



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

# TECHNOLOGY

Junior Certificate Examination, 2007

HIGHER LEVEL

200 Marks

Wednesday, 20th June, Afternoon, 2:00 to 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 C.

Centre Number

Examination Number

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

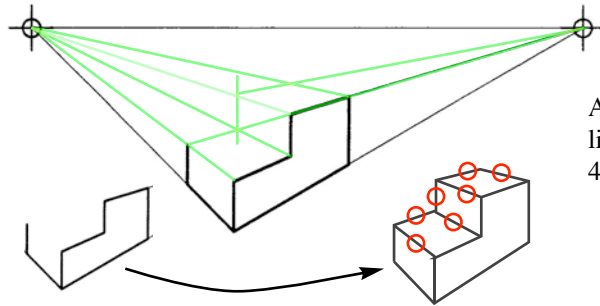
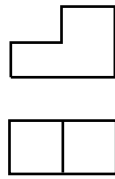
MAKE SURE TO WRITE YOUR EXAMINATION NUMBER IN  
THE BOX PROVIDED ON THIS PAGE

**Section A**

Answer 25 questions from this section - all questions carry equal marks.

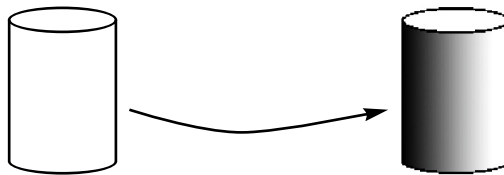
100 marks

1. Complete the perspective view of the object shown.



Any 4 of the missing lines as shown:  
4 x 1 marks

2. Shade the cylinder to indicate a light source from the direction shown.



No shading top surface  
2 marks  
Shading on curved surface  
2 marks

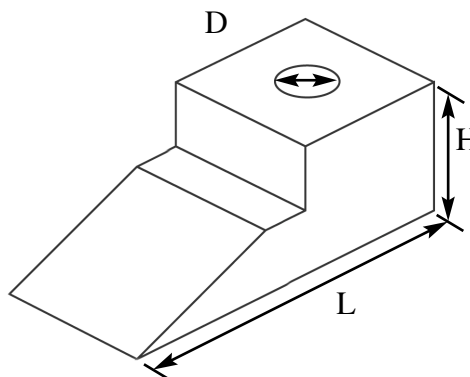
3. State **two** reasons why a bar code graphic is used on consumer products.



Any 2 valid reasons: 2 x 2 marks

easy identification of product by scanner, restocking requirements, price changes, etc.

4. Show clearly on the sketch, the three dimension lines:  
  
overall length (L),  
overall height (H) and  
diameter (D) of opening shown.



3 dimension lines:

first correct - 2 marks  
second correct - 1 mark  
third correct - 1 mark.

5. State the meaning of each of the symbols shown.



X



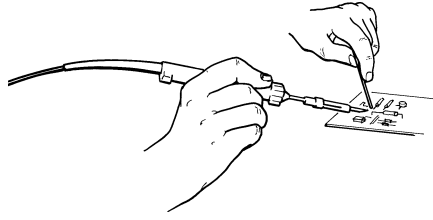
Y

X : Electrical Hazard 2 marks

Y : Wear Safety Mask 2 marks

6. Electrical solder is an alloy of two metals.

Name the **two** metals.



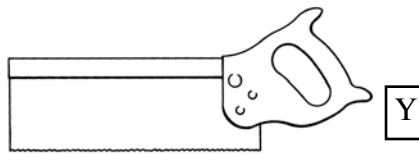
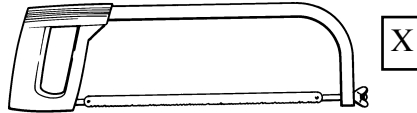
2 correct metals: 2 x 2 marks

Lead & Tin

7. Name the saws shown

*and*

name a material suitable for cutting with each saw.



X: Hack Saw : 1 mark

Material: Metal / Plastic - 1 mark

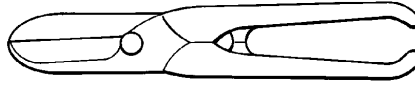
Y: Tennon Saw : 1 mark

Material: Wood - 1 mark

8. Name the tool shown

*and*

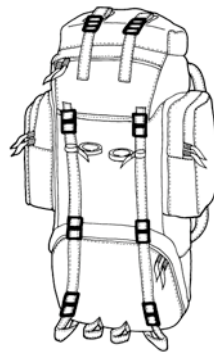
state why it is **not** suitable for cutting acrylic sheet.



Tool: Snips : 2 marks

Reason: Acrylic will shatter  
2 marks

9. Name **two** fabric properties which are found in a modern rucksack.



Any 2 valid properties -  
2 x 2 marks

Waterproof, lightweight, etc.

10. Name the type of drill bit shown

*and*

state where this drill bit should be used.



Drill bit: Countersink bit  
2 marks

Where used: 2 marks

used when countersinking a screw head into wood/plastic

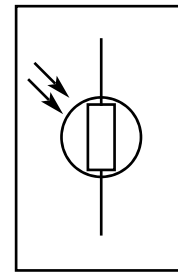
11. Sketch the electronic symbols for the components shown.



