Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2015

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.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2015

Technology

Ordinary Level

Marking Scheme

Section A - Core *(72 marks)*

Instructions:

(a) *Answer **any nine** questions in the spaces provided.*
All questions in Section A carry 8 marks.

Section A. Answer **any nine** questions. All questions carry 8 marks.

1. The image shows a *multi-tool* marketed by survival specialist Bear Grylls.

(i) Name **two** tools contained in the multi-tool shown.

1. Long Nose Pliers.

2. Scissors/Knife, etc.

(ii) Describe **one** situation where a multi-tool would meet the requirements of an individual.

Emergency repairs to electrical equipment/Any appropriate situation, etc.

(3+3+2 marks)

2.

(i) The image shows red *LEDs*.
Explain what is meant by the abbreviation LED.

LED: **Light Emitting Diode.**

(ii) Outline **two** methods of determining the *cathode* of an LED.

1. Shorter Leg.

2. Flat edge on the side of the LED.

(4+2+2 marks)

3. Wind turbines are used as a means of producing energy. They can be situated on land or at sea.

(i) List **two** advantages of using wind turbines.

1. Renewable source of energy.

2. Availability of Wind/Minimal Pollution, etc.

(ii) Name **one** energy conversion that takes place when wind turbines are generating electricity.

Kinetic to mechanical/mechanical to electrical/mechanical to sound, etc.

(3+3+2 marks)

4. Wireless printers have become very popular at home and at work.

(i) Name **two** devices that can print directly to a wireless printer.

1. Laptop computer.

2. Tablet/Smartphone, etc.

(ii) Give **two** benefits of using a *laser* printer instead of an *inkjet* printer.

1. Better quality printing.

2. Print cartridges last longer, etc.

(4x2 marks)

5. The image shows a *band saw* suitable for use in a Technology room.

(i) Give **two** safety precautions that should be observed when using a band saw.

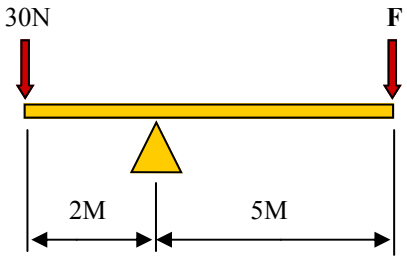
1. Wear goggles.

2. Use a guide stick/ Ear protection, etc.

(ii) Explain the purpose of the *tension adjuster* on the band saw as indicated by the arrow **A**.
To allow the band saw blade to be fitted/adjusted/tensioned to cut effectively.

(3+3+2 marks)

6. A lever diagram is shown opposite.



(i) Name the *class* of lever shown.

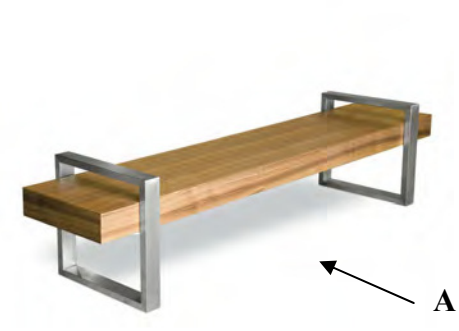
Class One lever.

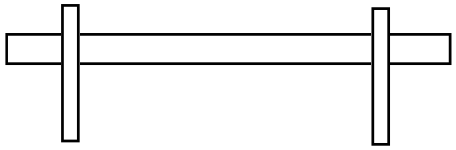
(ii) If 30N is applied as shown in the diagram, calculate the force **F** required to balance the lever.

Force (F): **Force x Distance (left side) = Force x Distance (right side)**
30N x 2m = F x 5m
F = 60Nm/5m
F = 12N

(4+4 marks)

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





(Very good sketch - *8 marks*
Fair sketch - *4 marks)*

8. The ESB launched 'The Great Electric Drive' to promote greater use of electric cars in Ireland.

(i) Give **two** advantages of using electrically powered cars instead of using petrol powered cars.

1. **Environmentally friendly/Less reliance on fossil fuels.**
2. **Cheaper running costs, etc.**

(i) Explain what is meant by a *hybrid* car.

