



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2013

Marking Scheme

Technology

Higher 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.



Junior Certificate Examination, 2013

Technology

Higher Level (Marking Scheme)

Wednesday, 19th June
Afternoon, 2:00 - 4:00

Section A

Instructions:

1. Answer **Section A** (short answer questions). 100 marks
2. Answer either **(a) or (b)** from each question in **Section B**. 50 marks
3. Answer **one** question from **Section C**. 50 marks
4. Hand up this paper at the end of the examination along with answer sheets for **Section B and Section C**.

Centre Number

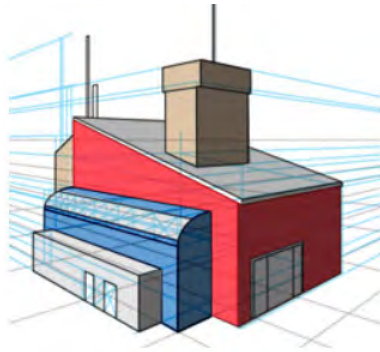
Examination Number

For Examiner	
Question	Mark
Section A	
Section B Q1 (a)	
(b)	
Q2 (a)	
(b)	
Section C Q3	
Q4	
Q5	
Q6	
Total	
Grade	

Write your examination number in the box provided on this page.

Section A Answer 25 questions from this section - all questions carry equal marks. **100 marks**

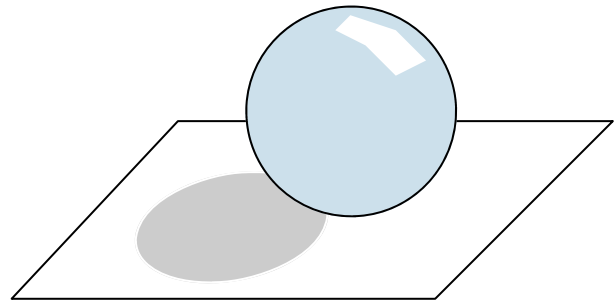
1. Name the type of drawing projection shown.



Answer: Pictorial, 3D, isometric, perspective: 4 mks

2. Use **two** rendering techniques on the graphic shown to suggest a sphere.

Surface shading on sphere—2 mks
Shadow on the plane—2 mks



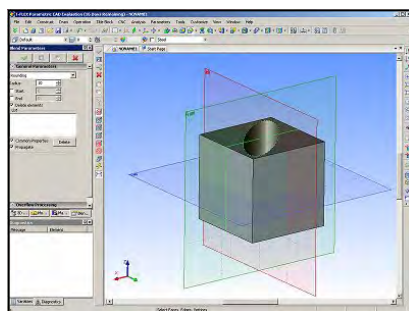
3. Name **two** new technologies found in handheld devices.



(i)/(ii): 2 x 2 mks

Cameras, Wi-Fi, Bluetooth, Touch screen, Multi-gesture screen, virtual keyboard, accelerometers, etc.

4. State **two** advantages of using CAD to produce a drawing.



(i)/(ii): 2 x 2 mks

Easy to alter (scale, render, colour, shade) graphic, store file etc.

5. State the meaning of **each** of the safety signs shown.



(i)



(ii)

(i): Electrical hazard—2 mks

(ii): Toxic—2 mks

6. Name **one** natural material
and

one synthetic material used to manufacture the bicycle shown.



Natural: Leather—2 mks

Synthetic: Carbon fibre, Al alloy, Mg/Ti alloy, butyl rubber— 2 mks

7. State **two** reasons why manufactured board is more widely used than native timber in furniture manufacture.



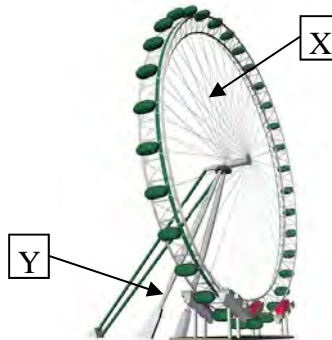
(i)/(ii): 2 x 2 mks

No defects (knots), large sheets, Consistent quality, range of finished .

8. Name the forces operating at X (spoke cables)

and

at Y (A frame legs) in the structure shown.



X: Tension—2 mks

Y: Compression—2 mks

9. State **two** advantages of using a dowel joint to form the drawer shown.



(i)/(ii): 2 x 2 mks

Hidden joint, strength, easy to manufacture

10. The tool shown uses a *thermoplastic adhesive*.

Name the tool

and

explain the term thermoplastic.



Tool: Hot glue gun—2 mks

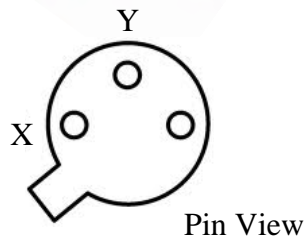
Thermoplastic: Plastic can be reshaped by heat—2 mks

11. Name the unit of capacitance



Name: Farad— 4 mks
Symbol only 'F' — 2 mks

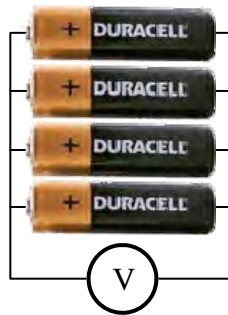
12. Name the legs of the transistor labelled X and Y on the pin view shown.