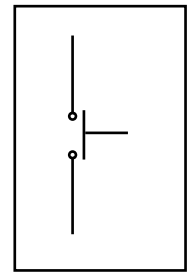
LDR



PTM switch

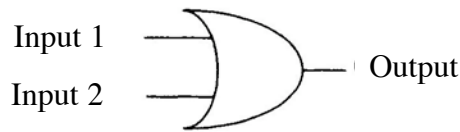


LDR symbol  
2 marks



PTM symbol  
2 marks

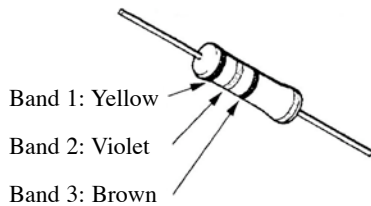
12. Complete the truth table for the logic gate shown.



Input1	Input 2	Output
1	1	1
1	0	1
0	1	1
0	0	0

Outputs: 4 x 1 marks

13. Using the table shown, determine the resistance of the resistor.



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

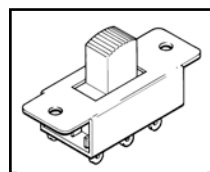
470R - 4 marks

Yellow - 4: 1 mark

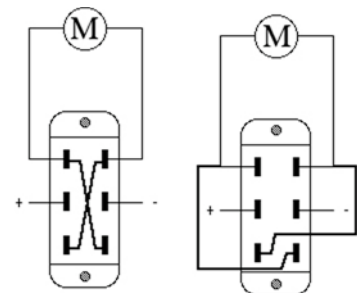
Violet - 7: 1 mark

Brown - One zero /(x10)  
2 marks

14. Indicate on the sketch, how the double pole double throw switch should be wired to allow a motor to turn clockwise or anticlockwise.



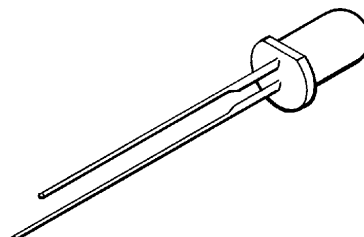
Double pole double throw switch



2 wires: 2 x 2 marks

15. The sketch shows an LED.

State **two** ways in which the negative leg could be identified.

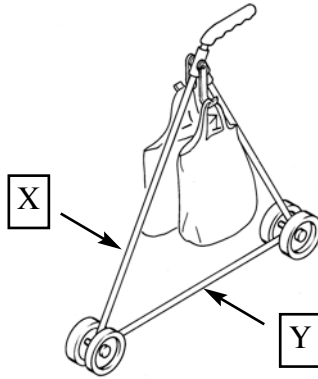


2 x 2 marks

Short leg, flat bevel

16. The sketch shows a bag carrier.

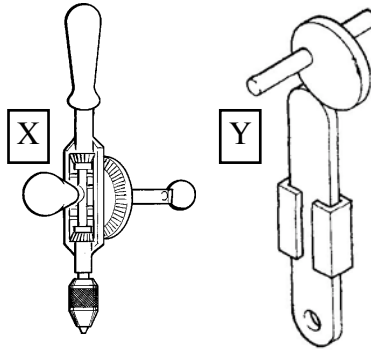
Name the main forces acting on the members X and Y shown.



Force on X: 2 marks  
Compression

Force on Y: 2 marks  
Tension

17. Name the mechanisms shown.



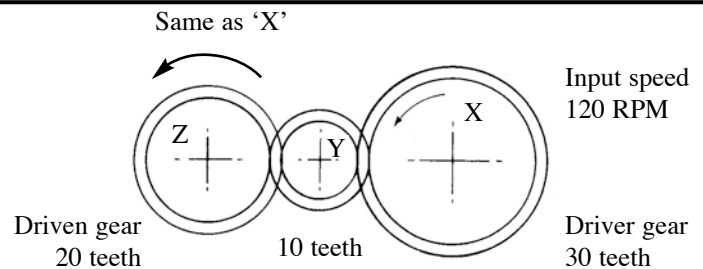
X: Mechanism - 2 marks  
Bevel gears

Y: Mechanism - 2 marks  
Cam & Follower

18. Indicate the direction of motion

and

calculate the speed of the gear Z in the gear train shown.



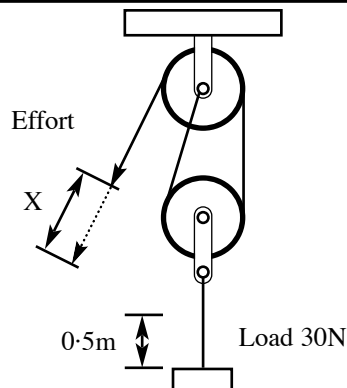
Direction: 2 marks,  
(same as X)

Speed : 2 marks  
180RPM  
( $120 \times 30 = 20 \times Z$ )

19. The pulley system shown lifts a load of 30N a height of 0.5m.

Calculate

(i) the effort force,  
(ii) the distance moved, X.

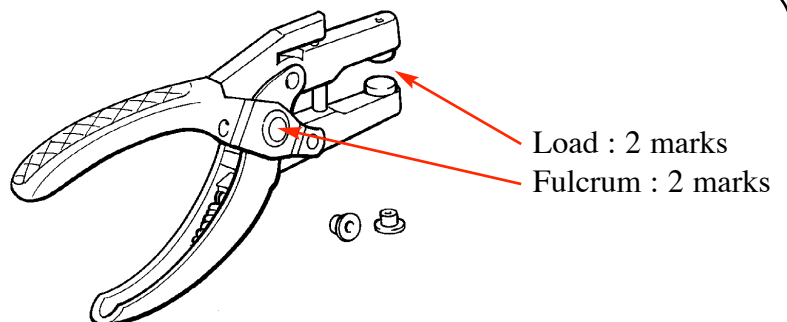


Effort force: 2 marks  
15N

Distance X: 2 marks  
1m

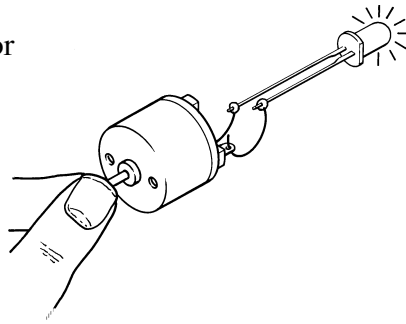
20. Mark clearly on the rivet punch shown the position of:

the Load (L),  
and  
the Fulcrum (F).