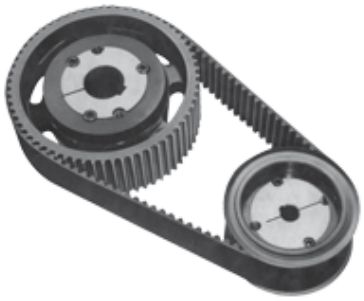
This is a car that uses two or more power sources to move itself. Typically it involves combining an internal combustion engine and one or more electrical motors. Hybrid cars can achieve greater fuel economy and release less emissions into the atmosphere etc.

(3+3+2 marks)

9. The mechanism shown allows mechanical power and torque to be transmitted.

(i) Name the mechanism shown.

Toothed belt pulley system.



(ii) Give **one** advantage of using this mechanism in a product.

Reduced slippage with a toothed belt, etc.

(4+4 marks)

10. The paper towel holder shown is manufactured from a *softwood* and a *metal*.

(i) Name a suitable *softwood* and a suitable *metal* which could be used to make the paper towel holder.

Softwood: **Pine.**

Metal: **Stainless Steel/Aluminium, etc.**

(ii) Give **two** reasons for selecting your chosen metal.

1. Strong.

2. Durable/ will not rust/ Appearance, etc.

(*4x2 marks)*

11. The image shows a laptop transformer that converts *AC* to *DC*.

(i) Explain what is meant by terms AC and DC.

AC: **Alternating Current.**

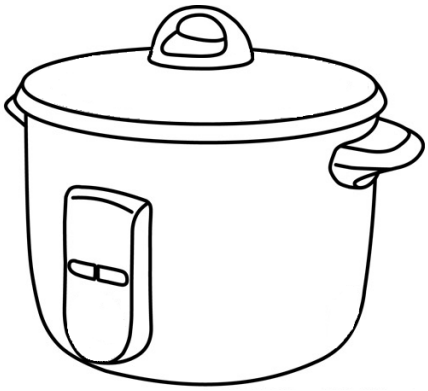
DC: Direct Current.

(ii) Current is measured in amps (A).
Give the unit of measurement of *Resistance*.

Unit of Resistance: **The Ohm (Ω)**

(*3+3+2 marks)*

12. Use **two** graphic techniques to enhance the graphic representation of the crock pot shown.



Rendering/colour/shading/ shadow/hatching etc.

(*4+4 marks)*

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Leaving Certificate Examination, 2015

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Marking Scheme

Section B - Core *(48 marks)*

*Answer **both** questions.*
Each question in Section B carries 24 marks.

Section C - Options *(80 marks)*

*Answer **two** of the five options presented.*
All questions in Section C carry 40 marks.

Section B - Core *Answer Question 2 **and** Question 3.*

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

2(a) The Irish Government intends to introduce domestic water charges for homes connected to public water systems and public wastewater services.

(i) Briefly describe **two** ways in which water usage in the home can be reduced.
Use a shower instead of a bath, recycle water usage where possible, tap limiters etc.

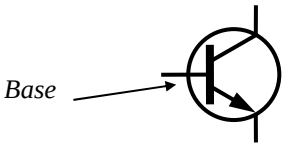
(ii) Outline **two** benefits of conserving water.
Less wastage is better for the environment, reduced water bill for consumers, reduced risk of reservoirs running dry in periods of hot weather etc.

(10 Marks, 6+4)

2(b) The image shows the circuit diagram for a moisture sensor circuit. The circuit is used in a water tank to activate a light emitting diode (LED) when the tank is full.

(i) Name a suitable material for the *probes* and give **one** reason for selecting this material.
Eg. **Copper– A conductor of electricity, strong etc.**

(ii) Redraw the symbol for the transistor shown and label the *base*.



(iii) Suggest, using notes and annotated sketches:

1. A suitable casing to contain the moisture sensor circuit.
Any suitable casing- vacuum formed etc.

2. An appropriate method of attaching the casing to the water tank.
Screw, clip or hinge attachment etc.

(8 Marks, 2+2+4)

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

2(c) The meters used by Irish Water feature *Automatic Meter Reading* (AMR) technology. This 'drive-by' technology allows for water meters to be read remotely.

