Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2022

Marking Scheme

Technology

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

The table below contains information on annotations used for marking the examination paper.

Annotation	Use	Marks (if applicable)
	Valid information	1
	Valid information	2
	Valid information	3
	Valid information	4
	Valid information	5
	Valid information	6
	Valid information	8
	Relevant information	N/A
	Incorrect answer	0
	Page seen by examiner/ information not valid	N/A

Section A - Core Write your answers in the spaces provided

1. The graphic opposite shows a safety sign commonly displayed in places of work.

(i) State the meaning of this safety sign.

Overshoes must be worn beyond this point

(ii) Give **two** examples of where this safety sign is used in everyday life.

Any two examples, swimming pool, laboratory, hospital, etc.

(4+4 marks)

2. The Microgeneration Support Scheme has been set up to enable people to meet their own electricity needs. Under the proposed scheme, people will be able to sell their excess electricity to offset their energy bills.

(i) Suggest **two** microgeneration systems that could be installed in Irish households to meet their own electricity needs.

Any two, solar, wind, etc.

(ii) Briefly outline **one** other way households could reduce their energy costs.

Better insulation, upgrading windows, more energy efficient appliances, etc.

(4+4 marks)

3. To tackle the global problem of plastics pollution, researchers developed a degradable plastic that breaks down after being exposed to sunlight and air for only one week.

(i) Suggest **one** benefit for the environment of using this type of plastic.

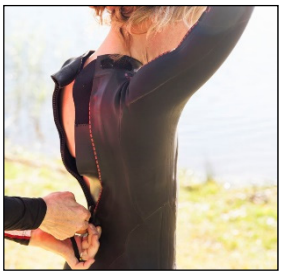
Less build-up of plastic in landfills, less harm to animals, etc.

(ii) Give **two** applications of a degradable plastic.

Any two, packaging, cutlery, food containers, etc.

(4+4 marks)

4. Neoprene is a material that is commonly used in wet suits worn by surfers and divers.



(i) Suggest **two** important properties of any material to be used in wetsuits.

Any two properties, waterproof, lightweight, flexible, etc.

(ii) Briefly outline the difference between a natural fabric and a synthetic fabric.

A natural fabric is derived from a plant or an animal. A synthetic fabric is made from chemical compounds.

(4+4 marks)

5. Researchers in RMIT Australia have designed a *prototype* wave energy converter, capable of doubling the power harvested from ocean waves.

(i) Explain what is meant by the term prototype.

An original model of an object used to provide valuable insight into how something looks or works.

(ii) State **one** energy conversion that takes place in a wave energy converter.

Kinetic to electrical, mechanical to electrical, etc.

(4+4 marks)

6. The image shows a mechanism which is commonly used in Technology.

(i) Name the mechanism shown.

Bevel gears.

(ii) Outline **one** application of this mechanism in everyday life.

Hand drills, vehicle differential, garage doors, etc.

(4+4 marks)

7. The image shows a *Stockholm toddler chair* that can be used at two different heights, by simply turning it upside-down.

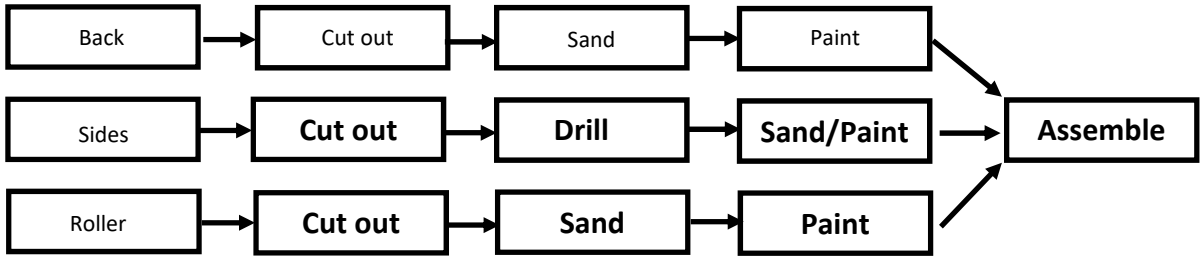
In the box provided, make a well-proportioned 2D sketch of the chair when viewed in the direction of arrow **A**.