Load : 2 marks  
Fulcrum : 2 marks

21. Name **two** energy conversions taking place when the generator shown lights the LED.

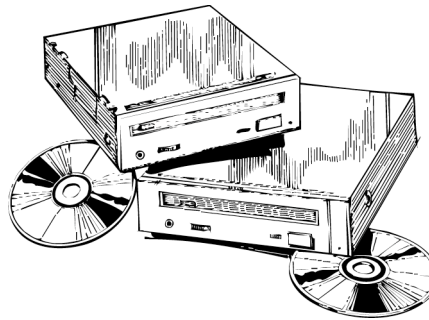


Any two valid energy conversions  
 2 x 1 marks (input)  
 2 x 1 marks (output)

Kinetic to electrical  
 Kinetic to light

22. State the meaning of the following abbreviations:

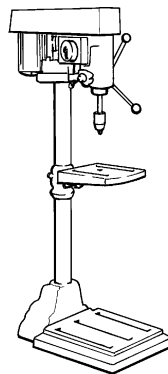
- (i) CD,
- (ii) DVD.



CD: 2 marks  
 Compact Disk

DVD: 2 marks  
 Digital Video Disk

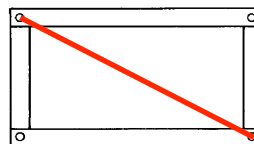
23. State **two** safety precautions which must be observed when using a pillar drill.



Any two valid safety precautions  
 2 x 2 marks

Goggles, Hair, Chuck, Clamp, etc.

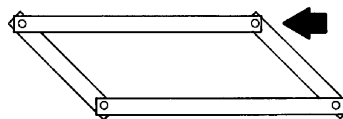
24. Indicate clearly on the frame (*fig.1*) the location of a tie which will stop the frame deforming as shown (*fig. 2*).



*fig.1*

Correct location: 2 marks

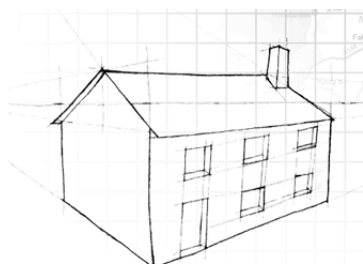
Explain how the tie works.



*fig.2*

Answer how works: 2 marks  
 Tie in tension will prevent frame moving as shown

25. State **two** ways in which technology has contributed to energy conservation in the home.



Two valid contributions:  
 2 x 2 marks

New structural material (insulators),  
 More efficient electrical equipment,  
 More efficient heating systems, etc.

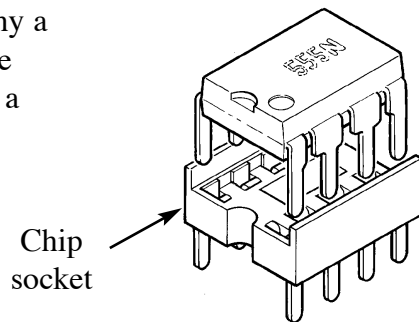
26. State **two** safety features found in modern cars.



Any two valid safety features:  
2 x 2 marks

Safety materials, crash zones, safety features (air bags ) etc.

27. State **two** reasons why a chip socket should be used when attaching a chip to a circuit.



Any two valid reasons:  
2 x 2 marks

Chip easily inserted/removed, avoid heating chip when soldering.

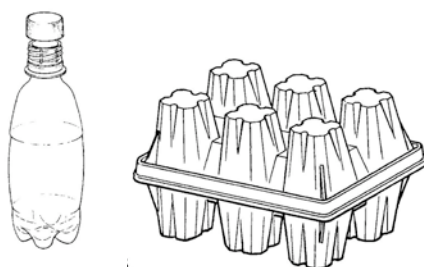
28. Name **two** energy sources, other than fossil fuels, which could be used in public transport.



Any two energy sources:  
2 x 2 marks

Bio fuels, fuel (Hydrogen) cells, electrical.

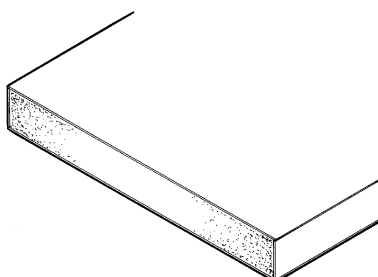
29. Name **two** processes by which plastic packaging can be formed.



Any two valid processes:  
2 x 2 marks

Blow moulding (forming), injection moulding, Vacuum moulding.

