 1-2-3



L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL PRIVATE CANDIDATES CONTROLLED ASSESSMENT SAMPLE PAPER

SUBJECT: Design and Technology
PAPER: Level 1 – 2 – 3
DATE:
TIME: 2 Hours

Directions to Candidates

Answer **all** questions in **all** sections in the space provided.

Non-programmable calculators are allowed.

Show all the working for mathematical calculations.

Coloured pencils and/or markers may be used for sketches.

Section A: Refer to the given Situation and answer ALL the questions.

Situation:

Outdoor festive activities like (Christmas villages, village feasts and funfairs, etc) bring with them commercial activities like kiosks selling a variety of products. Electrical/mechanical display devices that are fun to interact with attract more customers, especially kids and families.

1. Complete the following table which lists a number of possible product types and examples, that would have been suitable for this kind of display. (2)

Product types	Example of related product
Traditional festive products	
Craft products	
	Sweet pastries related to activity like cookies
	Amusing toys and games

(Total: 2 marks)

2. In order to identify the solution required, a clear indication of what the business is and the products being sold, is required.

- a. List **TWO** stakeholders in this project.

_____ (2)

- b. Explain the needs of **ONE** of these stakeholders with a focus on the required solution.

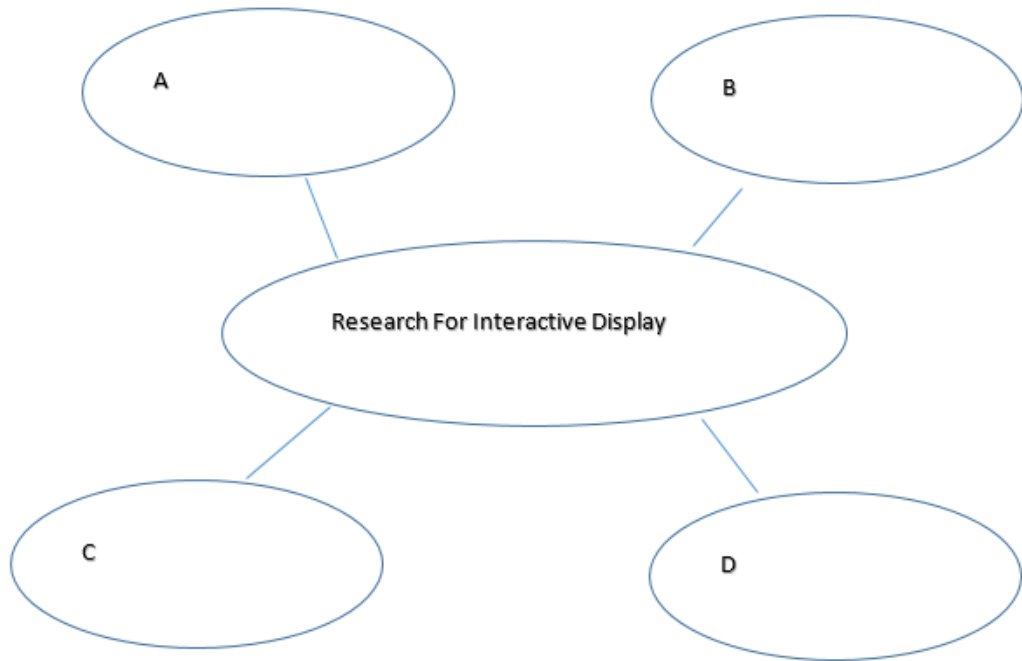
_____ (1)

- c. In the following space, draw a sketch of **ONE** item, that would be ideal to be displayed in a kiosk display of this kind. Communicate dimensions and product info with some annotations. (3)

d. Explain the needs of **ONE** possible target customer for the product you described in part (c).

(2)

e. The design team needs a range of relevant research information about the identified market to develop a solution. Complete the infographic below, by suggesting suitable research areas related to the design of the interactive display solution. (2)



f. Choose **ONE** of the areas as answered in part (e) and in the space provided, expand further research data for this particular strand.

Selected area: _____

Further research: _____

(2)

g. Referring to the research material presented in parts (e) and (f) above, explain how this research data should be collected, recorded and the general sources used for the information should be communicated.

(2)