X: Emitter—2 mks

Y: Base—2 mks

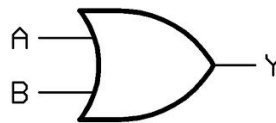
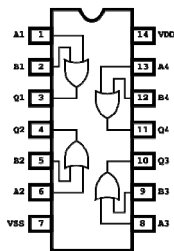
13. State the total voltage supplied by 4 x 1.5V cells connected in parallel.



Voltage: 1.5V—4 mks

14. The chip shown contains four logic OR gates.

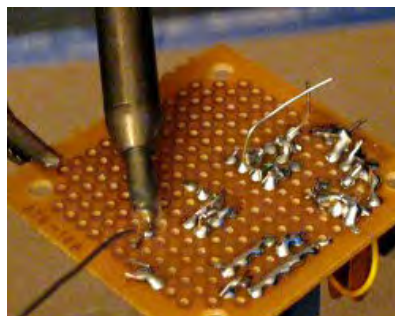
Complete the truth table shown for the OR gate.



Truth Table

A	B	Y
1	1	'1' —2 mks
0	1	'1' —2 mks

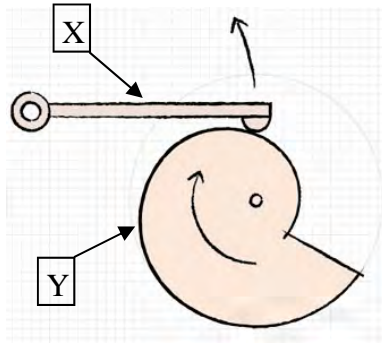
15. State **two** safety precautions which should be taken when soldering electronic components.



(i)/(ii): 2 x 2 mks

Ventilation, keep iron in stand when not in use, goggles, mask, lead free solder.

16. Name the parts labelled X and Y of the mechanism shown.



X: Follower—2 mks
Lever—2 mks

Y: Cam—2 mks

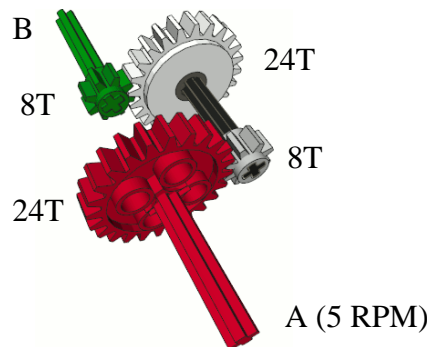
17. State **one** advantage and **one** disadvantage of a chain drive compared to a belt drive in a mechanism.



Advantage of chain drive:
no slippage / belt can snap
— 2 mks

Disadvantage of chain drive:
Lubrication required, cost, noise

18. In the gear system shown; if shaft A turns at 5 RPM, calculate the speed of shaft B.



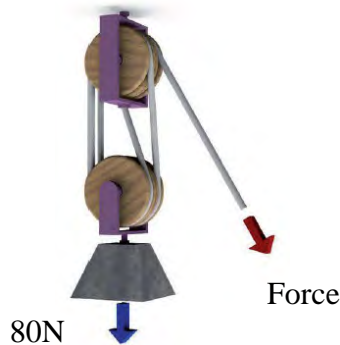
Answer: 45 RPM—4 mks

$$24 \times 5 = 8 \times X1 \quad (15—2 \text{ mks})$$

$$24 \times 15 = 8 \times X2 \quad (45—2 \text{ mks})$$

Alt: 5RPM 1:3 15 RPM
15 RPM 1:3 45 RPM

19. Calculate the force required to lift the 80N load in the pulley system shown.



Force: 20N—4 mks

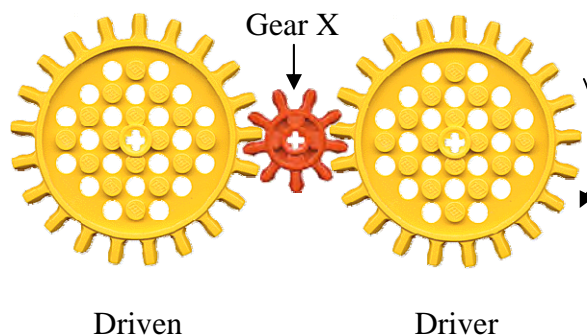
ALT:

$$F/MA$$

$$80/4$$

$$20N$$

20. In the gear system shown, name the gear labelled X and state its function.



Name: Idler—2 mks

Function:
Reverse direction
of driver, Driver &
driven same dirn.
—2 mks

21. Give **two** reasons why public transport should be used in cities in place of cars.



(i)/(ii): 2 x 2 mks

Less congestion, less pollution, Efficiency, cost, etc.

22. Name **two** modern methods of food preservation.



(i)/(ii): 2 x 2 mks

Irradiation, vacuum packing, modified atmosphere (N₂, CO₂, low O₂)

23. State **two** reasons why we should recycle packaging.



(i)/(ii): 2 x 2 mks

Reduce waste, reduce cost, create employment, clean up environment

24. State **two** reasons why digital cameras have become more popular than film cameras.



(i)/(ii): 2 x 2 mks

Ease of use, instant access to images, easy to alter images, easy to upload/share images.

25. State **two** functions of a USB port on a computer.



(i)/(ii): 2 x 2 mks

Connect to external device (printer, camera), memory storage (HD/USB stick), source of power on PC for external device.

