



Junior Certificate Examination, 2014

Technology

Higher Level

Wednesday, 18 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**.

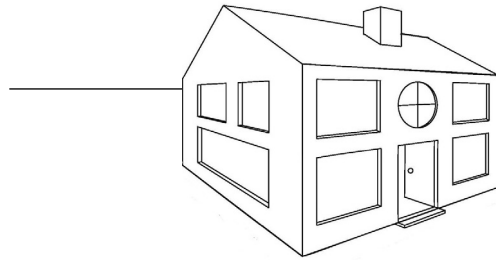
Centre Number

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.

1. Indicate clearly the location of the **two** vanishing points for the perspective drawing shown.

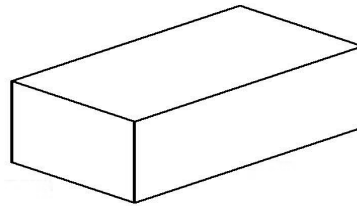


2. Use rendering techniques on the graphics shown to suggest that:

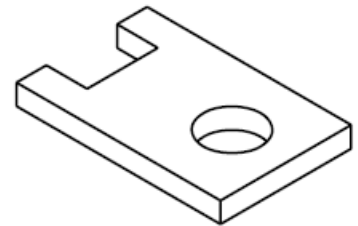
A is made of wood

and

B is made of acrylic.



A



B

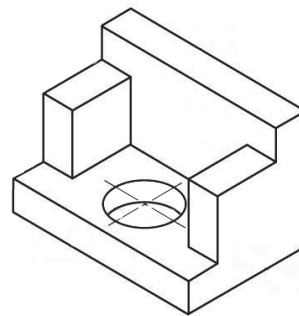
3. State **two** advantages of tablet devices.



(i): _____

(ii): _____

4. Show clearly **two** important dimensions on the drawing given.



5. State the meaning of **each** of the graphics shown.



(i)



(ii)

(i): _____

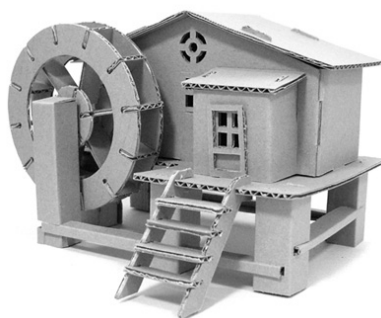
(ii): _____

6. Indicate clearly if each of the timbers listed are hardwoods *or* softwoods.



Wood	Hardwood	Softwood
Beech		
Oak		
Scots Pine		
Sycamore		

7. Designers commonly use cardboard to produce models of their ideas.



State **two** advantages of using cardboard to make the model shown.

(i): _____

(ii): _____

8. Name **each** of the saws shown

and

name a suitable material for cutting with each saw.



X: _____

Material: _____

Y: _____

Material: _____

9. When drilling acrylic sheet, why is it important to:

(i) drill a pilot hole

and

(ii) place a piece of waste wood under the acrylic?



(i): _____

(ii): _____

10. Name a suitable material to make the body of the hair straightener shown

and

state **one** reason for using that material.



Material: _____

Reason: _____

11. Sketch the electronic symbol for the switch shown

and

name the additional component required to operate this switch.

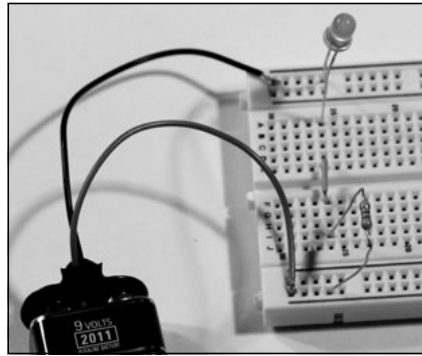


Symbol

Component: _____

12. When a working 9V battery is attached to the circuit shown, the LED does not light.

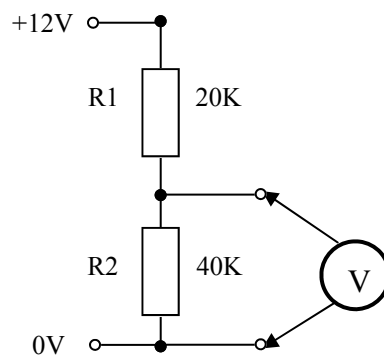
Suggest **two** reasons for this.