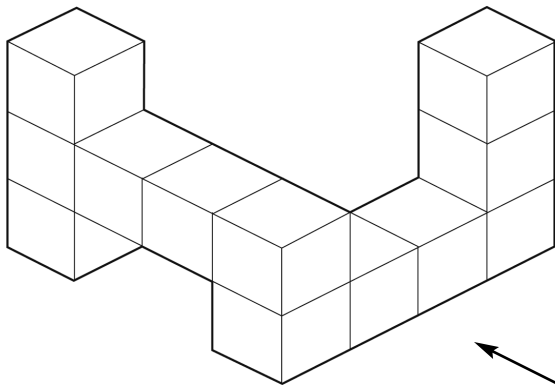
30. State **two** advantages to manufactured boards over natural wood.



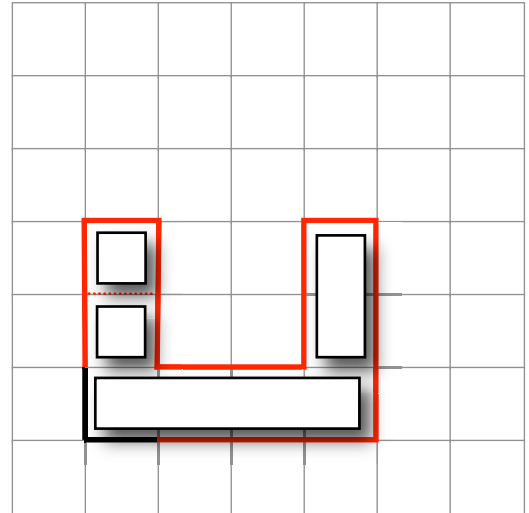
Any two valid advantage:  
2 x 2 marks

Uniform material, Range of sizes, cost, No defects (knots), etc.

31. Complete the end view of the component shown.

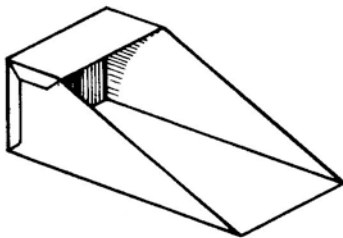


End view

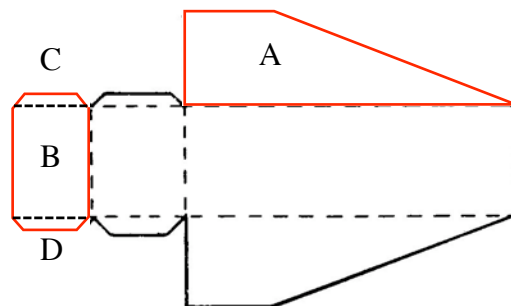


Correct end view: 4 panels - 4 x 1 marks

32. Complete the development of the scoop shown.



Scoop



Development

Correct development: 4 marks

Panel A - 1 mark

Panel B - 1 mark

Tab C - 1 mark

Tab D - 1 mark





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## TECHNOLOGY

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200 Marks

Wednesday, 20th June, Afternoon, 2:00 to 4:00

### SECTION B and SECTION C

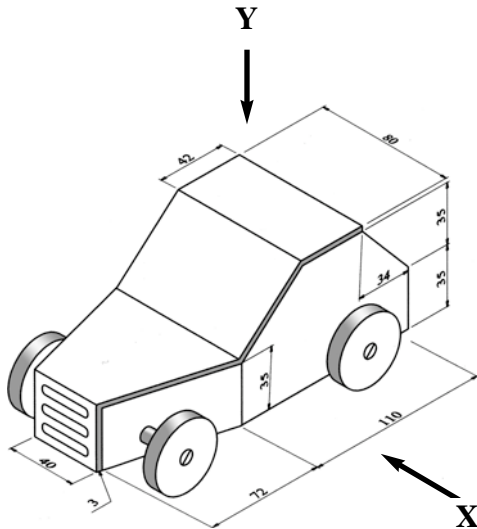
SECTION B - 50 Marks

SECTION C - 50 Marks

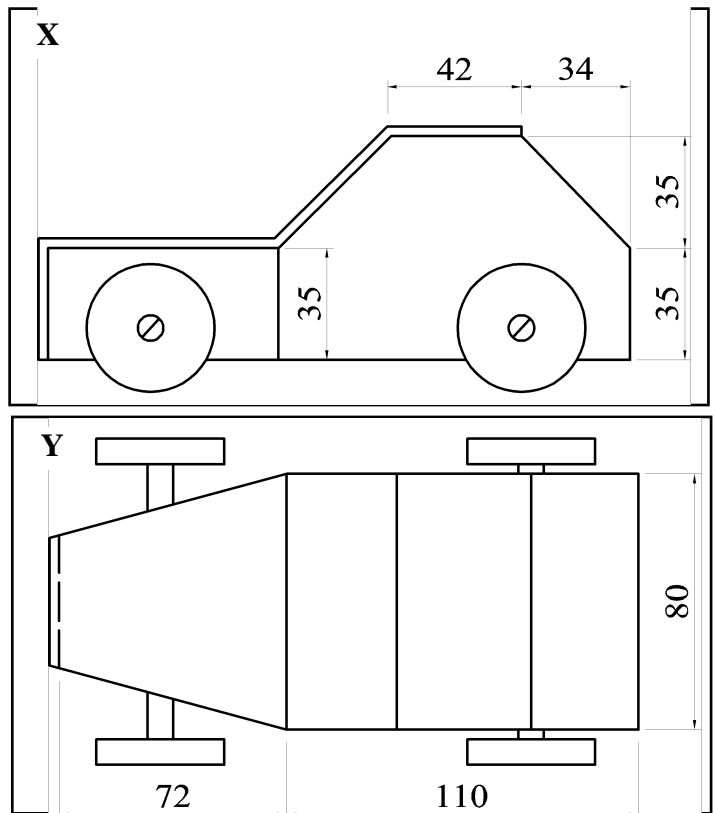
#### INSTRUCTIONS

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

- 1 (a) The sketch shows a student design for a motorised toy beach buggy. The buggy will be manufactured from yellow acrylic (top surface) and red acrylic (all other panels).