26. Name the tools labelled X and Y.



X: Counter sink bit—2 mks



Y: Drill chuck—2 mks

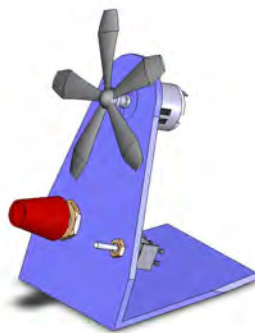
27. State **two** advantages of using LED lighting in public places.



(i)/(ii): 2 x 2 mks

Low cost, energy efficient, small size, Longer life, less heat produced, et

28. State **two** questions which should be considered when evaluating a completed task.



(i)/(ii): 2 x 2 mks

Is it safe, Does it function as required, Does it meet the brief

29. Why is it necessary to drill small vent holes in the vacuum forming mould shown?



Answer: Allow plastic to conform closely to mould—4 mks

30. State the purpose of the covering material on the acrylic sheet shown.

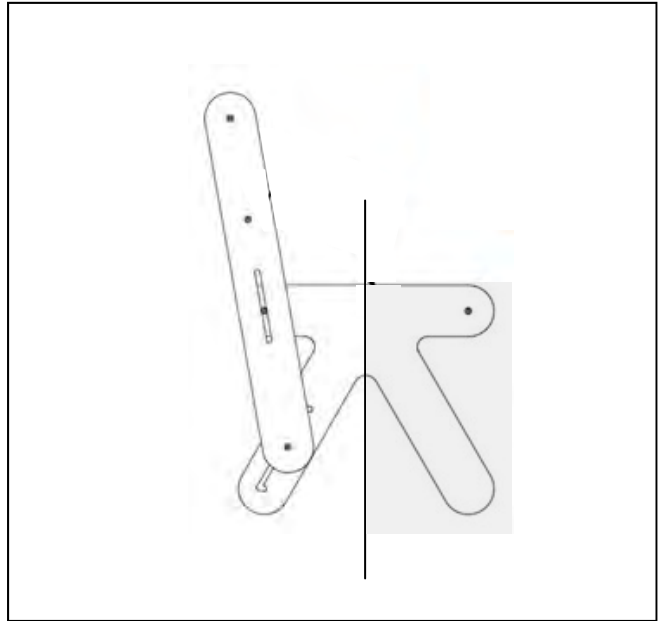


Purpose: Protection, allow marking on cover of acrylic— 4 mks

31. Shown is a pictorial view of a chair.
Complete the elevation view in the space provided.



Elevation

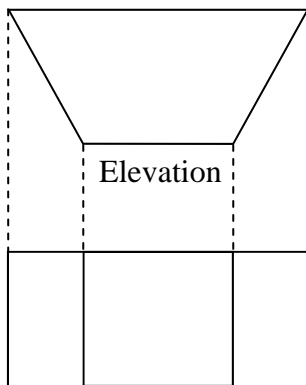
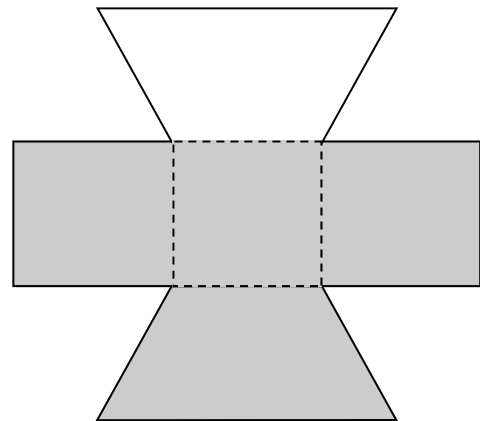