(i): _____

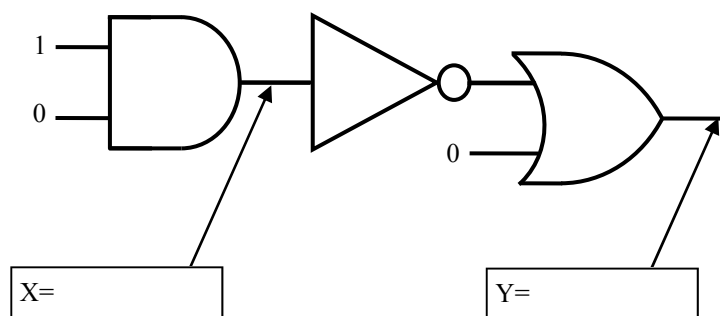
(ii): _____

13. Calculate the voltage across resistor R2 in the circuit shown.



Voltage: _____

14. Identify the logic states of the circuit at points X and Y.



X=

Y=

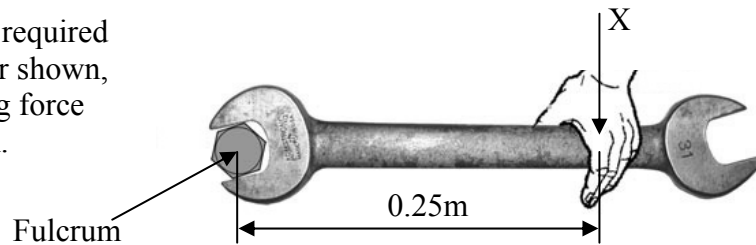
15. Electrical solder is an alloy. Name the **two** metals in electrical solder.



(i): _____

(ii): _____

16. Calculate the force required at X, on the spanner shown, to produce a turning force (moment) of 15Nm.



Force: _____

17. State clearly, where on a bicycle it is important to:

(i) minimise friction

and

(ii) maximise friction.



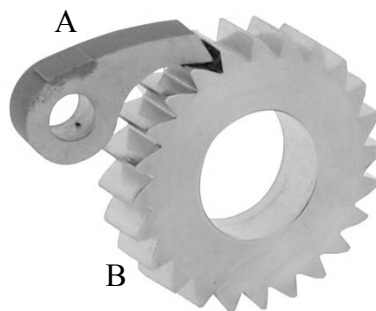
Minimise: _____

Maximise: _____

18. Name the parts of the gear system shown

and

state the function of part A.

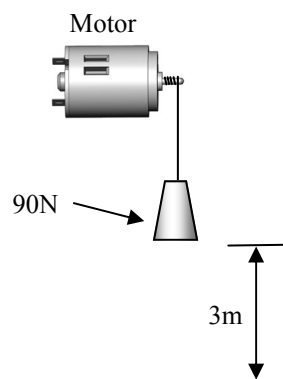


A: _____

B: _____

Function of A: _____

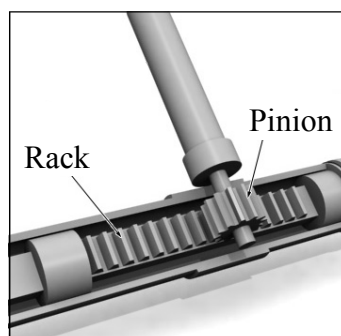
19. Calculate the work done to lift the 90N load by 3m in the system shown.



Work: _____

20. The gears shown are used in a car steering system.

Name **two** other areas where this gear system is used.



(i): _____

(ii): _____

21. Explain the term:
'biodegradable'

and

name **one** common
biodegradable household
material.



