S56

Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2004

MATERIALS AND TECHNOLOGY

METALWORK - ORDINARY LEVEL

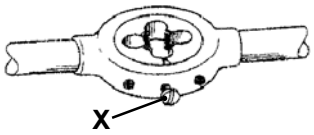
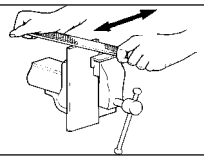
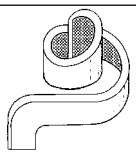
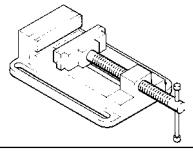
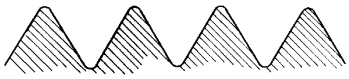
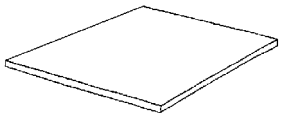
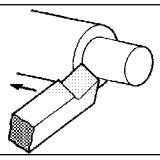
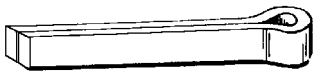
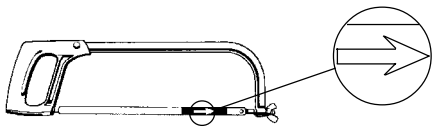
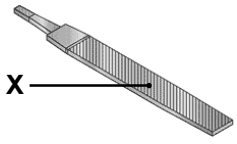
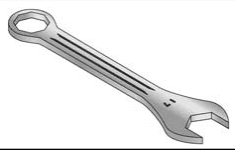
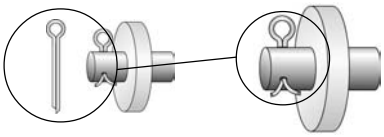
100 Marks

Marking Scheme

1.

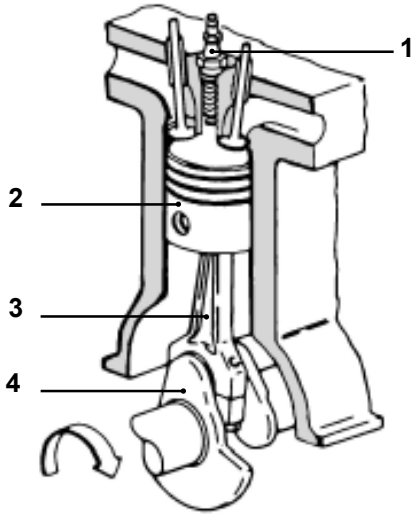
SECTION A - 20 MARKS
ANSWER ANY TEN QUESTIONS FROM THIS SECTION

40 Marks

(a) 	*Screw 'X' is used to adjust the:*	Plug Tap		②
		Thumb Screw		
		Split Die	✓	
		Tap Wrench		
(b) 	*This technique is called:*	Cross Filing		②
		Draw Filing	✓	
		Concave Filing		
		Pinning		
(c) 	*This tool is used for:*	Bending		②
		Cutting		
		Scrolling	✓	
		Folding		
(d) 	*This holding device is a:*	Pin Vice		②
		Bench Vice		
		Hand Vice		
		Machine Vice	✓	
(e) 	*This is a(n):*	Square Thread		②
		Acme Thread		
		ButtressThread		
		Metric Thread	✓	
(f) 	*3mm steel plate is cut using:*	Straight Snips		②
		Bench Shears	✓	
		Brazing Torch		
		Piercing Saw		
(g) 	*Lathe tool bits are made from:*	Stainless Steel		②
		Chrome		
		Aluminium		
		High Speed Steel	✓	
(h) 	*This tool is used for:*	Bending Sheet Metal	✓	②
		Forging Steel		
		Riveting Steel Plates		
		Holding Work		
(i) 	*The arrow on the hacksaw blade indicates:*	A Coarse Tooth Blade		②
		The Direction of Cut	✓	
		A Worn Blade		
		A Fine Tooth Blade		
(j) 	*Part 'X' is called the:*	Point		②
		Face	✓	
		Edge		
		Tang		
(k) 	*This tool is a(n):*	Allen Key		②
		Spanner	✓	
		Adjustable Spanner		
		Combination Pliers		
(l) 	*This fastener is a:*	Bolt		②
		Rivet		
		Split Pin	✓	
		Lock Nut		

SECTION B - 20 MARKS
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)



Name the labelled engine parts.