Elevation View: 4 mks
2 mks: base of chair (mirror image)
2mks: upright

32. Complete the development of the skip shown.



Development: 4 panels x 1 mks



Plan



Junior Certificate Examination, 2013

Technology

Higher Level

Wednesday, 19 th June
Afternoon, 2:00 - 4:00

Section B and Section C

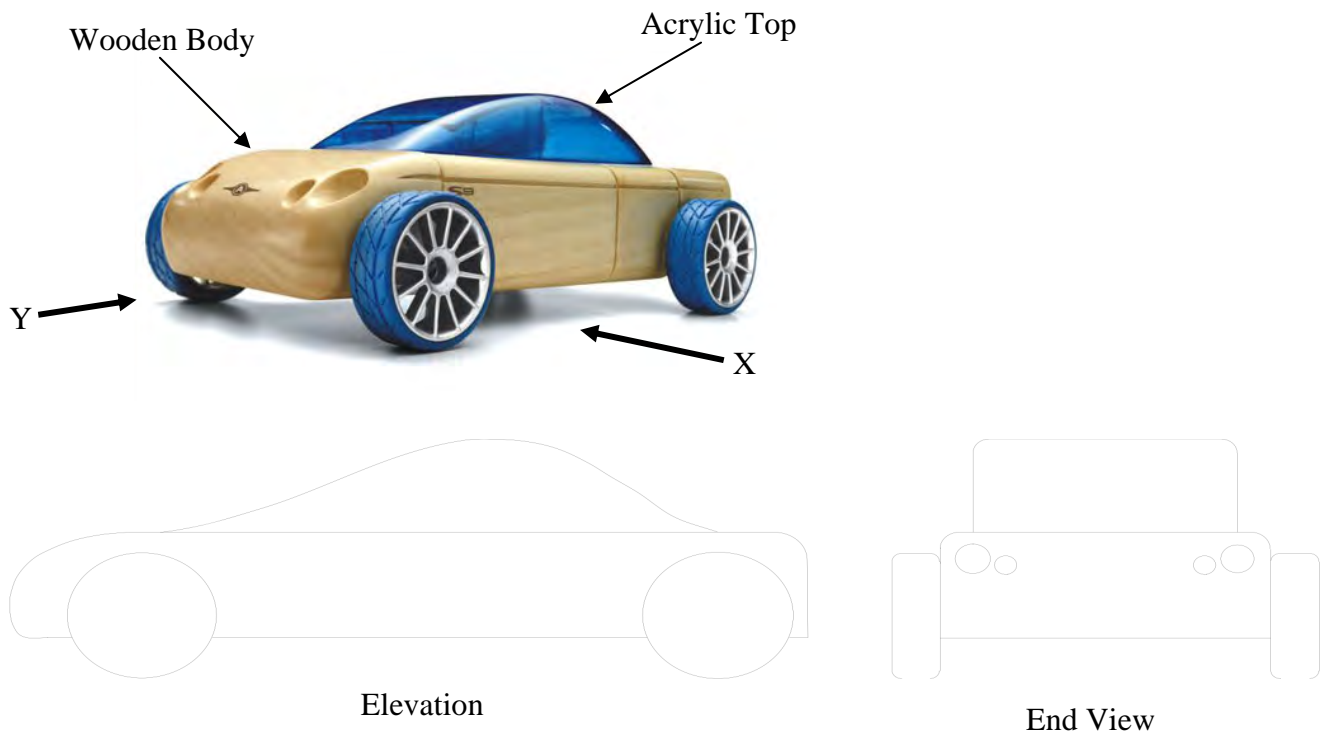
Section B - 50 marks

Section C - 50 marks

Instructions:

1. Answer either **(a)** or **(b)** from each question in **Section B**.
2. Answer **one** question from **Section C**.
3. Hand up **Section A** with your answer sheets to this paper.

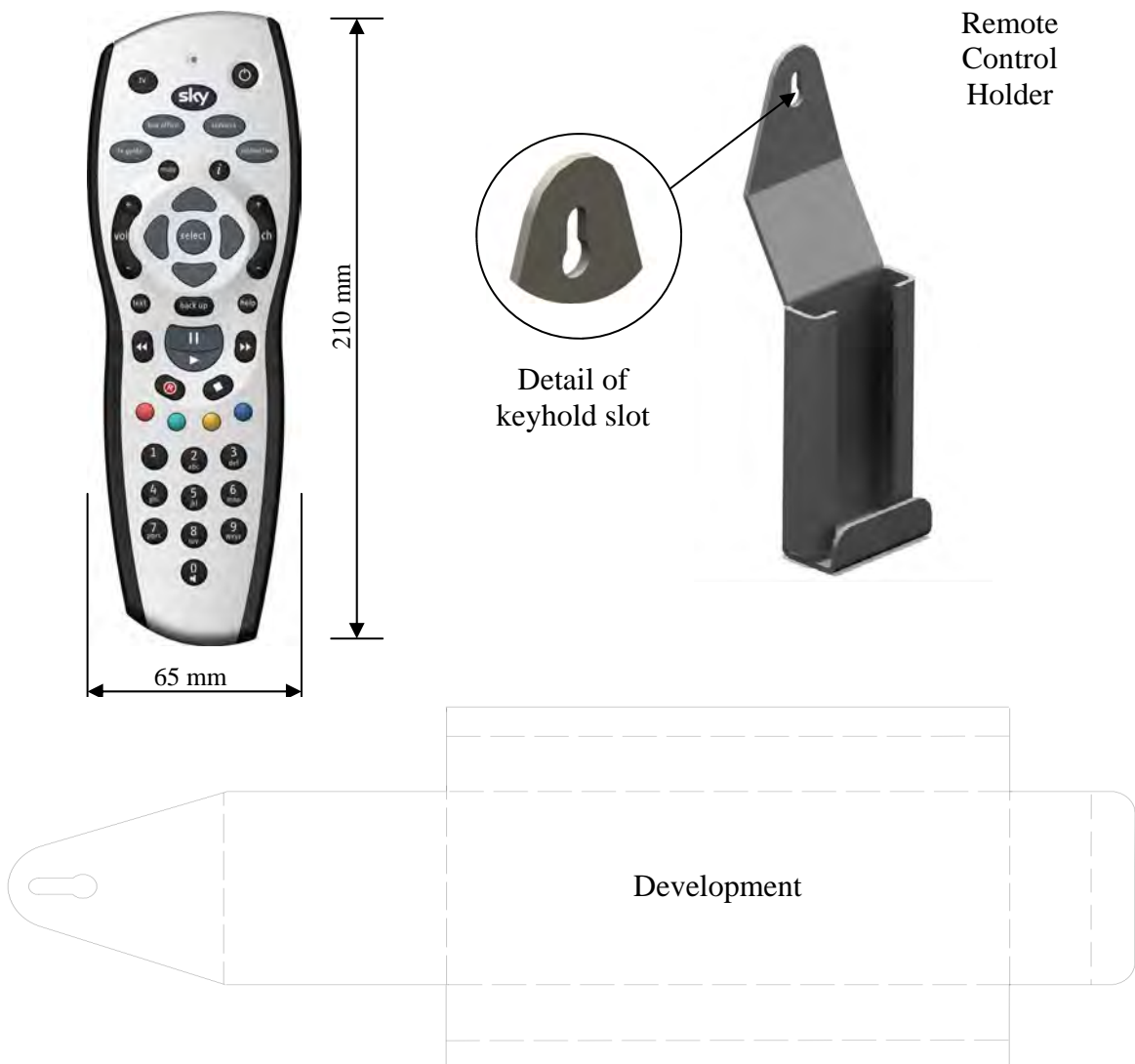
- 1 (a) The graphic shows a toy car. The body is made from 160 x 50 x 30 mm red deal. The top is made from translucent acrylic and can be removed to allow access to a motor and battery.