Biodegradable: _____

Material: _____

22. Name **two** properties
of fabrics which make
them suitable for use
as sails on yachts.



(i): _____

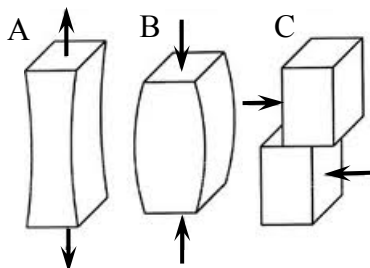
(ii): _____

23. Explain the term 'smartphone'
in relation to modern mobile
phones.



Smartphone: _____

24. Name the forces operating at A, B and C.



A: _____

B: _____

C: _____

25. Name **two** applications
of pneumatics.



(i): _____

(ii): _____

26. Identify **two** safety features on the drill shown.



(i): _____

(ii): _____

27. Wind energy is a renewable form of energy.

Name **two** other commercial renewable energies available in Ireland.

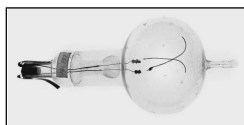


(i): _____

(ii): _____

28. Name the inventors of:

(i) the practical electric light bulb



and

(ii) the first modern automobile.



(i): _____

(ii): _____

29. Name the structural feature which makes the tower-crane both strong and lightweight.



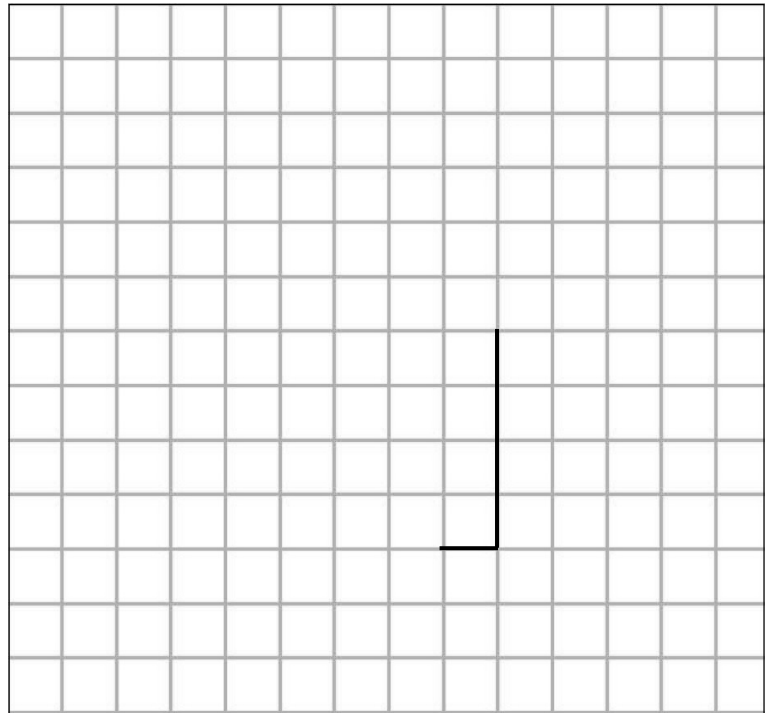
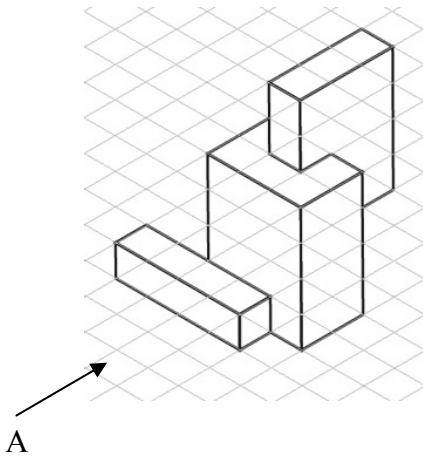
Answer: _____