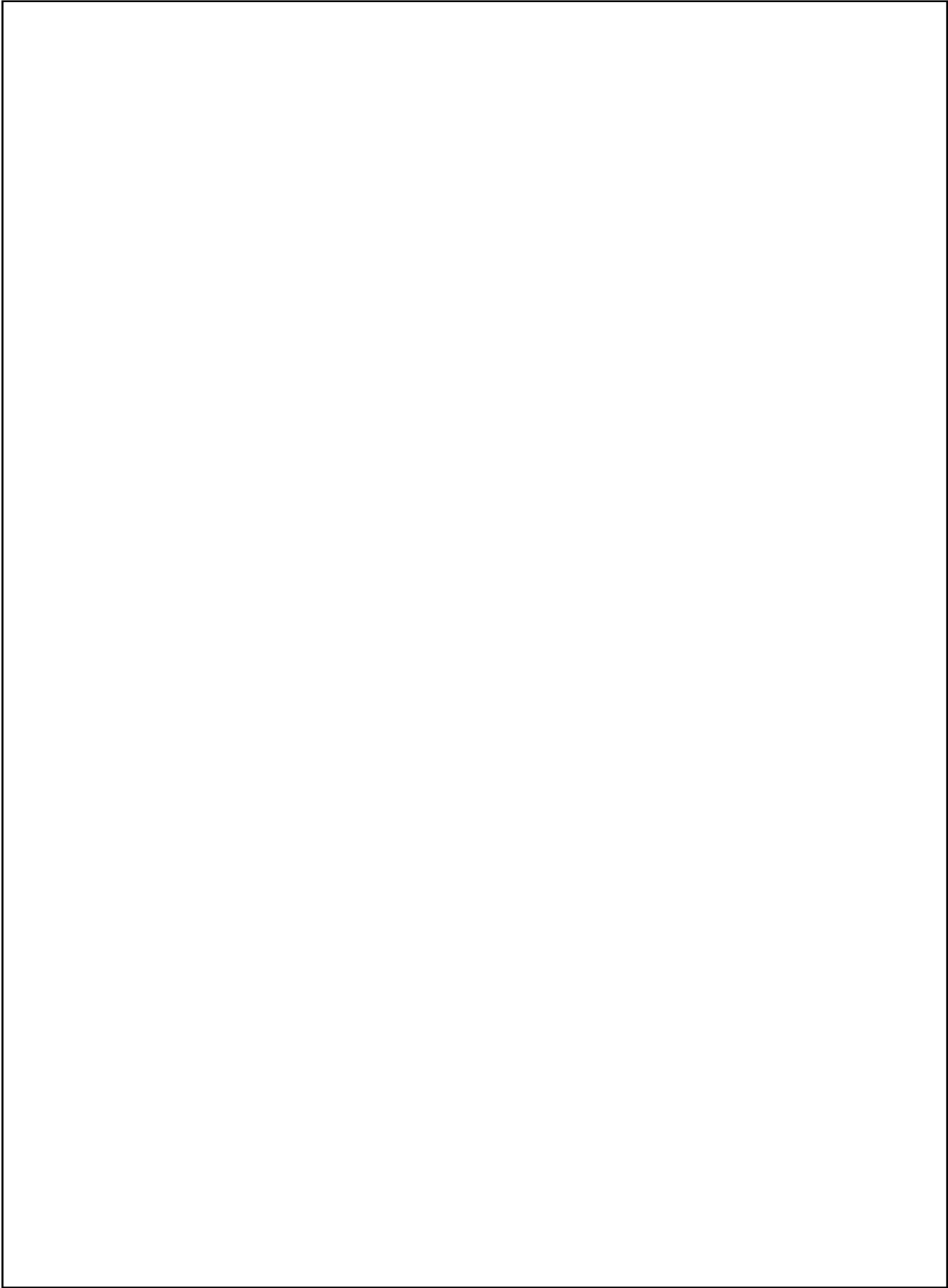
(Total: 14 marks)

3. Designing a variety of ideas is important to arrive at a chosen solution.

Present **ONE** detailed design idea for the situation presented, which apart from referring to the original situation also responds to the following Specifications, developed by the design Team. Include detailed annotations. (4)

No.	Specification
1	The display is made of some clear and other resistant materials.
2	Users can touch 1 sample of each item from the display.
3	The display includes an electronic function to attract attention.
4	The mechanical system is safe to use and easy to operate.
5	The product on display is about 10 cm high.
6	The design is themed in a suitable way to match the product being sold.

Design Idea



(Total: 4 marks)

4. Specifications that have led to this chosen idea should be very clear to a designer at this stage.

- a. List another **TWO** project specifications that are relevant to this developed and chosen idea in addition to the ones listed in question 3.

Specification no. 7: _____ (1)

Specification no. 8: _____ (1)

- b. In the table below, select any **TWO** given or suggested specifications and write **ONE** advantage showing how each specification was met in the design solution presented, thus leading to choosing this solution. (2)

Specification no.	Advantage of this feature within the solution
	<hr/> <hr/> <hr/>
	<hr/> <hr/> <hr/>

(Total: 4 marks)

5. Write a developed Design Brief for the project being presented. The design brief must include all the following details.

- who the target user is;
- how will it be set up;
- how will the user interact with the product;
- how will it be cleaned.

Design and make _____

(Total: 3 marks)

6. The product shall be called 'Interactive-display' or 'ID'.

a. Underline the ideal method to be used to communicate the solution to a potential client.