- (i) Make well-proportioned sketches of the following views:
- An **elevation** in the direction of arrow **X**. [5 marks]
Correct elevation: 2 mks, Wheels, body & top 3 x 1 marks
(The wheels should be shown as circles, omit the spokes)
 - An **end view** in the direction of arrow **Y**. [5 marks]
Correct end-view: 2 mks, Lights, top & wheels 3 x 1 mks
- (10 marks)
- (ii)
- A hollow space needs to be formed in the wooden body of the car to hold a battery and motor. Describe, using suitable sketches, how this hollow space could be formed. [5 marks]
Sketch: 2 mks, method used (3, 2, 1) - process & tool(s)
 - The acrylic top can be easily removed to replace the battery. Describe, using suitable sketches, how the top could be attached and detached from the car. [5 marks]
Sketch: 2 mks, method used (3, 2, 1) - process & tool(s)
- (10 marks)
- (iii) Outline **two** processes which might be used to finish the wooden car body to a high standard similar to the graphic shown. [5 marks (3 + 2)]
Named process: sanding, varnish, wax, stain (1 mk) & process outlined

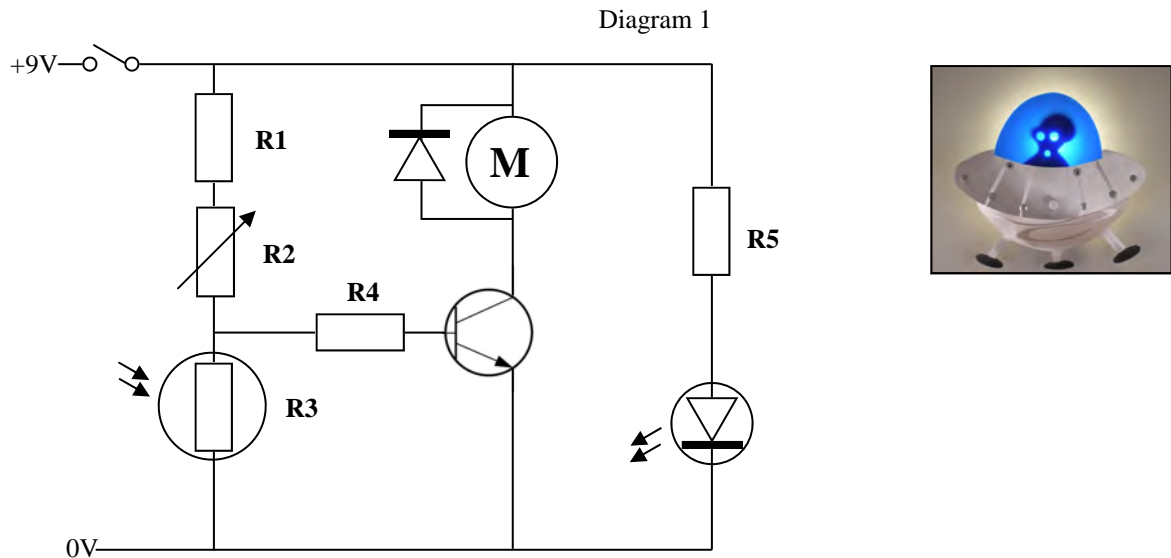
- OR -

- 1 (b) The graphic on the right shows a student design for a wall-mounted remote control holder. The holder is to be manufactured from 3 mm acrylic.

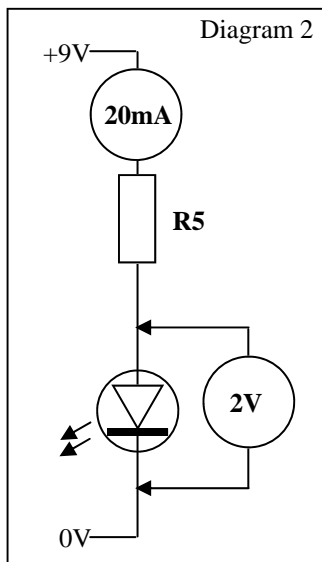


- (i) Make a well-proportioned sketch of a **development** of the holder. Indicate clearly on your sketch the position of all bend lines. Development: 9 panels (9x 1 mks) & correct location of keyhole slot (1 mk) (10 marks)
- (ii) 1. Explain, using sketches, how the holder should be manufactured from a sheet of acrylic. [4 marks (sketch 2 marks, method 2 marks)] (Marking out, cutting, strip heater, finish)
2. Explain, using sketches, how the keyhole slot could be made. [4 marks marks (sketch 2 marks, method 2 marks)] Suggest **one** advantage of this kind of slot. [2 marks] Prevent holder slipping from wall mounting (screw), secured to wall-mounting screw (10 marks)
- (iii) Describe, using sketches, how a smooth finish could be achieved on the edges of the acrylic. [5 marks (sketch 2 marks, describe 3 marks)] (Filling, sanding, polishing)