1.	*Spark Plug*	(1)
2.	*Piston*	(1)
3.	*Connecting Rod*	(1)
4.	*Crankshaft*	(1)

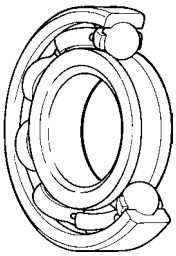
(n)

List four different machines that use petrol engines.

1.	*Cars*	(1)
2.	*Small Boats*	(1)
3.	*Lawnmowers*	(1)
4.	*Generators, etc.*	(1)

(o)

(i) This is a:



Slider	
Bearing	✓
Shaft	
Clutch	

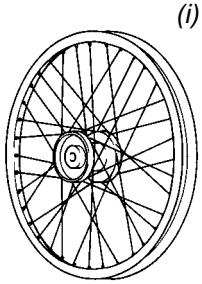
(2)

(ii) Lubrication is used to reduce:

Friction (2)

(p)

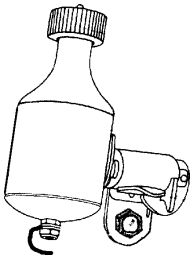
(i) Bicycle wheels are made from:



Copper	
Brass	
Steel	✓
Zinc	

(2)

(ii) A dynamo converts mechanical energy into:

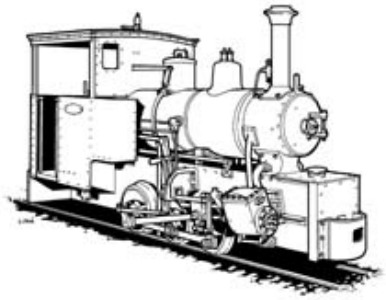


Potential Energy	
Electrical Energy	✓
Chemical Energy	
Heat Energy	

(2)

(q)

List four differences between a modern locomotive and this locomotive.



1.	*Modern locomotives reach higher speeds.*	(1)
2.	*Modern locomotives are more reliable.*	(1)
3.	*Modern locomotives cause less polution.*	(1)
4.	*Modern locomotives can travel greater distances, etc...*	(1)

2. **20 Marks**

(a)

(i) Steel is produced by combining iron with:

Copper	
Carbon	✓
Ore	

(1)

(ii) Copper is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

(1)

(iii) Metal gates are made from:

Mild Steel	✓
Iron	
Tin	

(1)

(iv) Plastic curtain rails are made from:

Acrylic	
Nylon	✓
Polyester Resins	

(1)

(v) Iron is produced in the:

Basic Oxygen Furnace	
Electric Arc Furnace	
Blast Furnace	✓

(1)

(vi) Battery plates are made from:

Zinc	
Lead	✓
Aluminium	

(1)

(vii) Plastics that cannot be softened when reheated are called:

Hard Plastics	
Thermoplastics	
Thermosetting Plastics	✓

(1)

(viii) Another name for glass reinforced polyester is:

Fibre Glass	✓
Polyvinyl Chloride	
Polyethylene	

(1)

(b) Complete the chart by matching each property to the correct definition below.