(Very good sketch- 8 marks, fair sketch 4 marks)

8. A *Work Breakdown Structure* (WBS) is a project management tool used by students and professionals.

Below is the incomplete WBS for the toilet roll holder shown.

Using your own headings, complete the sample WBS.



(8 marks)

9. The image shows a plastic bin used in many places of work.

(i) State the meaning of the symbol on the front of the bin.

Recyclable.

(ii) Explain, with **one** example, what is meant by a thermoplastic material.

A plastic that can be reheated and remoulded- acrylic, nylon, polystyrene, etc.

(4+4 marks)

10. Good file management is essential when saving files on a computer.

(i) Give **two** reasons why it is important to set up a good file management system.

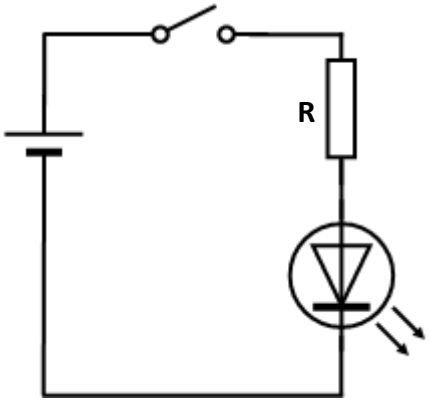
Any two reasons, easier to find material, less likely to lose material, quicker access, better practice, etc.

(ii) Describe the difference between a root-folder and a sub-folder.

The sub-folder is a folder within the root-folder, etc.

(4+4 marks)

11. The circuit diagram shown contains a power supply, a switch, a resistor and an LED.



(i) State the purpose of resistor **R** in the circuit.

To protect the LED by reducing the current flow, etc.

(ii) A current of 0.013 A passes through a resistor of 300 Ω.

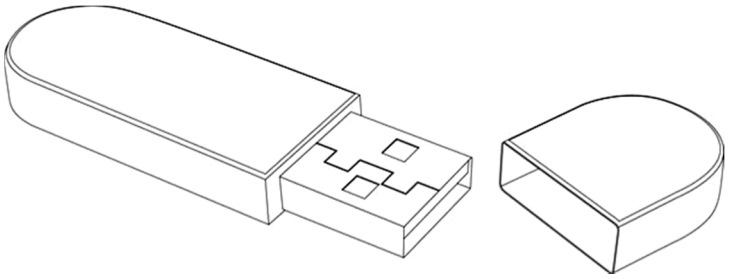
Calculate the voltage drop across the resistor.

Note: $V = I \times R$

V = 0.013 × 300 = 3.9V

(4+4 marks)

12. Use **two** graphic techniques to enhance the representation of the USB flash drive shown.



Rendering, colour, shadow, hatching, etc.

(4+4 marks)

Section B - Core - *Answer Question 2 **OR** Question 3*

Question 2 *(a) - 10 marks, (b) - 8 marks, (c) OR (d) - 6 marks*

*Answer 2(a) **and** 2(b)*

2(a) **(i)** Explain what is meant by the term *upcycling*.

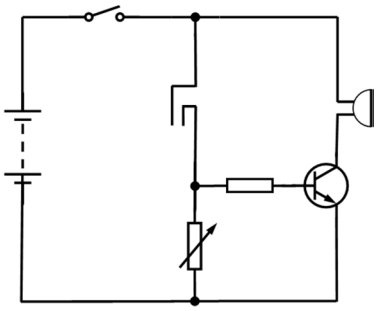
The process of transforming waste/unwanted products into products perceived to be of greater quality/value.

(ii) Suggest **two** ways in which the manufacturer could ensure that each Modpool produced is of a high quality.

Using high quality materials, using good quality electronics, testing properly, finishing to high quality, etc.

(10 Marks, 4+6)

2(b)



(i) Give **two** reasons why *steel* is a suitable material for the manufacture of shipping containers.

Strong, cheap, easy to work with, aesthetic appeal, etc.