2 (a) The graphic shows a motorised night light. Diagram 1 shows an electronic circuit for the night light. The circuit will automatically turn on an LED and motor, to animate the figure in the design, at night.



- (i) Explain the function of the fixed resistor R1 in the potential divider shown.
[4 marks (protect R2, prevent total of $R1 + R2 = 0$)]
- (ii) Explain the effect of swapping the positions of R1 and R2 in the circuit.
[4 marks (no effect Total $R = R1 + R2$)]
- (iii) Explain the effect of swapping the positions of R2 and R3 in the circuit.
[4 marks (circuit will activate in daylight)]
- (iv) Explain the purpose of fixed resistor R4 in the circuit.
[4 marks (protect base of transistor)]
- (v) All the fixed resistors in the circuit have a gold coloured 4th band printed on the resistors. Explain the meaning of this gold band.
[4 marks (tolerance, +/-5% of value)]

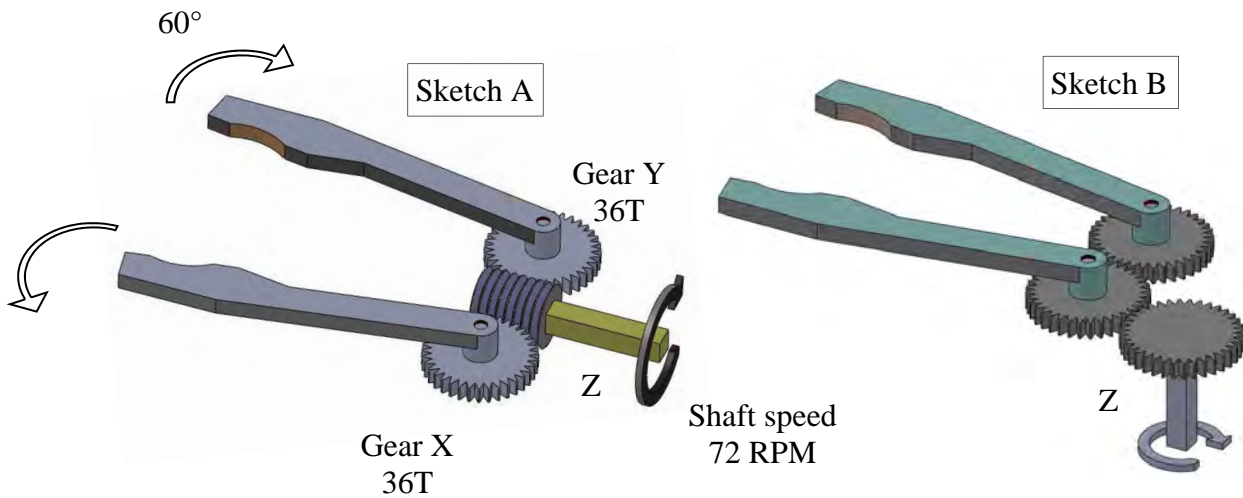


- (vi) Using the information provided in Diagram 2, calculate the required value of resistor R5.
[5 marks ($V/I=R$ (2 mks), $7V/.02A=350 \Omega$ (3 mks))]
[7/20 (3 mks)]

(25 marks)

- OR -

2 (b) The sketches show two possible mechanisms to operate a robot claw.



- (i) Name the gear mechanism shown in sketch A.
[5 marks (worm)]
- (ii) State **two** advantages of using the mechanism in sketch A, over the mechanism in sketch B, to operate a robot claw.
[5 marks (3 +2) - torque, speed reduction, non-slip, locking mechanism, etc.]
- (iii) Using the information given in sketch A, calculate the time taken for the arms of the claw to move through 60°.
[5 marks—5 sec.]

1 rotation of worm = 1 tooth advance on gear wheel
 On gear wheel: $360^\circ = 36T \Rightarrow 60^\circ = 6T$
 6T advance requires 6 rotations of worm
 On worm 72 rotations in 1 minute (60 sec)
 6 rotations = 5 sec $((60 \times 6)/72)$

- (iv) Two possible metal axles are available for use at Z.
 Axle S, which has a square cross section and axle C,
 which has a circular cross section.



Explain which axle, S or C, is the better choice for use in the robot claw.

[5 marks (2 mks = S, 3 mks = reason (grip))]

- (v) Outline a system which will prevent the claw from continuing to close on an object, once the object has been held by the claw.
 [5 marks—use of limit switch(s)]

(25 marks)


Section C - 50 Marks

Answer **one** question from this section – all questions carry equal marks.