All dimensions are in millimeters



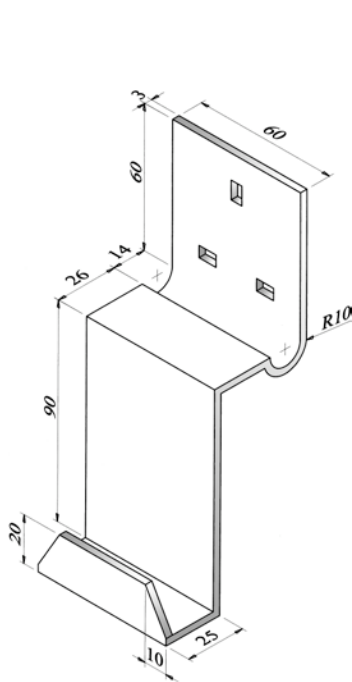
- (i) 1. An elevation looking in the direction of arrow 'X'. 5 marks  
 \* Correct view (2 marks), All proportions correct (1 mark),  
 2 correct dimensions shown - must include leaderlines (2 x 1 mark)
2. A plan view looking in the direction of arrow 'Y'. 5 marks  
 \* Correct view (2 marks), All proportions correct (1 mark),  
 2 correct dimensions shown (2 x 1 mark)

Omit the axle and wheels in your sketch. Include all dimension lines in your sketch.

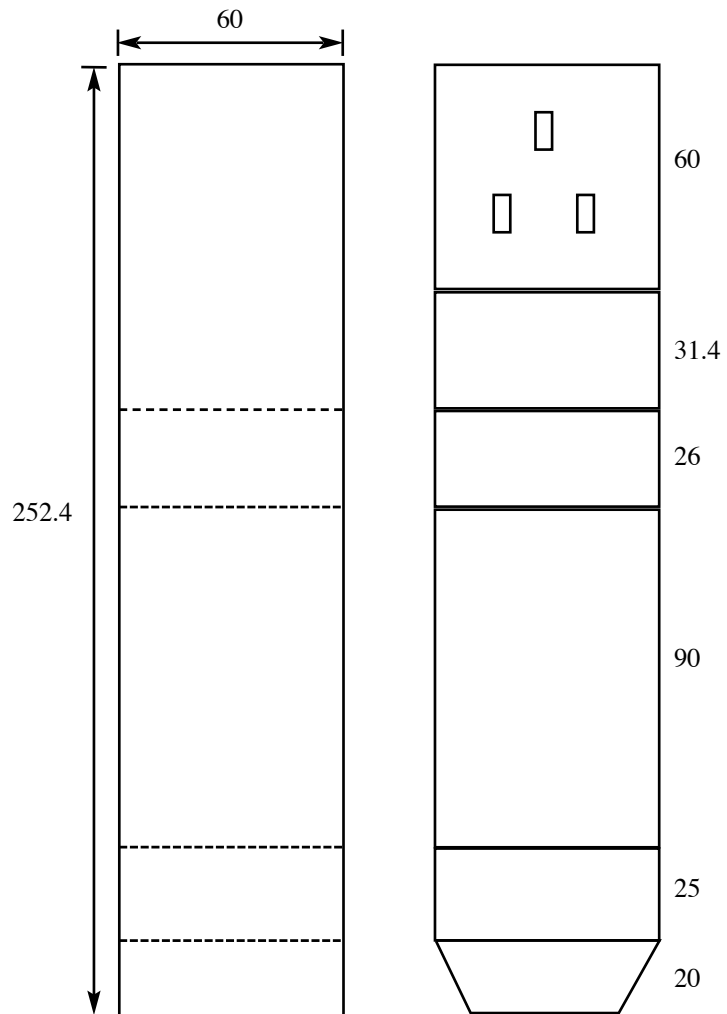
- (ii) 1. Describe the steps required to shape and finish the acrylic top surface of the buggy. Name the tools required. 5 marks  
 \* 2 correct steps (2 x 2 marks), Named tool (1 mark)  
 (cutting, bending, polish, drill, file, etc.)
2. Indicate, using a suitable sketch, how the battery for the motor could be easily accessed and changed. 5 marks  
 \* Valid sketch (2 marks), Quality of sketch (3 marks [ 3:2:1])
- (iii) During testing, the buggy wheels became embedded in sand. Sketch a design modification which will correct this fault. 5 marks  
 \* Valid modification (2 marks), Quality of sketch (3 marks [ 3:2:1])

- OR -

- 1 (b) The sketch shows a student design for an acrylic mobile phone holder with a built in socket attachment. The holder is designed to support the phone when charging.