30. Why have 'USB sticks' (flash drives) replaced 'floppy disks' for portable data storage?

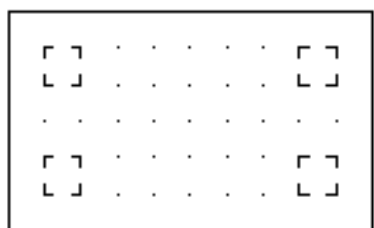
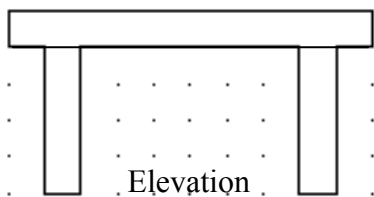


Answer: _____

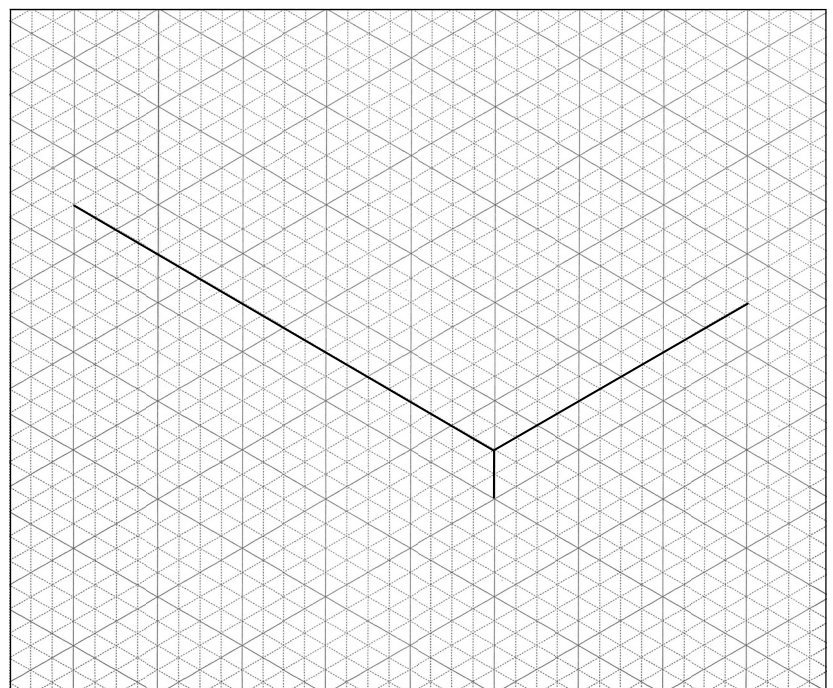
31. An isometric view of an object is shown.
On the grid below, complete the front elevation of the object in the direction of arrow A.



32. An orthographic projection of a table is shown below.
Complete the isometric sketch of the table on the grid provided.



Plan





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Technology

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Wednesday, 18 June
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Section B and Section C