This section relates to **Technology & Society, Control Systems and Design & Manufacture.**

3. Technology and Society



- (a) Modern motor cars have changed dramatically since they were first introduced in the early 1900's.
- (i) Explain, using **three** examples, the environmentally friendly features available in modern cars. [12 marks: 3 x 4 marks— (2 mks example & 2 mks explained)]
Parts recycled, electric cars, hybrid cars, catalytic converters, LED lights, design features
- (ii) Outline the operation of any **two** of the following technologies in modern cars:
- Air bags
 - Bluetooth connectivity
 - Keyless entry.
- [8 marks: 2 x 4 marks (4, 3, 2, 1)]
- (b) (i) Outline, using **two** examples, how technology has changed the way in which information is transmitted around the world.
[10 marks: 2 x 5 marks — (2 mks example & 3 mks outlined)]
- 
- (20 marks)
- (ii) Outline the role of **any two** of the following in the development of new communications technologies:
- Designers
 - Engineers
 - Programmers.
- [10 marks: 2 x 5 marks (5, 3, 1)]
- (20 marks)
- (c) Outline, using **two** examples, the alternative energies available in Ireland to replace fossil fuels.
[10 marks: 2 x 5 marks — (2 mks example & 3 mks outlined)]
Wind, wave, hydro, geothermal
- (10 marks)

4. Control Systems & Technology and Society

Modern manufacturing industry commonly use industrial robots.



- (a) (i) Suggest **two** advantages of using robots in industry.
[8 marks: 2 x 4 marks—efficient, long hours, accuracy, speed, etc.]
- (ii) Suggest **two** disadvantages of using robots in industry.
[8 marks: 2 x 4 marks—replace workers, limited ability, high maintenance, etc.]
- (iii) Outline **two** areas, other than manufacturing industry, where robots are used and explain their function. [8 marks: areas 2 x 2 marks, function explained 2 x 2 marks]
Space exploration, bomb disposal, exploration, medicine, etc.
- (iv) Explain why computers are necessary to operate robotic devices.
[4 marks - (4,3,2,1) - controlling programme, speed of control, accuracy, etc.]
- (v) In relation to computers explain the terms: CPU and RAM.
[8 marks: 2 x 4 marks—Central Processing Unit, Random Access Memory]

(36 marks)

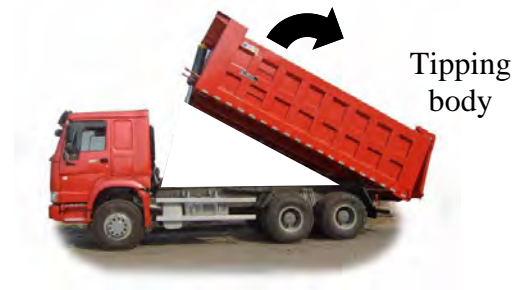
(b) Modern farming in Ireland is largely mechanised.

- (i) Outline **two** examples of this mechanisation.
[10 marks: 2 x 5 marks Named 2 mks, Outlined 3 mks(3,2,1)
- GPS on tractors, food collecting, computerised milking machines, etc.]
- (ii) In relation to modern farming, explain the term ‘GM crops’.
[4 marks—term expanded 2 mks, explained 2 mks. Genetically Modified crops]

(14 marks)

5. Design and Manufacture

A student is required to manufacture a toy tipping truck based on the design shown.



- (a) (i) Describe, with the aid of sketches, the steps required to manufacture a suitable tipping body.
Name the materials, tools and processes used.
[10 marks: sketch 4 (4,2,1)marks, process 2 marks, materials 2 marks, tools 2 marks]
- (ii) Outline **two** safety features which should be included in the design of the toy.
[10 marks: 2 safety features 2 x 5 marks—sharp edges, safe paint, no loose parts, etc.]
- (iii) Explain, giving **two** reasons, why plastics have almost completely replaced wood and metal in the manufacture of toys.
[10 marks: 2 reasons 2 x 5 marks - easier to shape, colours, cost, finish, etc.]

(30 marks)

- (b) (i) Outline, with the aid of sketches, a suitable motorised mechanism to raise and lower the tipping body.
[12 marks: sketch 6 marks, suitable motorised mechanism 6 marks]
CAM, worm drive, threaded bar, rack & pinion, ram(piston), etc.
- (ii) Outline where limit switches could be included in your suggested mechanism.
[8 marks: 2 appropriate locations for limit switches identified 2 x 2 marks,
outlined how switches function in the mechanism 2 x 2mks]