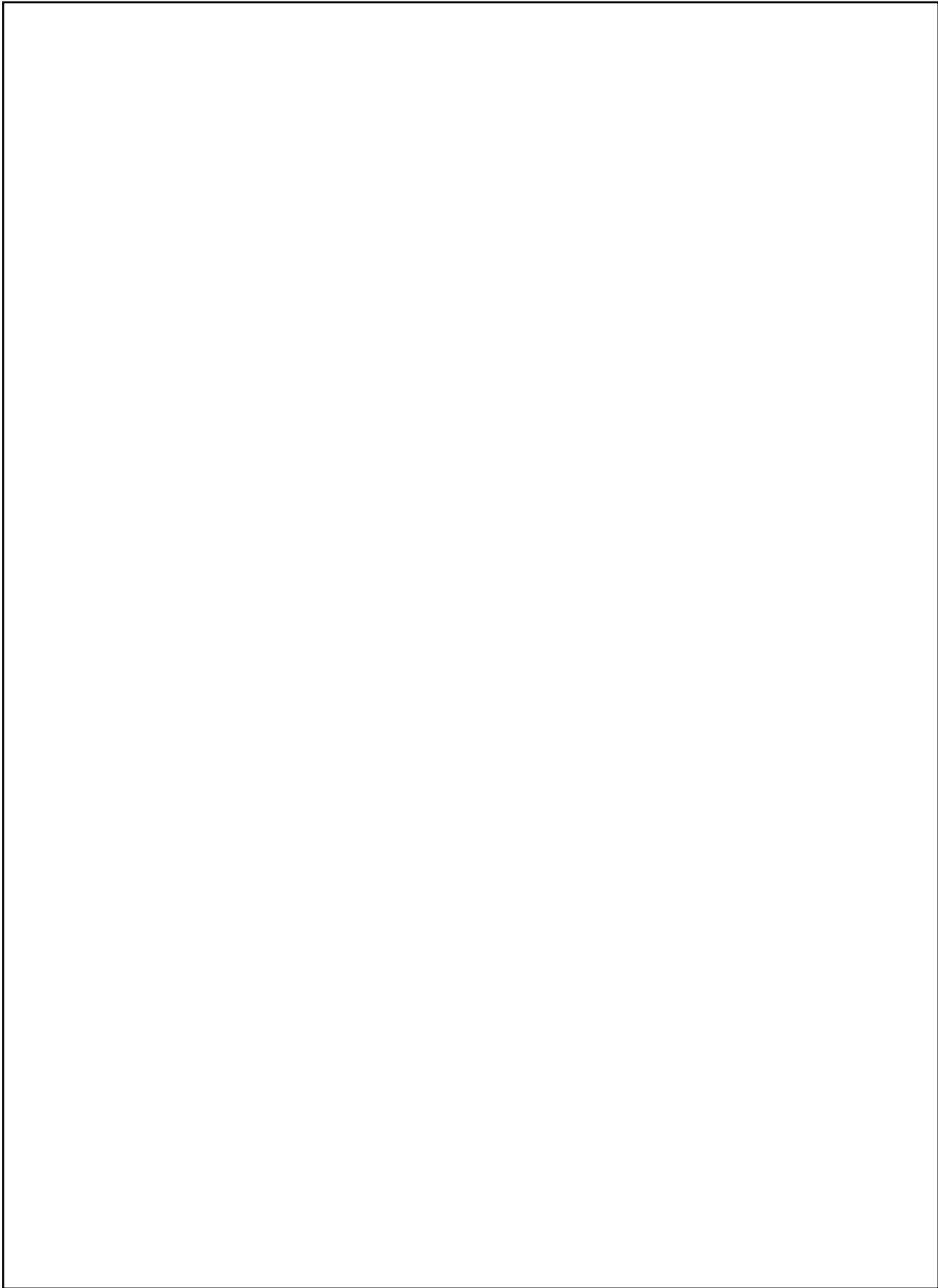
Pie chart, Product Leaflet, Spreadsheet (1)

b. Circle the logo of the product in the advert shown below. (1)



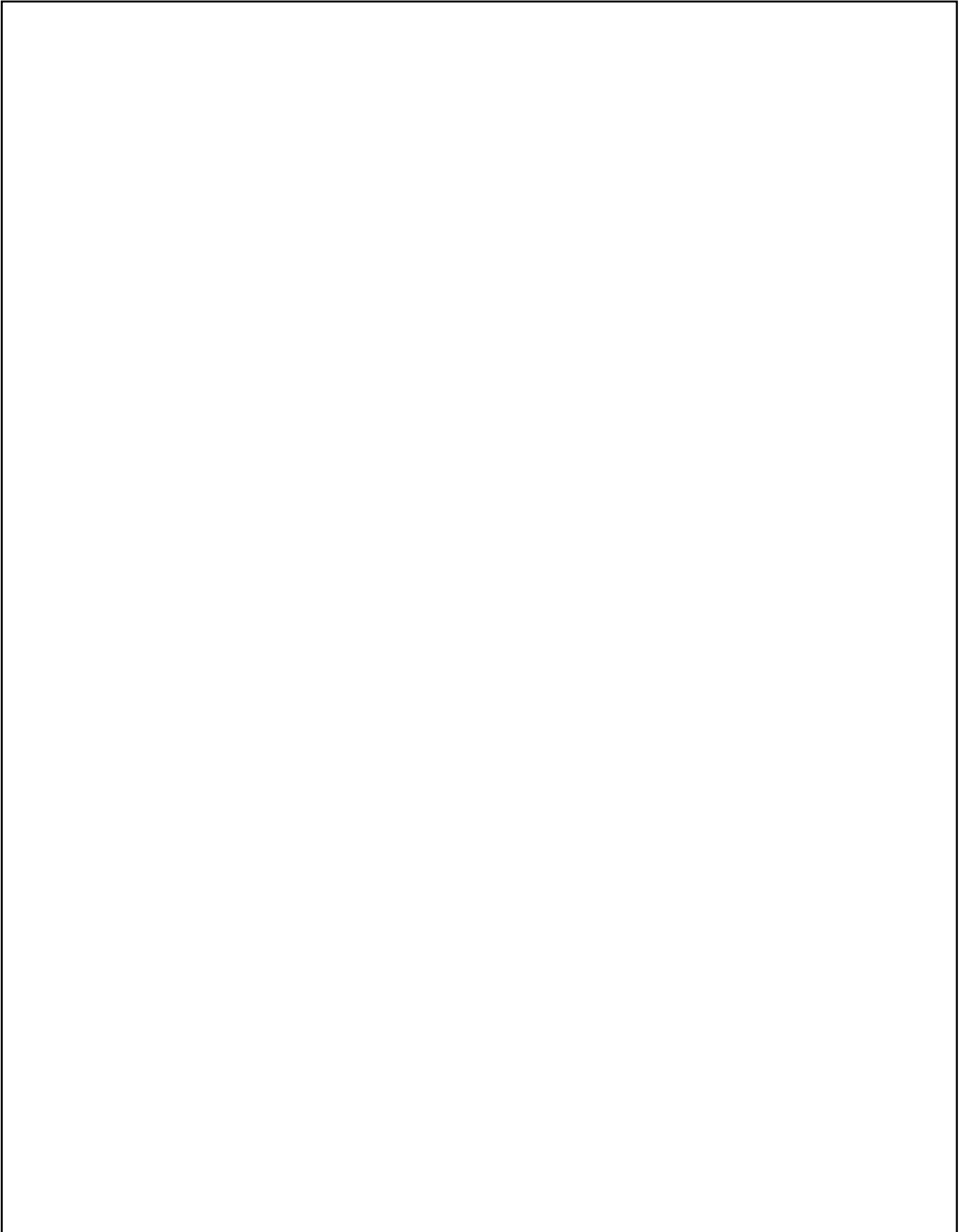
c. Present an illustrated document that highlights **TWO** key features of the proposed product. This should be a simplified graphic (e.g. showing only outlines, contours or a silhouette). The document must include: (3)