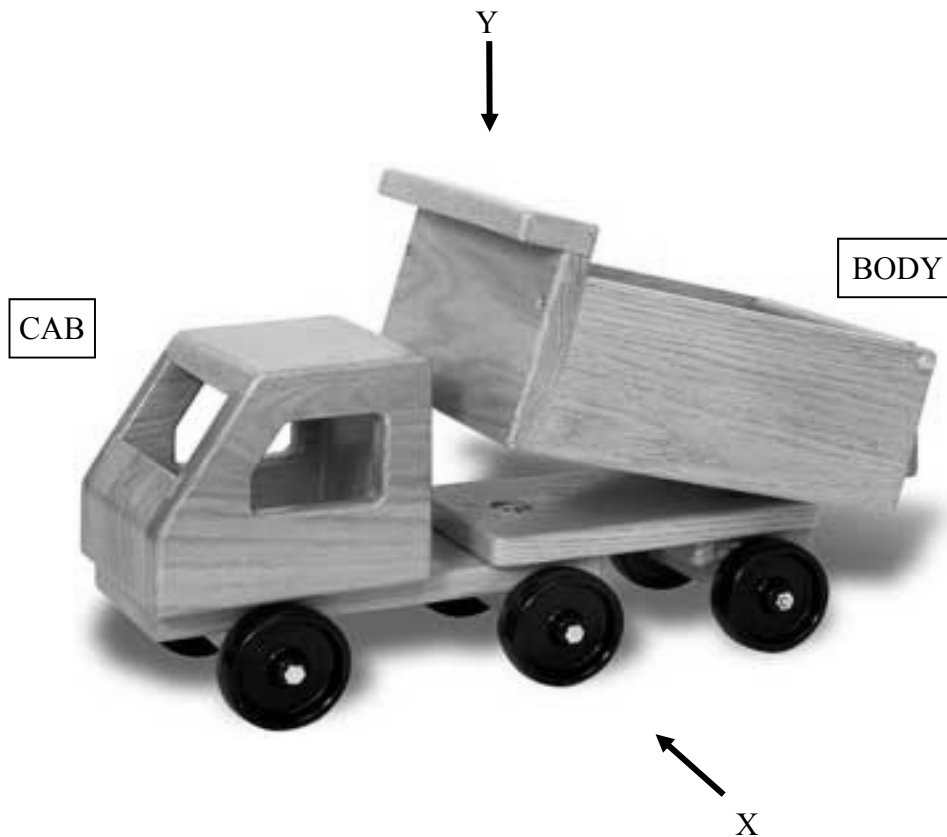
Section B - 50 marks

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 truck. The cab and body are made from 6 mm thick red deal. The wheels are made from black nylon.



- (i) Make well-proportioned sketches of the following views:

1. An **elevation** in the direction of arrow **X**.
(The wheels should be shown as circles)
2. A **plan** in the direction of arrow **Y**.

(10 marks)

- (ii)
1. Describe, using sketches, a suitable method of attaching the wheels to the truck.
 2. Use neat labelled sketches to describe a suitable mechanical method of raising and lowering the body.

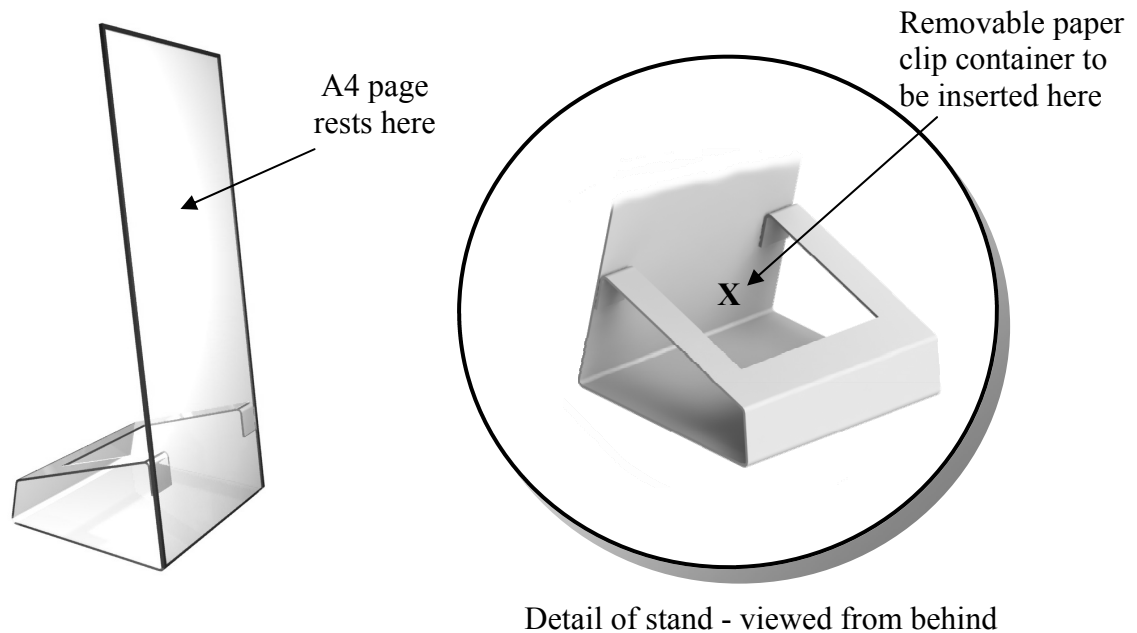
(10 marks)

- (iii) Outline **two** processes which might be used to manufacture and finish the wooden cab to a standard similar to that shown in the graphic.