(ii) Suggest **two** ways the safety of this Modpool could be enhanced for users.

Steps for getting in/out, railing around the sides, lights, etc.

(iii) Draw a labelled diagram of a suitable circuit to activate the siren.

Suitable circuit.

(8 Marks, 2+4+2)

*Answer 2(c) **or** 2(d)*

2(c) **(i)** Briefly outline **two** constraints when designing a suitable Modpool for a home.

Size of garden, depth of pool, type of ground, etc.

(ii) Give **two** benefits of using CAD when designing products.

Easier to visualise, can make changes, accuracy, etc.

(6 Marks, 4+2)

OR

2(d) **(i)** Outline **two** advantages of being able to use a phone to control these features.

Ease of use, can access from anywhere, more modern technology, etc.

(ii) Suggest **one** additional feature, other than those listed above, that could be controlled using the app.

Cover, filter, speakers, etc. *(6 Marks, 4+2)*

Question 3 *(a) - 10 marks, (b) - 8 marks, (c) OR (d) - 6 marks*

Answer 3(a) and 3(b)

3(a) (i) Give **two** benefits of converting a standard bicycle into an E-bike.

Better for environment, less materials used, personal preference, etc.

(ii) Briefly describe what is meant by the term *torque* when referring to motors.
A force that causes rotation/turning force.

(10 Marks, 6+4)

3(b) (i) Name a suitable material for the manufacture of the battery pack holder, shown.
Leather, neoprene, nylon, polyester, etc.

Battery pack holder

(ii) Suggest **two** reasons why your chosen material is suitable for the manufacture of the battery pack holder.
Waterproof, strong, hard wearing, lightweight, etc.

(iii) Describe, using notes and sketches, how the battery pack holder could be attached to the front of the bicycle.
A bracket could be used to attach the battery pack holder to the handlebar.

(8 Marks, 2+2+4)

Answer 3(c) ***or*** *3(d)*

3(c) (i) Explain what is meant by the abbreviation *DC*.

Direct current.

(ii) If the E-bike has an operating voltage of 48V and an output power of 240 watts, calculate the current drawn by the E-Bike.

Note: *Power = Voltage(V)× Current(I)*

240 = 48 × Current **Current = 240/48 = 5 Amps**

(6 Marks, 2+4)

OR

3(d) (i) Describe what is meant by the term *alloy* when referring to materials.

A metallic substance made from two or more elements.

(ii) Outline **one** structural feature that strengthens the bicycle frame shown.

Triangulation, tubing structure of material, etc.

(6 Marks, 4+2)

Section C - Options - *Answer **any one** of the five optional questions.*

Option 1 - Applied Control Systems

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

*Answer 1(a) **and** 1(b)*

1(a) (i) Suggest **two** advantages of using an automated deck cleaning device.

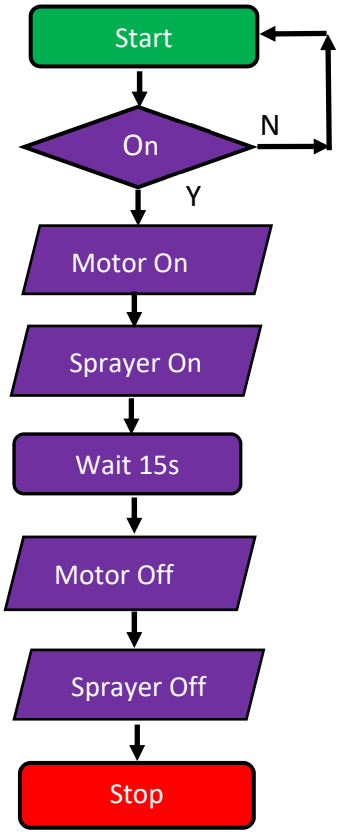
Easy to use, less labour, ensures deck stays in good condition, etc.

(ii) Briefly describe one other household device that operates like the Robo-Deck.