- **ONE** aspect of relevant research data supporting this product;
- **ONE** aspect highlighting the product identity of the new product which is called 'INTERACTIVE DISPLAY' or 'ID'.



(Total: 5 marks)

7. Draw an estimated working drawing of **ONE** elevation (Front side or end view) of your proposed idea in the space provided below. Your drawing does not need to be to scale but should be well proportioned. (5)

A large, empty rectangular box with a thin black border, intended for a student to draw an estimated working drawing of one elevation (front side or end view) of their proposed idea. The box is currently blank.

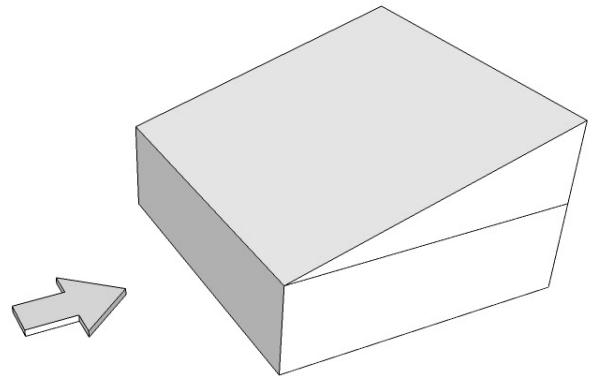
(Total: 5 marks)

8. Explain **ONE** key stage of the manufacturing process to manufacture **ONE** physical part of the proposed solution. In your answer, outline and illustrate the following:
- a minimum of **THREE** steps to describe the manufacturing process; (3)
 - process flow information by referring to: Health and safety, Wastages, tools and equipment as annotations to the illustration or as a separate text. (3)



(Total: 6 marks)

9. The figure shows a simplified diagram of a common cash register which will be used in the kiosk. The arrow indicates the front view.

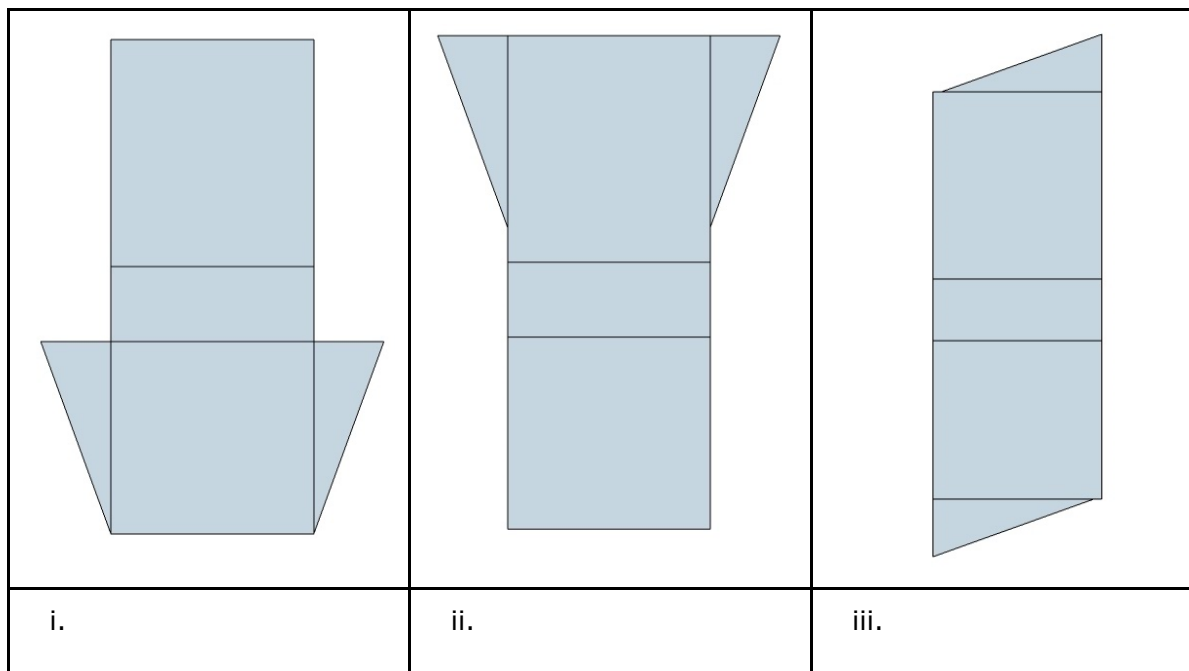


a. Label the views of the cash register shown in Figure 1. (3)

Figure 1

b. The cash register is made up of two basic 3D forms. Draw freehand 3D sketches of **ONE** of the 3D forms which make up the cash register. (2)

- c. It was decided to build a model of the cash register using thin metal. Choose the correct net (mark with an "X") for the top part of the cash register shown. (1)



- d. Underline the correct form of supply of thin metal.