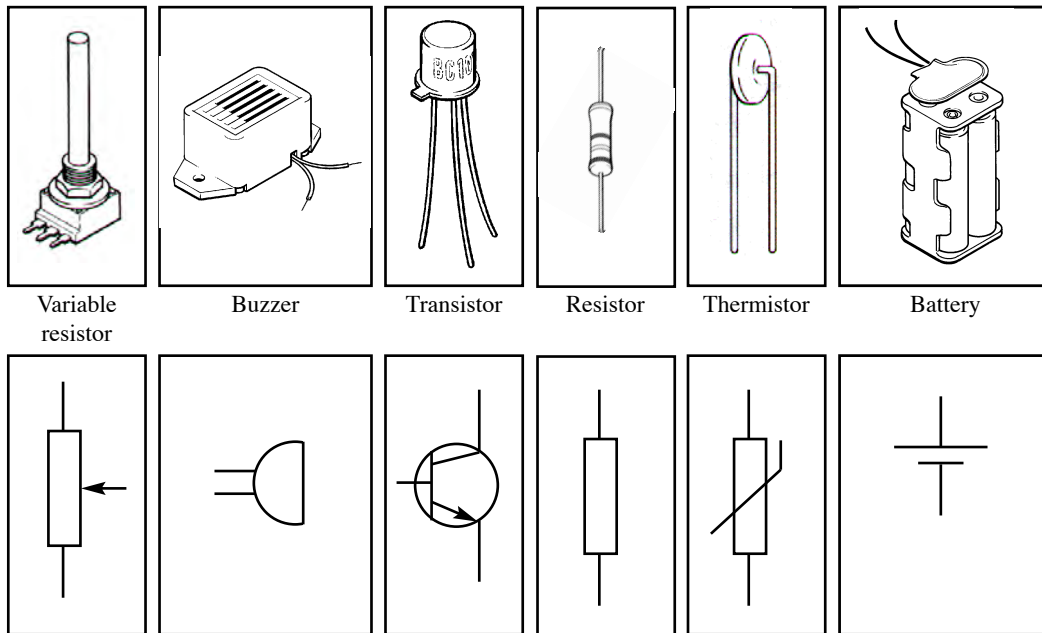


All dimensions are in millimeters



- (i) Development. 10 marks  
Indicate clearly all bend lines and show the overall dimensions.  
\* Correct view [development to show 5 panels. 5 x 1 mark] (5 marks),  
Overall length: 252.4 [20+25+90+26+60=221 = 1 mark, 31.4 = 2 marks] (3 marks),  
4 bend lines [4 or 3 correct = 1 mark, 2 or 1 correct 1 mark] (2 marks)
- (ii) 1. Equipment used and the steps required to shape the acrylic. 5 marks  
\* 2 correct steps (2 x 2 marks), Named tool (1 mark)
2. State **two** reasons why acrylic is a suitable material for this holder. 5 marks  
\* 2 correct reasons (3 + 2 marks)
- (iii) Sketch a design modification to prevent the phone falling out of the unit when charging. 5 marks  
\* Valid modification (2 marks), Quality of sketch (3 marks [3:2:1])

2 (a) A temperature sensitive circuit is required to sound a buzzer when low temperatures are detected. The components shown below are available to construct the circuit.



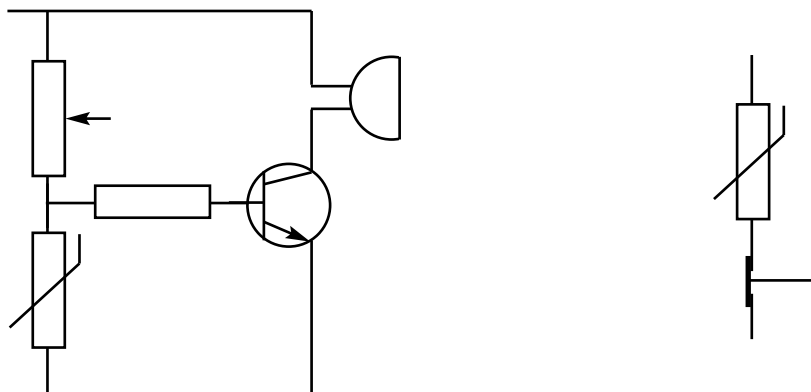
(i) Sketch the electronic symbol for each component shown.  
 \* 5 correct symbols (5 x 2 marks) 10 marks

(ii) 1. Explain which of the three contacts on the variable resistor should be used in constructing the potential divider for this circuit.  
 \* 2 correct contacts identified (4 marks), [middle - 2 marks, one other - 2 marks]

2. Sketch the circuit diagram for this circuit.  
 \* Correct circuit diagram (6 marks) 6 marks  
 (pot div. correct 2 marks, base resistor to transistor 2 marks, buzzer on C/E 2 marks)