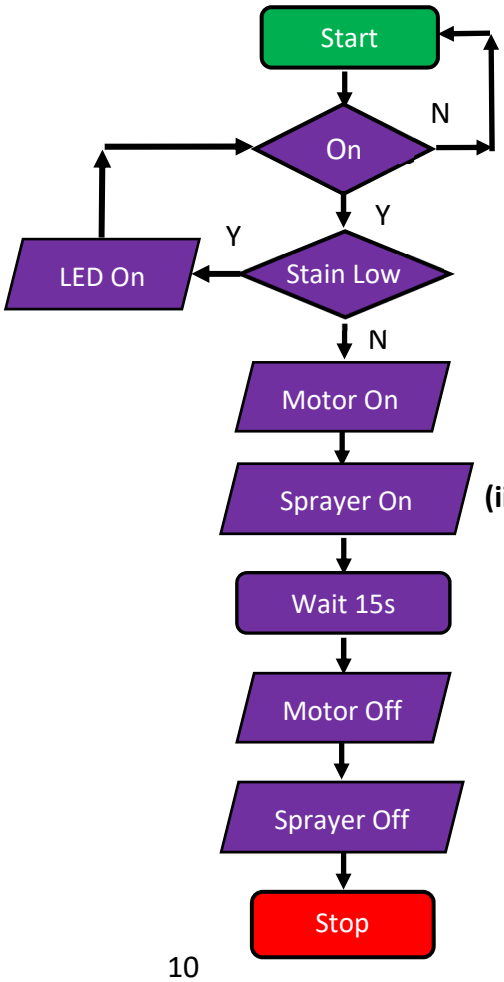
Vacuum cleaner, lawnmower, etc. *(10 marks, 6+4)*

1(b) (i) Complete the flowchart, shown, to operate the Robo-Deck in the following sequence:

- The system is powered on
- The motor activates, moving the Robo-Deck forward for 15 seconds
- At the same time, the stain sprayer comes on for 15 seconds
- The motor and the sprayer stop.



(ii) Suggest a modification to the flowchart to alert the user when the stain is running low.



(iii) Name a suitable sensor that could be used to detect an object in the path of the Robo-deck.

Infra-red motion sensor, LDR, etc.

(20 Marks, 8+6+6)

*Answer 1(c) **or** 1(d)*

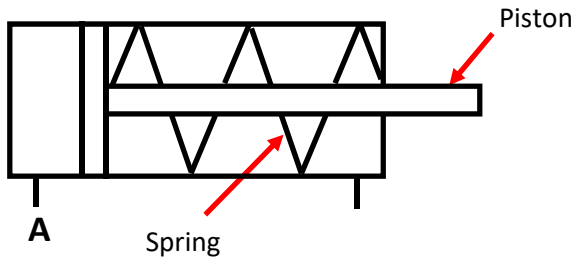
1(c) **(i)** Give **one** advantage and **one** disadvantage of using a pneumatic paint sprayer.

Advantages- Faster, uniform finish, easier to apply, etc.

Disadvantages- Needs more expensive equipment, uses more paint, etc.

(ii) Draw the pneumatic symbol for a single-acting actuator and explain how it operates in a pneumatic circuit.

Compressed air enters through Port A and pushes the piston out.
When the air stops, the spring brings the piston back to its original position.



(10 Marks, 4+6)

OR

1(d) Robots have become increasingly popular in industry in recent years. The mechanical gripper shown in the image below, grabs an object using a *compressive* force.

Mechanical Gripper

(i) Describe what is meant by a *compressive* force.

When a force presses inward on an object causing it to be compacted.

(ii) Describe, using notes and annotated sketches, what is meant by 'degrees of freedom' with reference to robotic devices.

The number of axes along or around which an object can move.

(10 Marks, 4+6)

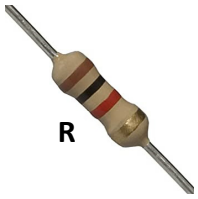
Option 2 - Electronics and Control

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

Answer 2(a) ***and*** *2(b)*

2(a) (i) The colour band sequence of **R** is *brown, black, red* and *gold*.

State the value of the resistor **R**.