(5 marks)

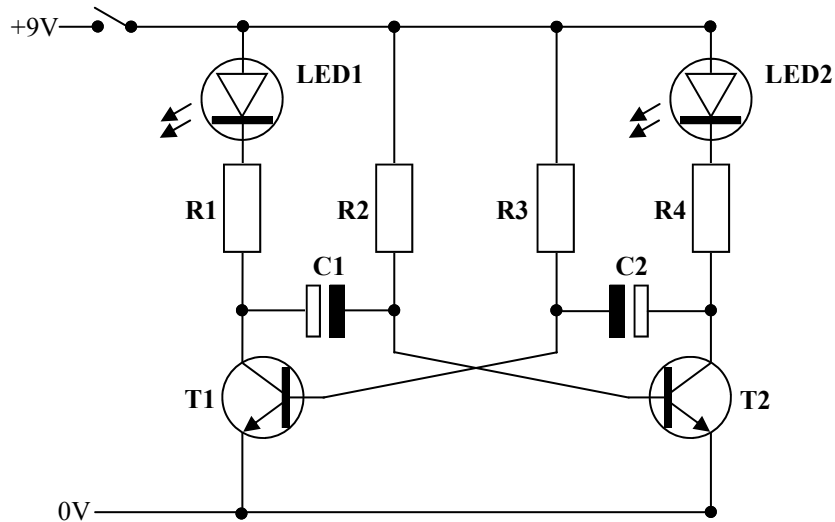
- OR -

- 1 (b) The graphics show a student's unfinished design for a document (A4 page) stand. The stand is to be manufactured from a single sheet of 3 mm acrylic.



- (i) Make a well-proportioned sketch of a **development** of the stand. Indicate clearly on your sketch the position of all bend lines. (10 marks)
- (ii) 1. Explain, using sketches, the steps required to manufacture the stand from the acrylic sheet. (10 marks)
2. Sketch a design for a removable paper clip container to fit in the space labelled X.
- (iii) It was found during testing that A4 pages fell off the stand. Describe, using sketches, a design modification to solve this problem. (5 marks)

- 2 (a) The diagram shows the component layout for a flashing LED circuit.
(LED1 on, LED2 off, LED1 off, LED2 on)



- (i) LED1 has the following values: $V_f = 2\text{V}$ and $I_{\text{max}} = 0.02\text{A}$.
Calculate the required value of R_1 in the circuit shown.
- (ii) The required value of resistor R_2 is $47\text{k}\Omega$.
Use the resistor colour codes shown below to determine the colour bands of this resistor.
- (iii) Identify the components shown at C_1 and C_2 .
What unit is used to measure the value of C_1 and C_2 ?
What effect will increasing the value of these components have on the operation of the circuit?
- (iv) Copy the symbol for transistor T_1 into your answerbook and indicate clearly the position of the base and the emitter.