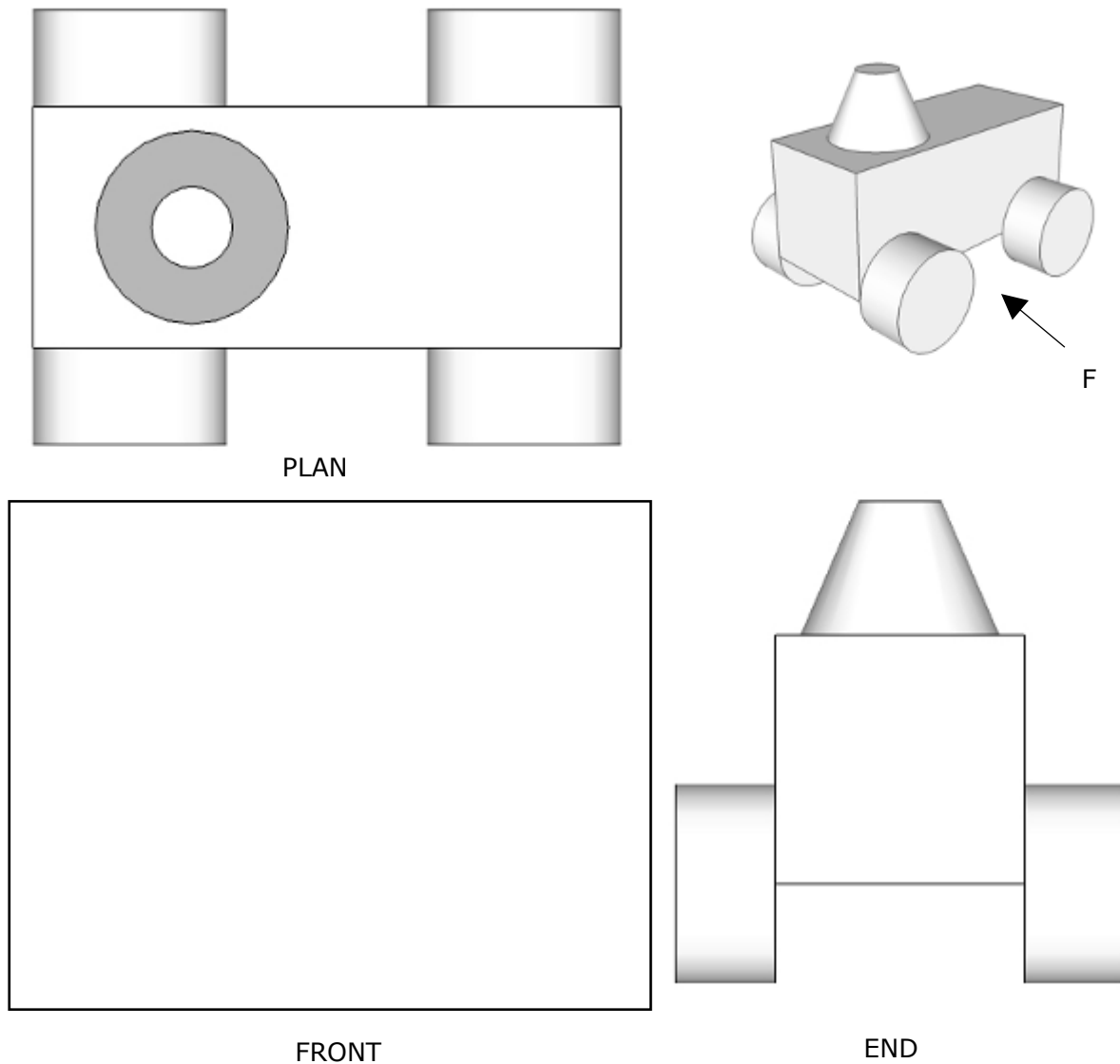
bar **sheet** **tube**

(1)

(Total: 7 marks)

Section B: Answer ALL the questions.

1. Consider and study carefully the following orthographic drawings of a Toy Car.



- a. Sketch a well-proportioned, freehand FRONT elevation, as a working sketch, which fully communicates the features shown in the 3D sketch, in the space allocated above which is labelled as 'FRONT'. (3)

- b. Figure 1 below shows, in hidden detail, the chosen driving axle of this toy car, where a DC motor will drive the rear wheels.