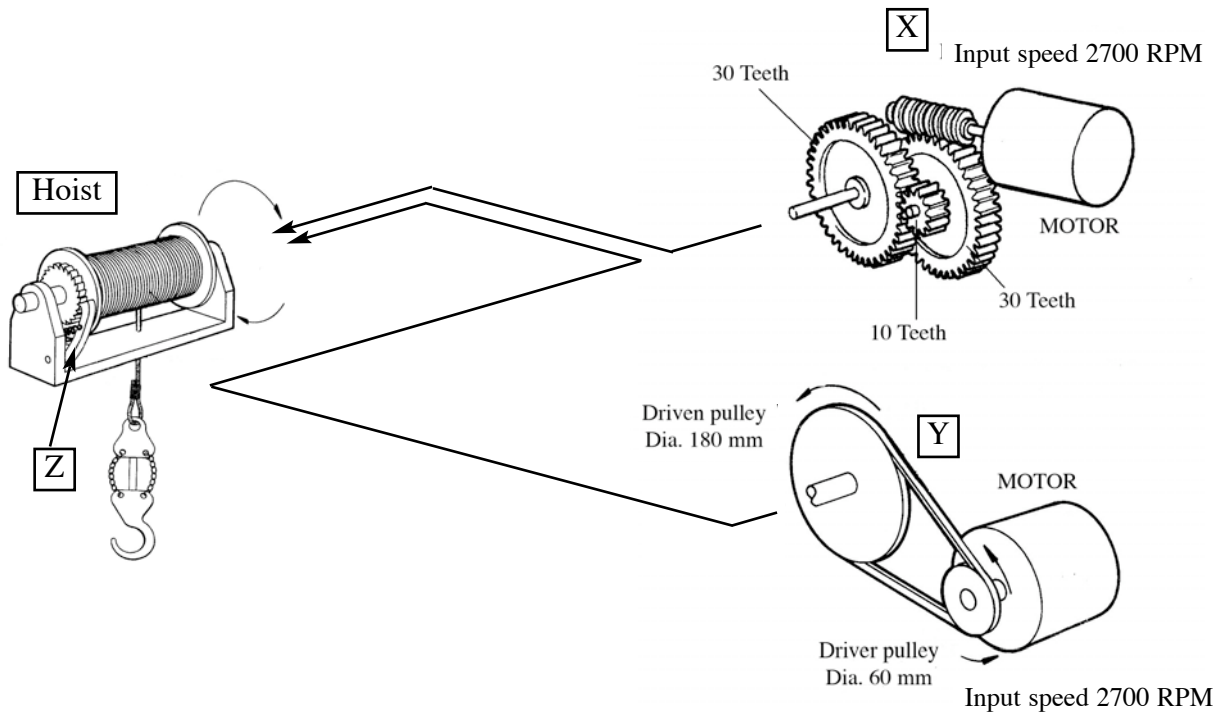
3. If the components of the potential divider are interchanged, what effect will this have on the operation of the circuit?  
 \* Circuit now detect high temp (2 marks) 2 marks

4. Sketch a modification to the circuit to include a PTB switch which will test if the circuit is working without reaching low temperatures.  
 \* Correct location of PTB in series with thermistor (3 marks) 3 marks



- OR -

- 2 (b) A student intends to attach a motor driven mechanism to the hoist shown. The mechanisms labelled X and Y are available to drive the hoist.



- (i) 1. Name the mechanisms attached to the motor in X.  
\* X : *Worm & wheel* - 2 x 2 marks. 4 marks
2. State **two** advantages to mechanism X over mechanism Y in driving the hoist.  
\* 2 valid advantages (2 x 3 marks)  
speed, locking, non-slip, etc. 6 marks
- (ii) The motor turns at 2700 RPM in both mechanisms.
1. Calculate the output speed in mechanism X.  
\* O/P speed : 30RPM - 5 marks 5 marks  
[ $2700/30 = 90\text{RPM}$ : (3 mks),  $90 \times 10 = 30 \times \mathbf{30}$ :(2 mks)]
2. Calculate the output speed in mechanism Y.  
\* O/P speed : 900 RPM - 5 marks 5 marks  
[ $2700 \times 60$  ( 3 mks) =  $180 \times \mathbf{900}$  (2 mks)]
- (iii) Name and state the function of the feature identified at Z on the hoist.  
\* Name (*Ratchett & Pawl*) 3 marks, Function (*prevent slip*) 2 marks 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

Advanced electronics technologies are at the core of modern handheld communication and music devices.

Many of these devices can:

- (i) take digital images,
- (ii) play mp3 files and
- (iii) download files.



- (a) (i) Explain each of the three functions above.  
\* *3 functions explained: 3 x 5 [5,3,1] marks* 15 marks  
Image: device stores image electronically (no film), instant replay, etc.  
MP3: compressed audio format, stored electronically, etc.  
Download: access web/pc transfer data to device, etc.
- (ii) Explain why many of these devices are considered 'disposable'.  
\* *Correct explanation 5 [5,3,1] marks* 5 marks  
low cost manufacture, too expensive to repair, built in redundancy, etc.

The development of the world wide web, and the supporting technology, has brought about great changes to society in recent years.

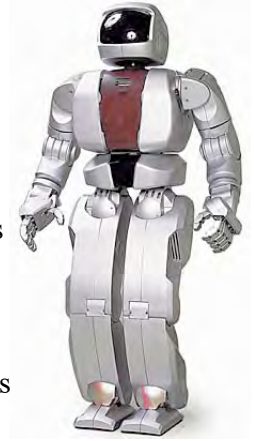
- (b) Explain, using **two** appropriate examples, the impact the world wide web has on society.  
\* *2 examples(2x2) marks, explained (2 x 3 [3,1]) marks* 10 marks  
Commercial impact: shopping, ordering online, etc.  
Personal impact:e-mail, blogs, communications, research, etc.

Forecasters warn of an energy crisis in the developed world.

- (c) (i) Explain, using **two** appropriate examples, the reason for this energy crisis.  
\* *2 examples(2x2) marks, explained (2 x 3 [3,1]) marks* 10 marks
- (ii) Outline, using **two** appropriate examples, how technology might be used to reduce the impact of this energy crisis.  
\* *2 examples(2x2) marks, explained (2 x 3 [3,1]) marks* 10 marks

#### 4. Control Systems & Technology and Society

Robotic figures are commonly available as microprocessor controlled toys.