(i) Give **two** advantages of using this technology to gather data.
Meters do not have to be opened, less time consuming,
Greater accuracy in readings taken (less risk of human error) etc.

(ii) Wireless technology is used in AMR. Using notes and sketches, briefly describe how a wireless transmission might work.
Transmitter and receiver units, use of radio signals etc.

(6 Marks, 4+2)

OR

2(d) The image shows a compression fitting used for joining water pipes.

(i) Suggest **two** features (*quality attributes*) of the fitting shown which would indicate that it is a product of high quality.
Selection of materials, Design of the fitting, Manufacturing processes used etc.

(ii) Give **two** costs associated with improving the quality of a public water system.
Replace/Repair burst water pipes, water meter installation, water treatment plants etc.

(6 Marks, 4+2)

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

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

3(a) One role of the Health and Safety Authority (HSA) is to promote accident prevention through the use of *Personal Protection Equipment* (PPE) in work environments.


Protective Gloves

(i) Briefly describe any **two** safety hazards found in a Technology workshop.
Pillar Drill– Rotating chuck/drill.
Soldering Iron– Hot tip when in use.
Sanding Machine– Face mask required to prevent dust inhalation, etc.

(ii) Name a suitable material for the manufacture of the protective gloves shown.
Give **one** reason to justify your selection.
Cotton– Strong and durable, etc.
Alternative materials: leather, PVC/Latex etc.

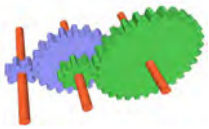
(10 Marks, 6+4)

3(b) A *Power Take Off* (PTO) is a method of taking power from a running engine and transmitting it to a separate machine or attachment. PTO shafts are commonly used with agricultural machinery.

(i) Outline the function of the plastic guard of the PTO shaft shown.
To protect individuals from serious injury, etc.

(ii) The internal metal shaft contains a *universal joint*.
Briefly describe an advantage of using universal joints.
This joint offers a excellent range of movement, etc.

(iii) A power take off (PTO) shaft operates at 540 RPM (revolutions per minute), but a tractor engine operates at a higher RPM.
Describe, using notes and sketches a mechanism used to achieve speed reduction.
A compound gear system/gearbox could be used to achieve the desired speed reduction etc.



(8 Marks, 2+3+3)

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

3(c) The graphic shows a PTO shaft drawn using a CAD program.

(i) Give **two** reasons why CAD software is used to design components
Accuracy, Visualisation, Speed, Print capabilities, etc.

(ii) Explain what is meant by the term CAM.
Computer Aided Manufacture.
Manufacturing involving machines such as a CNC router, etc.

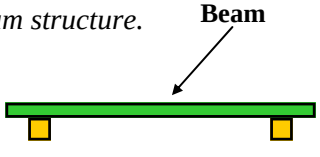
(6 Marks, 4+2)

OR

3(d) The guard of a PTO shaft is an example of a *shell structure*.

(i) Give **one** other example of a shell structure in an everyday product.
Body panels of a car, plastic toys, etc.

(ii) Describe, using notes and sketches what is meant by a *beam structure*.



Give **one** example of where a beam structure is used.
Any relevant use, e.g. a steel bridge,
Pre-cast concrete floor panels, etc.

(6 Marks, 2+4)

Section C - Options - *Answer **any two** of the Options*

Option 1 - Applied Control Systems - *Answer 1(a) **and** 1(b)*

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

1(a) The images show a *microcontroller* and a *chip socket* used with printed circuit boards (PCBs).

(i) Briefly describe the benefits of using an **18 pin** microcontroller in terms of the inputs and outputs available to a student.

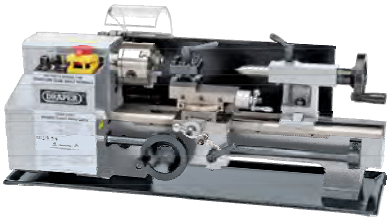
Greater number of input/output devices can be used compared to 14 pin and 8 pin PICs.
18 pin microcontrollers also allow the use of servo and stepper motors.
These microcontrollers also allow d.c. motor reversal to be used in student project work, etc.