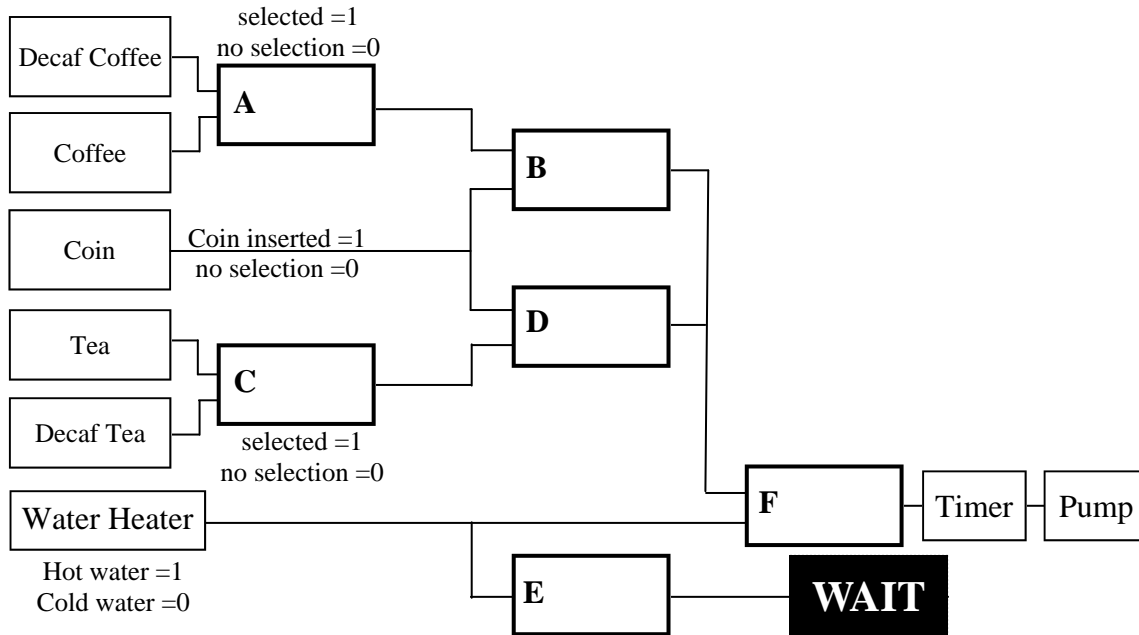
(20 marks)

6. Control Systems

The graphic shows a tea and coffee dispensing machine. Drinks are dispensed if a coin is inserted in the machine and either coffee or tea is selected.



The student designed system shown below is intended to control the dispenser. A pump will add hot water to a paper cup containing tea or coffee only if the correct coin is inserted and the water is hot. A 'WAIT' sign is lit if the water is cold.



- (a) (i) Name the logic gates required at A, B, E and F.
[8 marks: 4 x 2 marks—A: OR, B: AND, E: NOT, F: AND]
- (ii) Sketch truth tables for gates B and E.
[Truth table for B (AND) 8 marks—2 marks for each correct line ,
for E (NOT) 4 marks—2 marks for each correct line .]

A	B	Q
1	1	1
0	1	0
1	0	0
0	0	0

A	Q
1	0
0	1

- (iii) Explain why a 'timer' is required in the system.
[5 marks: to deliver a fixed quantity of water , prevent cup over filling]
- (iv) Name the component required to detect hot water.
[5 marks: thermistor]

(30 marks)

(b) Outline how the system could be modified to include the following:

Illuminate a 'Service Required' sign if the dispenser has;

(i) no stock of tea or coffee cups *or*

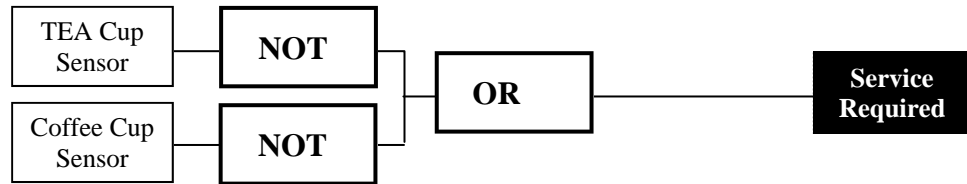
[5 marks]

(ii) has no water to heat.

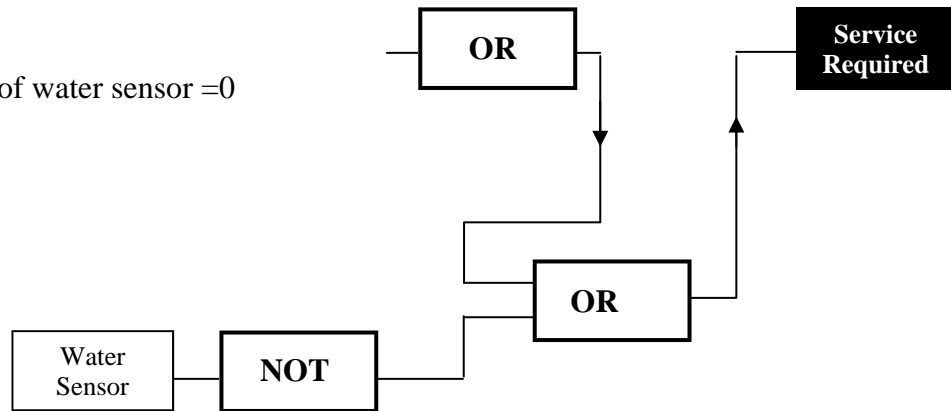
[5 marks]

(10 marks)

Out of Tea / Cofee cup sensor =0



Out of water sensor =0

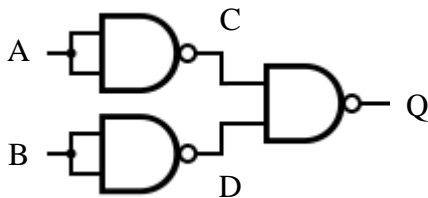


(c) All of the logic gates above can be constructed from NAND gates.

Using a truth table, determine the type of logic gate which has been constructed from the NAND gate arrangement shown.

[10 marks: Identify an OR gate from the table

—2 marks for each correct line and 2 marks for OR gate]



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