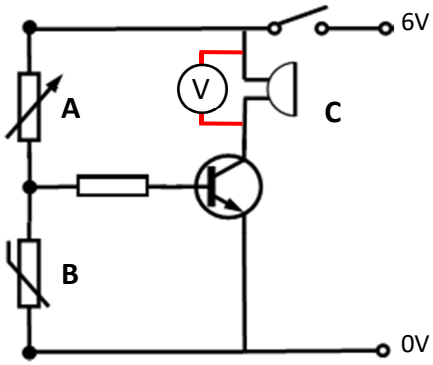
1000Ω

(ii) Outline the function of the gold band on the resistor shown.

The tolerance band, indicates a tolerance of +/- 5%

(10 Marks, 6 +4)

2(b) (i) Using the *Formulae and Tables* booklet, or otherwise, name components **A** and **B** in the circuit.
A = Variable resistor, B = Thermistor



(ii) Briefly describe the operation of the circuit.

When the temperature is low, the transistor activates and the buzzer will sound.

(iii) Redraw the given circuit diagram to show how the probes of a multimeter would be connected to measure the voltage drop across the buzzer **C**.

(20 Marks, 8+6+6)

Answer 2(c) ***or*** *2(d)*

2(c) (i) State the unit of measurement of capacitance.

The Farad (F)

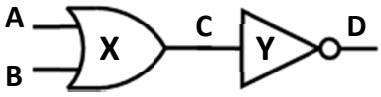
(ii) An electrolytic capacitor is a *polarised* component. Explain what is meant by the term *polarised* when referring to electronic components.

A component that has an anode/cathode, positive/negative leg.

(10 Marks, 4+6)

OR

2(d)



A	B	C	D
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

Truth Table

(i) Name the logic gates **X** and **Y**.

X = Or gate, Y = Not gate

(ii) In your answerbook, draw and complete the truth table for the combination of logic gates shown

(10 Marks, 4+6)

Option 3 - Information and Communications Technology

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

Answer 3(a) ***and*** *3(b)*

3(a) (i) Suggest **two** advantages of streaming movies and television shows.

More variety, choose what you like, instant access to shows, etc.

(ii) Describe **two** precautions that should be taken when accessing streaming services.

Make sure it's coming from a reliable source, anti-virus on devices, care taken when paying for services, etc.

(10 Marks, 4+6)

3(b) (i) Suggest **two** advantages of using a computer network system in a school setting.

Access information from multiple devices, sharing/saving information, etc.

(ii) Name **two** hardware devices that could be connected wirelessly to a computer network.

Printer, mouse, keyboard, etc.

(iii) Describe **two** measures a business could take to ensure that they have high quality wireless connectivity in their workplace.

Location of router, add signal amplifier, update firmware, etc.

(20 Marks, 8+6+6)

Answer 3(c) ***or*** *3(d)*

3(c) (i) Describe what is meant by the term *Open-Source* when referring to computer software.

Software released where the copyright holder grants the users permission to use, change and distribute the software with its source code.

(ii) Outline **two** items of personal data you might be required to submit when downloading software.

Email address, name, date of birth, etc.

(10 Marks, 4+6)

OR

3(d) (i) Outline the main differences between an eBook and an Audiobook.

An eBook is downloaded to a device and read as normal;
an Audio book is listened to by an end-user.

(ii) Name a file extension commonly used when creating Audiobooks.

MP3, AAX, M4A, etc.

(10 Marks, 6+4)

Option 4 - Manufacturing Systems

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

Answer 4(a) ***and*** *4(b)*

4(a) **(i)** The packaging as shown in the image has been *mass produced*. Describe what is meant by the term mass-produced.

Manufacturing large quantities of standardized products.

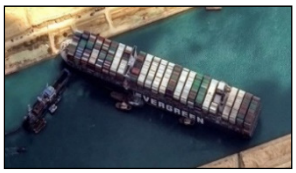
(ii) Suggest **two** ways in which a company could be more environmentally conscious when considering the choice of packaging for their product.

Using less plastic, using biodegradable materials, making packaging as small as possible, etc.

(10 Marks, 4+6)

4(b) **(i)** Explain the manufacturing term *Just-In-Time*.