(ii) Give **two** reasons why chip sockets are used when soldering PCBs.

To protect the chip from heat damage during the soldering process.
To allow faulty chips to be replaced easily without the need to re-solder the PCB, etc.

(10 Marks, 4+6)

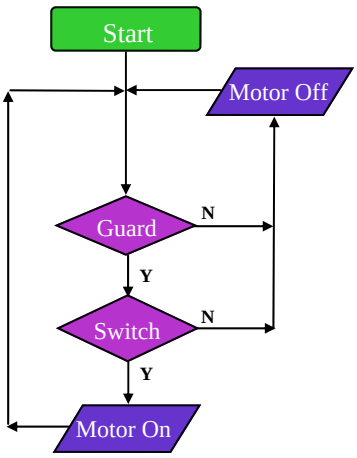
1(b) A student is asked to produce a flowchart for a workshop lathe. The *safety guard* must be in place and the *switch* must be pressed before the lathe will turn on.



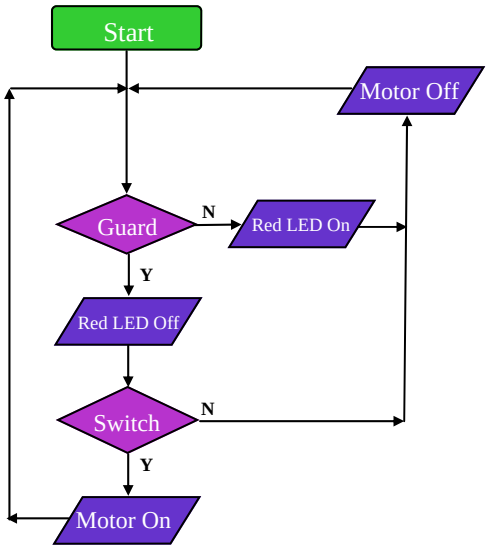
(i) Complete the given flowchart for the workshop lathe.

(ii) Sketch a modification to the flowchart to include a red LED which lights when the safety guard **is not** in place.

(i)



(ii)



Any valid alternative solution accepted.

(iii) Outline **two** advantages of using PICs instead of a conventional electronic circuit.

The ability to re-program PICs makes them very versatile, less wiring required in PIC circuits compared to conventional electronic circuits, Using flow-charts allows the operation of a program to be followed logically, etc.

(20 Marks, 8+6+6)

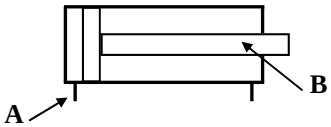
Answer 1(c) ***or*** *1(d)*

1(c) The image shows a heavy duty multi-purpose paint spray gun. The spray gun uses *pneumatic* power.

(i) Explain what is meant by pneumatic power and give **one** other example of where it is used.

Pneumatic power uses compressed air to do work and effect mechanical motion. Assembly line applications– drilling, clamping, ejecting, etc.

(ii) Name the pneumatic component shown below. What is the function of the parts labelled **A** and **B**?



Double acting cylinder.

A- Compressed Air Inlet B- Piston Rod
The compressed air forces the piston rod out of the cylinder. The piston rod retracts when compressed air is forced through the inlet at the opposite end. ***(10 Marks, 4+6)***

OR

1(d) *Humanoid robots* are being designed for work in the field of medicine.

(i) Describe the main features of a humanoid robot.
A humanoid robot resembles the human body having a torso, a head, two arms and two feet. It may also have sound and vision sensors, etc.

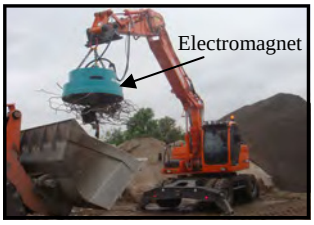
(ii) List **two** advantages of using such robots in this area of work.
Accurate, reliable, the risk of human error is reduced, etc.