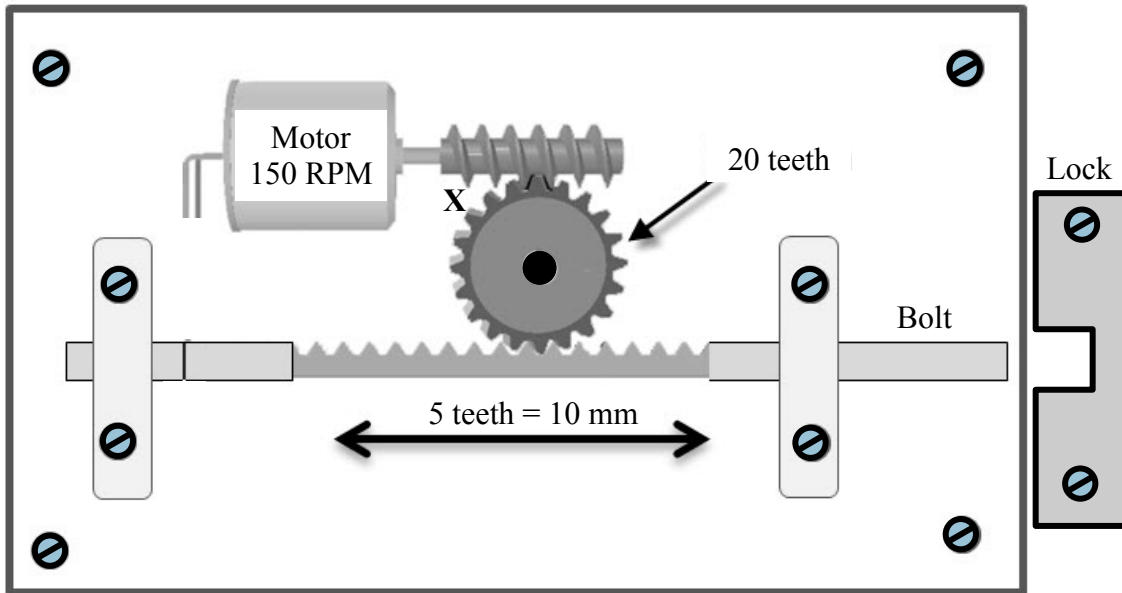
(25 marks)

Resistor Colour Codes

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

- OR -

2 (b) The sketch shows a mechanism to lock and unlock a door.



- (i) Name the mechanism shown at X.
State **one** advantage of using this mechanism in a lock. (5 marks)
- (ii) The mechanism at X changes the direction of motion through 90° .
Name and sketch another mechanism which also achieves this change. (5 marks)
- (iii) Using the information given in the sketch, calculate the length of time for which the motor must run to move the bolt a distance of 30 mm. (5 marks)
- (iv) The door can be locked and unlocked, using a circuit constructed from the following components: a battery, a DPDT switch and a motor.
Indicate how these components should be connected to allow the door to lock and unlock. (5 marks)
- (v) Explain why limit switches should be used as part of the controlling circuit. (5 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) Many ‘end of life’ microelectronic devices (e-waste) find their way to landfill.

- (i) Outline **two** reasons why many electronic devices have a ‘short working life’.
- (ii) Outline **two** reasons why sending these products to landfill is not good practice environmentally.

(20 marks)

- (b) *‘Internet users continue to spend more time on social media sites than any other type of site.’*



- (i) Explain what is meant by ‘social media’.
- (ii) Outline **one** advantage of using these sites.
- (iii) Outline **one** disadvantage of using these sites.

(20 marks)

- (c) Services to customers of Intercity rail travel have improved through technological advances.

Outline, using **two** examples, new technologies now available to rail customers.

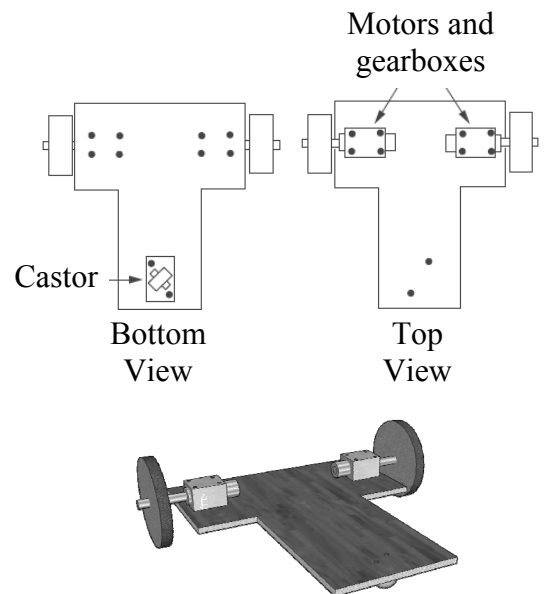


(10 marks)

4. Control Systems & Technology and Society

The graphics show a base platform for an educational robot.