Products are manufactured just before the market needs them.



(ii) Suggest **one** advantage and **one** disadvantage of using a *Just-In-Time* system of manufacturing.

Advantage: Reduces stock, less storage, less waste, etc.
Disadvantage: No spare products to meet unexpected demand, etc.

(iii) Briefly describe **three** unintended costs for manufacturers as a result of the disruption to the supply chain of products in 2021.

Rise in cost of materials, time spent sourcing products, shipping became more expensive, etc.

(20 Marks, 6+8+6)

Answer 4(c) ***or*** *4(d)*

4(c) **(i)** Briefly describe **two** important roles of a 'managing director' in an organisation.

Understanding all aspects of the business, providing direction, making important decisions, etc.

(ii) Outline **two** ways of promoting good teamwork within an organisation.
Identifying roles of each member, focus on strengths of individuals, setting goals and objectives, etc.

(10 Marks, 6+4)

OR

4(d) **(i)** Outline **two** ways a company might carry out market research for a new product.

Online surveys, interviews, customer observations, etc.

(ii) Suggest **two** negative consequences for a company that does not carry out effective market research.

Less sales, less profit, products less responsive to the needs of consumers, etc.

(10 Marks, 6+4)

Option 5 – Materials Technology

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

Answer 5(a) ***and*** *5(b)*

5(a) (i) Explain what is meant by the term *laminated* when referring to wood products.

Laminated refers to a process where multiple layers of thin wood are assembled with adhesives. A laminated product possesses several advantages over solid wood. It can be used to fabricate large members that are impossible to make from solid wood, etc.

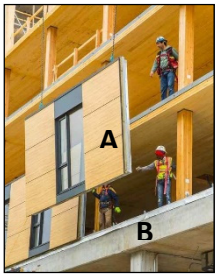
(ii) State **one** advantage and **one** disadvantage of using laminated wood products in the construction of buildings such as the Mjøstårnet.

Advantage: Strong, durable, large sheet formats, etc.

Disadvantage: Sometimes their appearance is not natural, can contain dangerous chemical compounds, etc.

(10 Marks, 4+6)

5(b) (i) Name a suitable timber for the manufacture of the panels shown. Justify your selection.



Pine, Oak, Teak, etc. Justification- Hard wearing, aesthetically pleasing.

(ii) Using notes and annotated sketches, describe how the exterior panel **A** could be attached to the concrete floor **B**.

Bolts, screws, brackets, etc.

(iii) Briefly outline **two** safety precautions to be observed by workers when installing the exterior panel shown**.**

Safety harness, safety glasses, safety shoes, etc. *(20 Marks, 6+8+6)*

Answer 5(c) ***or*** *5(d)*

5(c) (i) Describe **two** properties of aluminium that make it a useful material for the manufacture of drinking bottles.

Lightweight, corrosive resistant, odourless, etc.

(ii) Briefly outline **one** reason for anodising the external surface of a drinking bottle.

Can apply any colour, can add logo/symbol, aesthetics, etc.

(10 Marks, 6+4)

OR

5(d) (i) Describe what is meant by the term *smart material.*

The properties of a smart material can be changed in a controlled fashion by external stimuli, e.g., light, temperature, electricity, etc.

(ii) Briefly outline **one** other possible use for a thermochromic material.

Spoon for baby food, room thermometer, etc. *(10 Marks, 6+4)*

Coimisiún na Scrúduithe Stáit
State Examinations Commission

2022. M103P
2022. M104P

Leaving Certificate Examination, 2022

Technology

Coursework Briefs

Ordinary Level and Higher Level

200 marks

The Thematic Briefs for the Leaving Certificate Examination 2022 are given overleaf.

The Coursework must be available for assessment by Friday 8 April 2022.

Leaving Certificate Technology

Ordinary Level and Higher Level 2022

Instructions to candidates:

1. The coursework submitted for assessment must consist of two components:
   - a design folio *and*
   - an artefact.

2. If **either** assessment component (written examination or coursework) is submitted at Ordinary Level, the subject is graded at Ordinary Level.