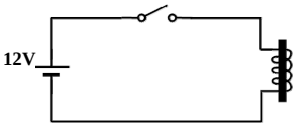
(10 Marks, 6+4)

Option 2 - Electronics and Control - *Answer 2(a) **and** 2(b)*

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

2(a) The image shows a crane using an *electromagnet* to lift scrap metal.





(i) Describe how an electromagnet works.
A coil is wrapped around an iron core and a current passed through it. This creates a magnetic field around the coiled wire, magnetising the metal as if it were a permanent magnet, etc.

(ii) An circuit incorporating an electromagnet has a voltage of 12V and a current of 0.25 amps. Calculate the *power* used in the electromagnet.

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

P= 0.25 x 12 = 3W

(10 Marks, 4+6)

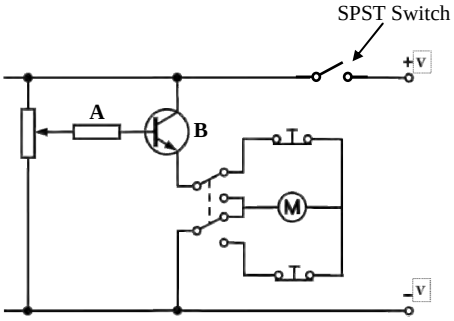
2(b) The circuit diagram shown allows forward and reverse control of a motor and includes speed control. A student has incorporated this circuit into a model of a garage roller door.

(i) Name components **A** and **B** in the circuit.
A– Resistor, B– Transistor.


Garage roller door

(ii) Briefly describe the operation of the circuit.

The potentiometer controls the gain of the transistor. This allows for current to be increased/decreased to the motor controlling its speed as a result. The DPDT switch allows for motor reversal while the limit switches stop the motor when required, etc.

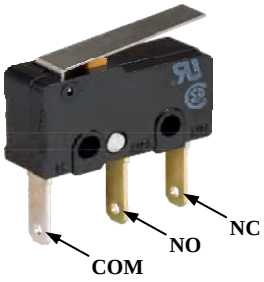


(iii) Redraw the given circuit diagram to include a master on/off *SPST switch* to activate the circuit.

(20 Marks, 6+6+8)

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

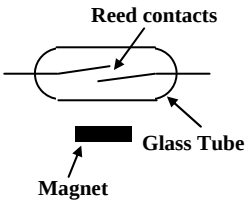
2(c) The image shows a lever microswitch as commonly used in electronic circuits.



(i) Explain what is meant by the abbreviations *COM*, *NO* and *NC*.
COM- Common, NO- Normally Open, NC- Normally Closed

(ii) Using notes and annotated sketches, describe the operation of a *reed switch*.

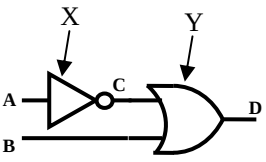
When a magnet is brought close to the glass tube, its magnetic field pulls the metal reeds together activating the switch.
The reeds open again once the magnet is removed, etc.



OR

(10 Marks, 6+4)

2(d) The graphic shows a combination of two logic gates.



(i) Name the logic gates shown at **X** and at **Y**.
X- NOT gate Y- OR gate.

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

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

(10 Marks, 6+4)

Option 3 - Information and Communications Technology - *Answer 3(a) **and** 3(b)*

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

3(a) Many individuals have access to a range of ICT devices in their homes including *laptops* and *tablets*.

(i) Outline **two** reasons why tablets might be more popular than laptop computers when performing simple ICT related tasks.
More lightweight/portable, more user friendly, speed, cost, etc.

(ii) Computers generally perform more slowly over time.

Suggest **two** ways to help ensure that a computer continues to operate optimally - quickly and reliably- throughout its life cycle.
Clear cache on a regular basis, update systems software as required, remove unwanted files/programs as necessary, etc.

(10 Marks, 6+4)

3(b) Network computer systems allow for the use of *shared folders.* These folders may be accessed by several users on a network.

(i) Give **two** advantages of using shared folders on a network.
Different people can access common information/easier to transfer information, etc.