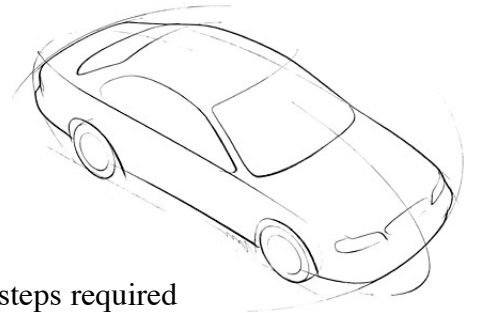
- (a) (i) Describe **two** functions available in these robot toys.  
\* 2 functions(2x2) marks, described (2 x 3[3,1]) marks 10 marks  
input:sensors, output:various
- (ii) Explain the role of a 'microprocessor' in the operation of these robots.  
\* Role of microprocessor - data processing [5,3,1]marks 5 marks
- (iii) Explain why the movements of these robots are slow.  
\* explained - multiple motors, limited complexity [5,3,1]marks 5 marks

Industrial robots are commonly used in motorcar production lines.

- (b) (i) Explain, giving **two** reasons, why industrial robots are preferred to workers on production lines.  
\* 2 reasons (2x2) marks, explained (2 x 3[3,1]) marks 10 marks
- (ii) Explain, giving **two** reasons, why it is unlikely that industrial robots will replace all workers in production industry.  
\* 2 reasons (2x2) marks, explained (2 x 3[3,1]) marks 10 marks
- (iii) Explain, giving **two** reasons, why many companies have moved manufacturing plants from the developed world to developing countries.  
\* 2 reasons (2x2) marks, explained (2 x 3[3,1]) marks 10 marks

#### 5. Design and Manufacture

A student is required to manufacture a motorised model car based on the design shown.

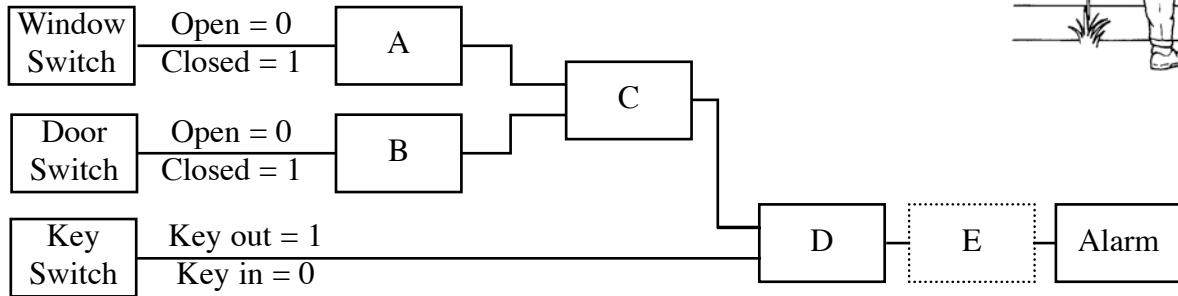


- (a) (i) Describe, with the aid of suitable sketches, the steps required to manufacture the body from plastic sheet by vacuum forming.  
\* Sketch(s) 2 x 3 [3,1]marks, Steps 3 x 3 marks 15 marks
- (ii) Describe, with the aid of suitable sketches, how the body could be attached to an aluminium baseplate.  
The body must be easily attached and removed from the baseplate.  
\* Sketch(s) 2 x 3 [3,1]marks, Steps 3 x 3 marks 15 marks
- (b) (i) Describe, with the aid of suitable sketches, the steps required to motorise the design shown.  
\* Sketch(s) 4 [4,2]marks, Steps 2 x 3 marks 10 marks
- (ii) Sketch the circuit diagram required to light two white LED headlights and two red LED tail-lights in the design shown.  
\* Circuit diag. 4 [4,2]marks, Steps 2 x 3 marks 10 marks

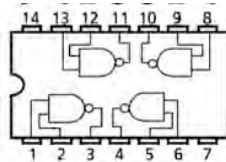
## 6. Control Systems

A block diagram for a burglar alarm control system is shown.

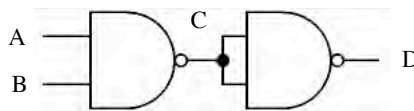
The system, controlled by a master key, will sound an alarm if a window or door is opened. The window and door switches produce a logic state of '0' when opened. A master key must be inserted to turn off the system and produce a logic state of '0'.



- (a) (i) Explain why a reed switch is suitable for use in the door and window.  
 \* Explain 6 [6,4,2]marks 6 marks
- (ii) Identify the logic gates required at A, B, C and D.  
 \* Gates identified (A:NOT, B:NOT, C:OR, D:AND) 4 x 2 marks 8 marks
- (iii) Sketch and complete a truth table for logic gates A and D.  
 \* NOT (2 marks), AND (8 marks, 4 x 2) [ip = 1, op = 1 mk] 10 marks
- (iv) A latch is required at E. Explain the function of a latch in the system.  
 \* Latch function explained 6 [6,4,2]marks 6 marks
- (b) A NAND logic gate is a combination of an AND gate followed by a NOT gate. These logic gates are available in a single chip similar to the one shown.



- (i) Sketch and complete a truth table for a NAND gate.  
 \* NAND table (4 x 2 mks) [ip = 1, op = 1 mk] 8 marks
- (ii) Use a truth table to identify the logic gate produced when two NAND gates are combined as shown. 12 marks



- \* Gate identified as AND [NAND + NOT] (4 marks)  
 \* Truth table constructed - (8 marks, 4 x 2) [ip = 1, op = 1 mk]

AND

input	input	output
1	1	1
1	0	0
0	1	0
0	0	0

NOT

input	output
1	0
0	1

NAND

input	input	output
1	1	0
1	0	1
0	1	1
0	0	1

input A	input B	output C	output D
1	1	0	1
1	0	1	0
0	1	1	0
0	0	1	0