3. All coursework submitted for assessment must be clearly identified with your examination number.

4. The coursework submitted for assessment must be **your own individual work** and must be completed in school under the supervision of the class teacher.

5. Your coursework must not be removed from the school setting under **any** circumstances as doing so may result in such coursework being considered invalid.

6. The design folio should record all stages of your work and should document how the artefact meets the stated thematic brief.

7. When using research sources, including the Internet, the sources **must be acknowledged**. Research material copied directly from the Internet or from other sources and presented as your own work will not receive any marks.

8. The coursework should display knowledge and skills developed through your study of the core and chosen options.

9. All important operating features of the artefact must be clearly visible and be easily accessible without dismantling.

10. Where an electrical supply is used to operate the artefact, it should be of low voltage output. Where specialised equipment is required, it must be set up by you, have clear operating instructions and be ready to use.

11. The coursework presented for assessment must be displayed in an attractive manner. Multimedia presentations, where submitted, must be of **maximum** 3 minutes duration, must be set up by the candidate and must be ready for viewing.

The coursework must be available for assessment by Friday 8 April 2022.

Leaving Certificate 2022 - Ordinary Level

Thematic Brief

Ireland's Greenways are a great way to see some of the most beautiful and unspoilt parts of the country while enjoying the outdoors. A Greenway is a predominantly traffic free path, designated for use by pedestrians, families with buggies, cyclists, and other non-motorised vehicles.

When designing a Greenway many factors may need to be considered. These factors can include entrance/egress systems, navigation and information displays, trail safety considerations, and traffic management systems.

In this context, design and make a working model of a device or technological aid that could be used as part of the design of a Greenway. Using modern materials and technologies, your model should incorporate an electronic and/or mechanical system and should be well presented.

Note: The maximum dimension of the artefact you present for assessment should not exceed 500 mm.
If multimedia presentations are used to enhance your display, a hardcopy printout and a digital file (USB flash drive) must be included in your portfolio.

Coursework at Ordinary Level is weighted as follows:

- Design Folio - 40% of marks
- Artefact - 60% of marks

Total - 200 marks

Design Folio - Ordinary Level - 80 marks			
No.	***Heading***	***Description***	***Marks***
1	Analysis, research and investigation	Analysis of thematic brief. Research into chosen area. Analysis of existing solutions.	10
2	Overall management of the project	Analysis of available resources, time and budget constraints; proposed timeframe etc.	5
3	Environmental impact	Impact of materials and production processes; product use; suitability for reuse/recycling.	5
4	Design ideas and selection of optimum solution	Annotated **freehand** sketches outlining three possible solutions. Optimum solution identified and justified.	10
5	Sketches and drawings for manufacture	Detailed annotated sketches and drawings including all elements/aspects of solution; circuit diagrams/ flowcharts/ models/prototypes/dimensions/scale/assembly details.	15
6	Production planning	Materials and component lists; scheduling, work breakdown structure, costing.	10
7	Product realisation	Sequence of manufacture including photographic record.	15
8	Evaluation and testing	Testing against chosen brief. Evaluation of final artefact. Comparison of planned schedules and actual schedules. Suggested modifications with justification.	5
9	Presentation and ICT	Correct sequence of presentation. Quality of material presented. ICT skills in production of folio.	5

Artefact - Ordinary Level - 120 marks			
No.	***Heading***	***Description***	***Marks***
1	Artefact meets theme & specification	Solution presented fulfils the thematic brief and specifications.	15
2	Creativity	Creativity in design, aesthetics & ergonomics. Creative and appropriate use of materials.	15
3	Production skills	Processing of materials. Assembly of materials and components. Range and depth of skills.	30
4	Functionality	Artefact works well. Appropriate/limited use of commercial components/solutions.	30
5	Quality and finish	High quality manufacture. Artefact well finished. Due regard for health and safety.	20
6	Presentation	Coursework well presented. Parts well integrated and labelled where appropriate.	10

Note: ***While the general headings and marks above will largely remain the same, breakdowns may vary depending on the actual brief for any given year.***