(ii) Describe why some documents should be saved as *read only* files on a shared network.
To prevent accidental or deliberate deletion of these files.

(iii) Using notes and annotated sketches, describe how a *local area network* (LAN) could be set up for a small business.
Main requirements for a LAN:
PCs/Laptops, server, switch, router, modem, etc.

(20 Marks, 8+6+6)

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

3(c) In 2014 a computer bug known as 'Regin' was uncovered by a computer security company. This piece of malware had the potential to allow its creators to spy on companies and government agencies.

(i) Outline **two** reasons why malware might be created to spy on individuals or organisations.
To access secure data such as financial records and personal details.
To find out what strategies are used by competitors to gain an advantage in the markets, etc.

(ii) Suggest **one** initiative a government could introduce to protect personal or corporate data.
Promote an awareness campaign for greater internet security, incentivise the use Firewalls and Anti-Virus software, legislation, etc.

(10 Marks, 6+4)

OR

3(d) The images **A**, **B** and **C** show cable connectors used to connect ICT devices.

A

B

C

(i) Name the connectors **A**, **B** and **C**.
A– USB, B– Stereo Jack , C– HDMI.

(ii) Give an application for **any two** of the connectors shown above.
USB– Mouse/Keyboard, Stereo Jack– Headphones, HDMI– Gaming Console/TV, etc.

(10 Marks, 6+4)

Option 4 - Manufacturing Systems - *Answer 4(a) **and** 4(b)*

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

4(a) *Production lines* have been in use since the last century. They are used by companies to facilitate the large scale manufacture of products.

(i) Give **two** benefits for companies who use production lines to manufacture products.
Employees are highly skilled in doing specific tasks, reduced costs and time, etc.

(ii) Suggest **two** products which are suitable for large-scale manufacture using production line methods.
Automobiles, computers, toys, etc.

(10 Marks, 6+4)

4(b) The image shows a *food mixer* commonly used in food preparation.

(i) Briefly describe the importance of *testing* when designing a product such as a food mixer.
Find faults, to meet safety standards, to improve manufacturing processes, etc.

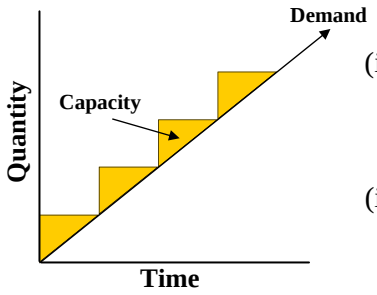
(ii) Suggest **two** aspects of the food mixer shown which could be tested to ensure that it meets performance related standards.
The variable speeds of the motor, the stability of the mixer when in use, etc.

(iii) Describe the main steps you took when testing **one** aspect of your Leaving Certificate Technology project.
Description of a relevant test carried out on the project.

(20 Marks, 8+6+6)

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

4(c) *Capacity management* is a process where a manufacturer closely monitors the demand for a product or service they offer.



(i) Give **two** reasons why a manufacturer might increase, for a period of time, the quantity of a product it produces.
To meet projected demands, lower cost of raw materials at a moment in time, etc.

(ii) With reference to the graphic shown, briefly describe what is meant by the term '*lead capacity*'.
A manufacturer increases production in anticipation of expected growth of a product. For example, a phone company increases the production of a new phone in expectation of a high demand for the phone once it goes on sale, etc.

(10 Marks, 6+4)

OR

4(d) *Just in Time (JIT)* is an manufacturing strategy used by many companies across the world. There are many benefits for a company that uses this approach when manufacturing goods.

(i) Explain what is meant by the term 'Just in Time' manufacturing.
JIT sets out to cut costs by reducing the amount of goods and materials a business holds in stock. Parts/components only arrive as required, etc.

(ii) Name **one** company that uses this manufacturing approach.

Give **one** benefit for this company in using JIT manufacturing.
Any relevant company, e.g. a Florist.
Flowers are only ordered from a wholesaler when a florist has a customers order, etc.

(10 Marks, 4+6)

Option 5 - Materials Technology - *Answer 5(a) **and** 5(b)*

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

5(a) Metals are often used in the form of *alloys.* Many people purchase alloy wheels for their cars.