- (a) (i) Outline **two** reasons why the castor is required.
- (ii) Explain why gear boxes are attached to the drive motors.
- (iii) Outline **two** reasons why some robots use tracks instead of wheels.
- (iv) Explain how, using the two motors, the robot can move forward in a straight line and then turn left.
- (v) Outline how such a robot could detect and avoid an obstacle (e.g. a wall).



(40 marks)

- (b) Robotic devices are commonly used in military operations and in space exploration.

In **each** case, explain the advantages of using robotic devices for these operations.

(10 marks)

5. Design and Manufacture

It is required to manufacture a lightweight show-jumping fence. The fence should be both free standing and height adjustable.

- (a) (i) Explain, giving **two** reasons, your choice of material to manufacture the fence.
- (ii) Outline **two** safety features which should be included in the design of the fence.
- (iii) Describe, with the aid of sketches, a proposed structure for the side supports of the show-jumping fence.
- (iv) Describe, with the aid of sketches, the features of your design which will allow the horizontal fence rails to fall if struck by a horse.



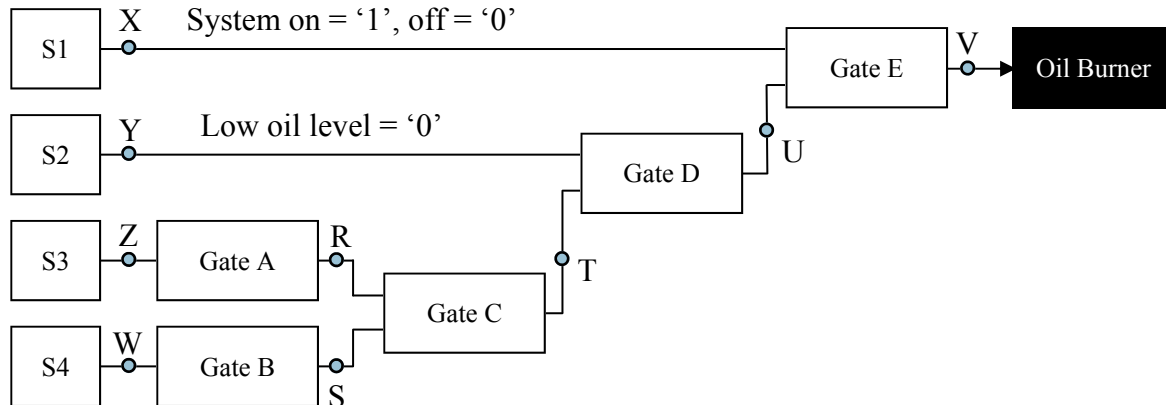
(40 marks)

- (b) Outline, with the aid of labelled sketches, a suitable mechanism to allow one person easily adjust the height of the fence.

(10 marks)

6. Control Systems

A system diagram for an oil-burning heating control unit is shown. The system contains:
 a system on/off switch (S1), a low oil-level sensor (S2),
 a low-temperature sensor (S3) and a high-temperature sensor (S4).
 S3 will output a '0' at a set low temperature and S4 will output a '1' at a set high temperature. The oil burner must operate if the temperature is between the values set by S3 and S4.
 A number of logic gates are identified as: A, B, C, D and E.



- Name the logic gates required at A, C, D and E. (10 marks)
- Draw truth tables for gates C and E. (10 marks)
- Copy the truth table below into your answerbook.

For **each** of the situations described below, use the truth table to identify the logic states (1 / 0) at the points marked X, Y, Z, W, R, S, T, U and V.

	X	Y	Z	W	R	S	T	U	V
Situation 1									
Situation 2									

Situation 1: The system is turned on, there is sufficient oil in the tank, a low temperature is detected by S3 and a low temperature is detected by S4.

(10 marks)

Situation 2: The system is turned on, there is no oil in the tank, a high temperature is detected by S3 and a low temperature is detected by S4.

(10 marks)

- A latched alarm is required to indicate that there is no oil in the tank. Explain how a latch alarm can be constructed from an 'OR' logic gate. (10 marks)