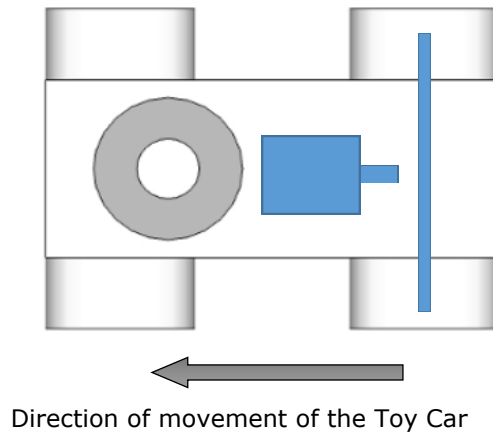


Figure 1

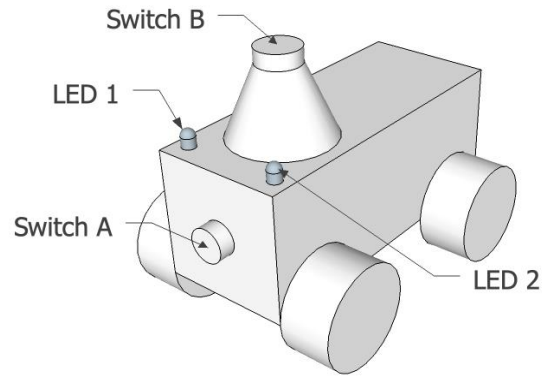
- i. Label the axle of the toy in Figure 1. (1)
- ii. Describe and/or illustrate a mechanical design solution in the space below, that can turn the rear axle of the toy car by means of the perpendicularly positioned shaft of the D.C. motor. Communicate mechanical components, rotation and the interaction between the axle and the shaft in order to make the car move in the given direction.

(3)

(Total: 7 marks)

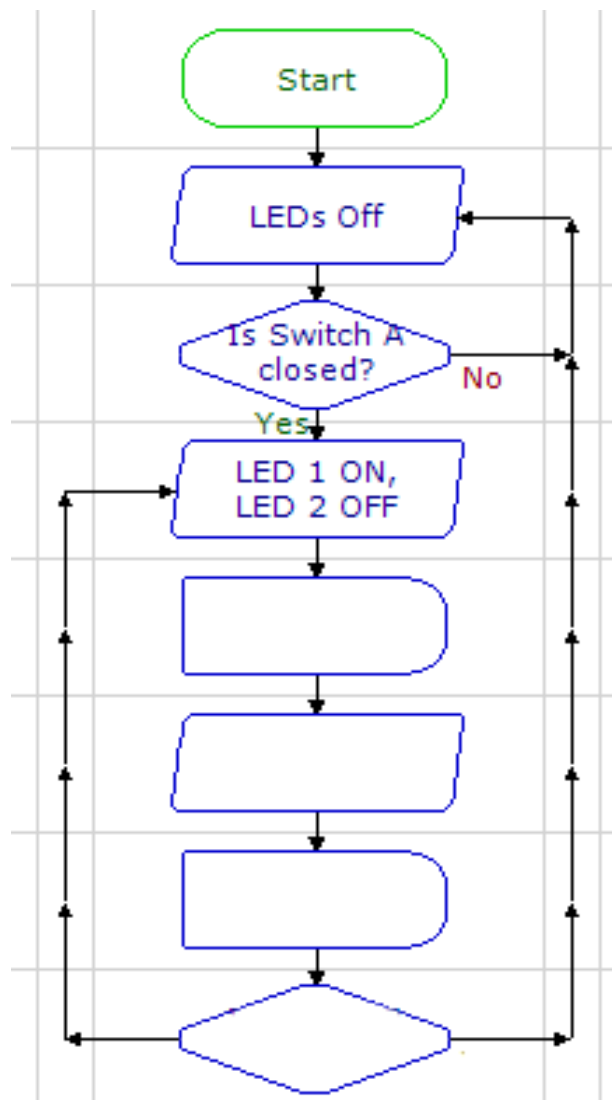
2. To make the toy interactive, two LED lights will be added. The following functional needs were identified:

- When switch A is closed, LED 1 and LED 2 light up alternately for five seconds each.
- One LED light on each side of the toy car will light for 5 seconds and then alternate with the other light on the other side for another 5 seconds.
- The flashing light circuit must turn 'ON' when switch A is closed. the button on the front or top of the truck hit or are hit by something.
- When switch B is closed If the top button is pressed again, all the flashing lights would stop.



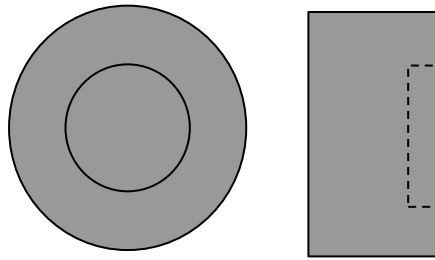
Complete the following flow chart using the word bank below, to achieve the functions stated above. Each command can be used more than once. (5)

- Wait 5** **Wait 10** **LED 1 OFF** **LED 2 ON** **LED 1 ON** **Led 2 OFF**
Is switch B closed? **Is switch B off?** **Is switch A closed?**



(Total: 5 marks)

3. The design of the wheel of the Toy Car was modified slightly to look like a real wheel, with a central part being set inwards in the wheel, but still made as a single part, as shown in the diagram below.



- a. Describe and illustrate **THREE** steps required to model digitally this ONE wheel, using a 3D CAD software of your choice. This design will guide the manufacturing of the wheel as a single part using CAM processes. Acknowledge the name of the software you describe, broadly explaining the method used in a minimum of 3 steps. Do **not** include opening and saving documents as a step.

Name of software: _____

(5)

- b. The CAD design for one wheel will be used to manufacture a batch of 4 toy wheels, using CAD-CAM, as a prototype.

Using some suggested terms in the word bank below, communicate a method of using a particular CAD-CAM equipment, to produce this batch.

Laser Cutting, 3D Printer, FDM (Fused Deposition Modelling), Slicer, 2D Vector editor, 3D modelling software, Duplicate, Copied, Pasted, Heated bed, Additive manufacturing.

Your answer should include:

- i. the name of the CAM equipment which can be used, and how CAD designs are transferred to such equipment;
- ii. an illustrated description of the manufacturing process performed by this equipment;
- iii. reference to how the required batch is produced.