(i) Explain what is meant by the term 'alloy'.
Give **one** advantage of using metals in this form.
An Alloy is a mixture of two or more metals that is produced with specific properties in mind – e.g. strength, weight, appearance, etc.

(ii) Name the metals used to produce each of the following alloys:

1. Bronze– **Copper and Tin.**
2. Solder– **Lead and Tin.**

(10 Marks, 6+4)

5(b) The image shows a garden playhouse suitable for use by children. The playhouse is made using a range of materials.

(i) Name a suitable *wood* for the manufacture of frame of the playhouse.
Treated softwood, Teak or other naturally durable hardwood, etc.

(ii) Using notes and annotated sketches, describe a suitable method of fixing the slide to the frame.
Assembly involving nuts and bolts or screws, clip on system, etc.

(iii) Garden products must meet stringent safety standards before they are passed as being fit for sale.

Briefly outline **two** safety features incorporated into the design of the playhouse shown.

Triangulated frame, rounded edges, appropriate fixtures used, etc.

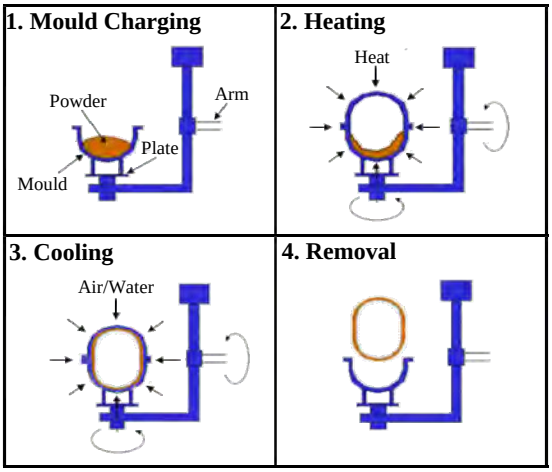
(20 Marks, 6+8+6)

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

5(c) The plastic slide at ***5(b)*** above could be manufactured using *rotational moulding*. The main steps of the rotational moulding process are shown in the graphics below.

(i) Give **one** suitable thermoplastic material that could be used to manufacture the slide using rotational moulding.
Polyethylene, PVC, Nylon, ABS, etc.

(ii) Briefly describe the steps involved in rotational moulding as outlined in the graphics below.



1. Mould Charging– Plastic powder is added into the mould.

2. Heating– The mould is closed and heated.
As the plastic softens, the mould begins to rotate.

3. Cooling- The softened plastic takes the shape of the mould as it rotates. Once this process is complete, the cooling of the mould commences.

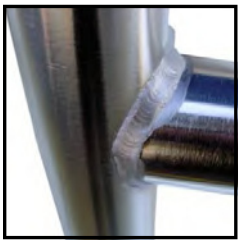
4. Removal- Once the mould has cooled sufficiently, the moulded plastic component is removed, etc.

(Very good description– *6 marks*
Fair description- *4 marks)*

(10 Marks, 4+6)

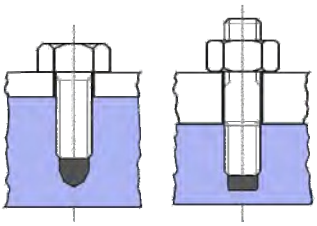
OR

5(d) The image shows a welded joint. Welding is a means of permanently joining two pieces of metal.



(i) Name **two** other types of permanent joints.
Brazed joint, soldered joint, adhesive joint, etc.

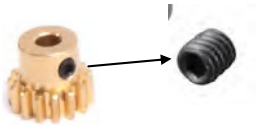
(ii) Describe using notes and annotated sketches **one** *semi-permanent* joint.
Description of a relevant joint.



Machine screw **Stud**

Machine screw– Used to hold a plate to a cast housing, etc.

Stud– Used to secure machines to factory floors, etc.



Grub screw

Grub screw– Used to lock gears onto shafts, etc.

(Very good description– *6 marks*
Fair description- *4 marks)*

(10 Marks, 4+6)

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