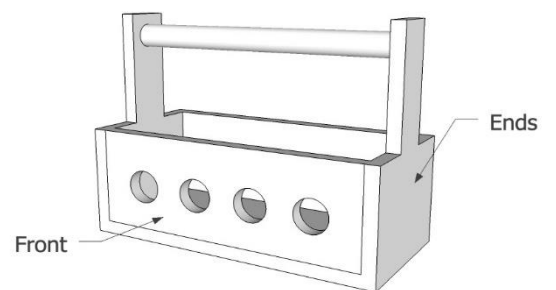
(6)

- c. In the space provided below, discuss why using such digital manufacturing makes sense for the required prototyping needs.

(2)

(Total: 11 marks)

4. Consider the following toy tool-box, which is composed of 2 different materials – a wooden body and metal fasteners.




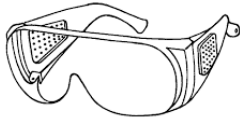
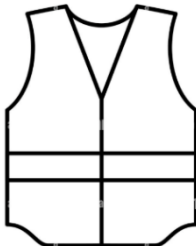

- a. Describe the manufacturing process required to produce the holes in the front of the tool box, taking into consideration that the material given has been already cut to size.

(4)

- b. Identify **TWO** Health and Safety hazards associated with the manufacturing process stated above. (Mark with an "X") (2)

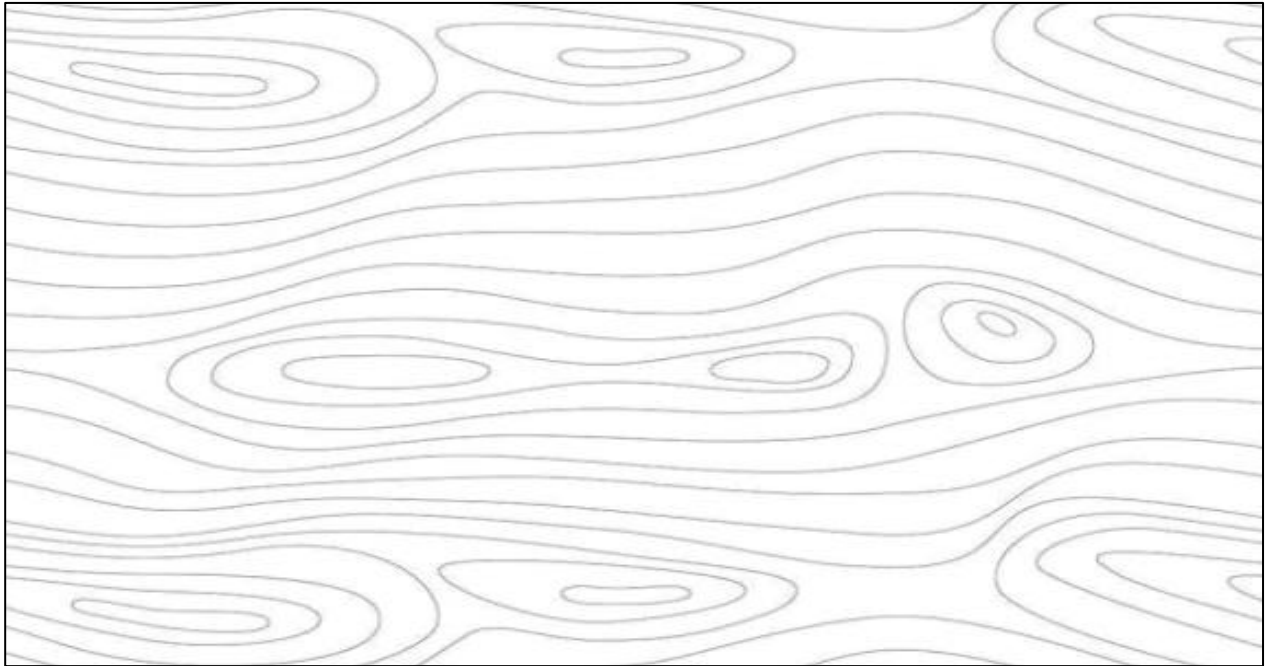
<input type="checkbox"/>	Hard object hitting head
<input type="checkbox"/>	flying debris hitting eyes
<input type="checkbox"/>	Not being seen at night
<input type="checkbox"/>	hard objects falling on feet

- c. Tick the appropriate PPEs for the manufacturing process described from the list shown below. (Marks with an "X") (2)

			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- d. Describe a suitable joining method required to join the ends to the front of the toolbox, communicated with illustrations and annotations. (2)

- e. On the wooden sheet shown below, draw the full front panel of the tool box appropriately at an estimated scale taking into consideration the grain of the material and waste. (2)



- f. The manufacturer would like to include ways to separate long tools from two sets of smaller components. Produce a design idea to satisfy the manufacturer's need. Your answer should include an appropriate sketch that describes your solution, including annotations. (3)



(Total: 15 marks)

5. Testing is important in assuring quality. The manufacturer of the Toy Car claims that the toy is safe for all children 3 years upwards for its mechanical durability of moving joints, Safety for choking on small parts and is also appealing to the target market.

Design a test to determine the validity of any of the claims above. Communicate your designed test procedure as required, in the space below.

Your answer should include a clear indication of how test data will be collected.

(4)

(Total: 4 marks)

6. A new toy is being designed by a competing brand. This has some new features that use emergent technologies. You are being asked to propose a further development on the design solution of the toy car which includes the adoption of an emergent technology.

Discuss, using illustrations and annotations, how an emergent technology concept of your choice could be adopted as a further development of the toy car product.

(6)

(Total: 6 marks)

END OF PAPER



**SECONDARY EDUCATION CERTIFICATE LEVEL
MARKING SCHEME FOR SAMPLE PRIVATE CANDIDATES CONTROLLED PAPER**

SUBJECT:	Design and Technology
PAPER:	Level 1- 2 - 3
DATE:	
TIME:	2 Hours

Section A

Question		Marks	Comments
1.			Award ½ mark for each correct answer.
	Product types	Example of related product	
	Traditional festive products	Sweets / Popcorn	
	Craft products	Keychains	
	Village feast	Sweet pastries related to activity like cookies	
	Fun Fairs	Amusing toys and games	
Total:		2	
2.	a.	Award: 1 mark for each of two correct stakeholders	2
	b.	Award: 1 mark for a relevant need.	1
	c.	Award: 1 mark for drawing; 1 mark for annotations; 1 mark for dimensions.	3
	d.	Award: 2 marks for suitable explanation of the respective need.	2
	e.	Award: ½ mark for each relevant research area.	2
	f.	Award: 2 marks for relevant further research described.	2
	g.	Award: 1 mark for data collection and recording; 1 mark for sources used.	2
Total:		14	
3.		Award: 2 marks for idea suitability and relevance to specifications; 2 mark for sketch communication in pencil.	4
Total:		4	

4.	a.	Award: 1 mark for each suitable specification.	2	
	b.	Award: 1 mark for each suitable and relevant advantage.	2	
Total:			4	
5.		Award: 2 marks for correct answer for each statement (½ mark each); 1 mark for brief structure;	3	
Total:			3	
6.	a.	Pie chart	1	
	b.	Award: 1 mark for correct circling of logo.	1	
	c.	Award: 1 mark for correct inclusion of one research aspect; 1 mark for leaflet communication to stakeholders; 1 mark for graphic communication skills.	3	
Total:			5	
7.		Award: 3 marks for relevance of the working sketch in representing the development of the proposed idea (either the electronic circuit or 2D views are relevant); 2 marks for the quality of design details presented, communicative aspect, labelling (components or dimensions) and appropriate techniques used.	5	
Total:			5	
8.	a.	Award: 3 marks for logical sequence and appropriateness of manufacturing process and relevance to design idea.	3	
	b.	Award: 3 marks for text or annotations referring to each of the requested process flow aspects.	3	
Total:			6	
9.	a.	Front, Plan, End	3	
	b.	Award: 1 mark for using correct 3D view; 1 mark for correct proportion.	2	
	c.	i.	1	
	d.	sheet	1	
Total:			7	

Section B

1.	a.	Award: 2 marks for complete side elevation sketch; 1 mark for proportion.	3	Award partial marks for partial work
	b.	Award: 1 mark for correct label	1	
	c.	Award: 1 mark for suggesting suitable components; 1 mark for a suitable mechanical interaction/setup; 1 mark for appropriate communication (description and/or illustrations).	3	
Total:			7	
2.		<pre> graph TD Start([LEDs Off]) --> SwitchA{Is Switch A closed?} SwitchA -- No --> Start SwitchA -- Yes --> LED1[LED 1 ON, LED 2 OFF] LED1 --> Wait5_1([Wait 5]) Wait5_1 --> LED2[LED 1 OFF, LED 2 ON] LED2 --> Wait5_2([Wait 5]) Wait5_2 --> SwitchB{Is Switch B closed?} SwitchB -- No --> Start SwitchB -- Yes --> LED1 </pre>	Award: 1 mark for each correct function	5
Total:			5	
3.		Award: 3 marks for a minimum of 3 appropriate steps that describe the CAD steps required. Typical procedures include but are not limited to aspects of the following: <ul style="list-style-type: none"> • Drawing or dragging in the canvas the initial circle shape or cylinder form. • Extruding the circle to become a cylinder or resizing it if this was a ready component. • Drawing an internal circle or placing a smaller cylinder on one side of the cylinder. • Subtracting a smaller cylinder from a larger one to create the indent or extruding inwards the inner circle. 2 marks for effectiveness and organised structure of process.	5	
	b.	Award: 1 mark for reference to a suitable CAM equipment and file transfer; 3 marks for reference to an appropriate sequence of operation including utilised material, and typical operation of a selected equipment; 2 marks for relevant reference to batch production.	6	
	c.	Award: 1 mark for reference to suitable advantages of digital manufacturing; 1 mark for reference to the prototyping need of having the required wheels before going for a larger scale of manufacturing.	2	
Total:			13	

4.	a.	i. marking out ii. selecting appropriate drill size iii. fit in pillar drill / cordless drill iv. drill multiple holes	4	
	b.	Flying debris hitting eyes; hard objects falling on feet	2	
	c.	Safety goggles; safety shoes	2	
	d.	Award: 1 mark for correct illustration; 1 mark for correct annotations.	2	Accept other correct answers.
	e.	Award: 1 mark for the correct proportion of the part; 1 mark for placing the parts appropriately and without waste.	2	
	f.	Award: 1 mark for 2 sets of smaller components + 0.5 marks for annotation; 1 mark for longitudinal partition + 0.5 marks for annotation.	3	
Total:			15	
5.		Award: 2 marks for the description of a relevant test; 1 mark for explaining how test data will be collected; 1 mark for explaining how claim is validated or otherwise.	4	
Total:			4	
6.		Award: 4 marks for suggesting an appropriate emergent technology concept, relevant as a development of this product; 2 marks for communicating the idea through annotations and illustrations.	6	Technical details related to the emergent technology are not expected.
Total:			6	