Property	Definition	
Toughness	*The ability to withstand blows or an impact.*	(1)
Malleability	*The ability to be hammered into a sheet without breaking.*	(1)
Ductility	*The ability to be stretched into thin wire.*	(1)
Brittleness	*The tendency to break easily when struck.*	(1)
Hardness	*The ability to resist wear and scratching.*	(1)
Conductivity	*The ability to allow electricity to pass through.*	(1)

Descriptions:

- *break easily when struck.*
- *resist wear and scratching.*
- *allow electricity to pass through.*
- *withstand blows or an impact.*
- *be hammered into a sheet without breaking.*
- *be stretched into thin wire.*

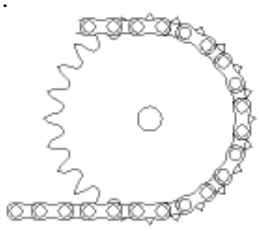
(c) Complete the chart by listing a tool for each process.

Process	Tool	
To flatten aluminium sheet without causing damage.	~~*Mallet*~~	
To cut an internal thread.	*Tap Wrench*	(1)
To mark the position of a hole before drilling.	*Centre Punch*	(1)
To clean a pinned file.	*File Card*	(1)
To draw a circle on a piece of metal.	*Dividers*	(1)
To cut a 20mm round mild steel bar.	*Hacksaw*	(1)
To mark out and check angles on a piece of metal.	*Protractor*	(1)

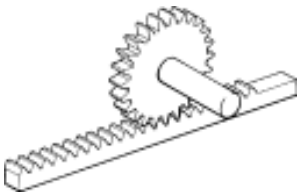
3. **20 Marks**

(a) **(i) Match the number to the correct mechanism.**

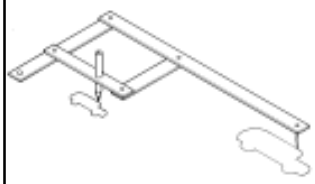
1.



2.

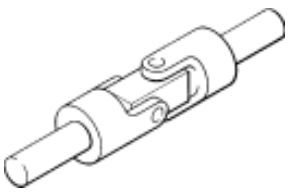


3.

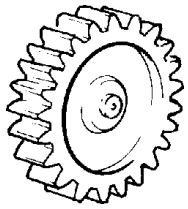


4.

5.

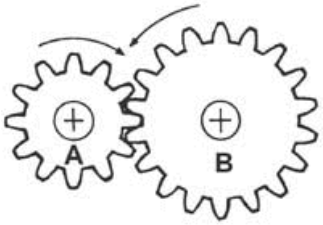


6.



Mechanism	No.	
Universal Joint	5	1
Sprocket	1	1
Worm Gear	4	1
Spur Gear	6	1
Rack and Pinion	2	1
Parallel Linkage	3	1

(ii) How many times will gear A have to rotate in order that gear B completes one full rotation?



A = 12 Teeth **B = 18 Teeth**

1.5 times 3

(b) **The sketch shows a machine with an input and an output.**

(i) Name the input mechanism.

Ratchet	
Crank	✓
Pinion	

1

(ii) What kind of input motion is required?

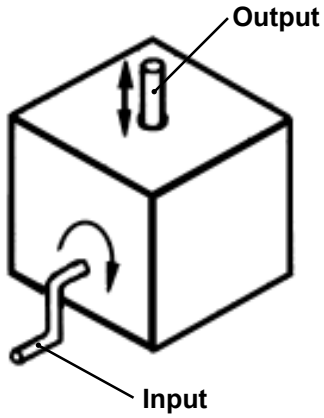
Oscillating	
Reciprocating	
Rotary	✓

1

(iii) Name the output motion produced.

Linear	✓
Rotary	
Reciprocating	

1



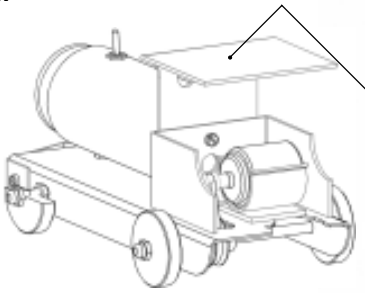
(iv) Name the internal mechanism used to produce the output motion. *Cam* 2

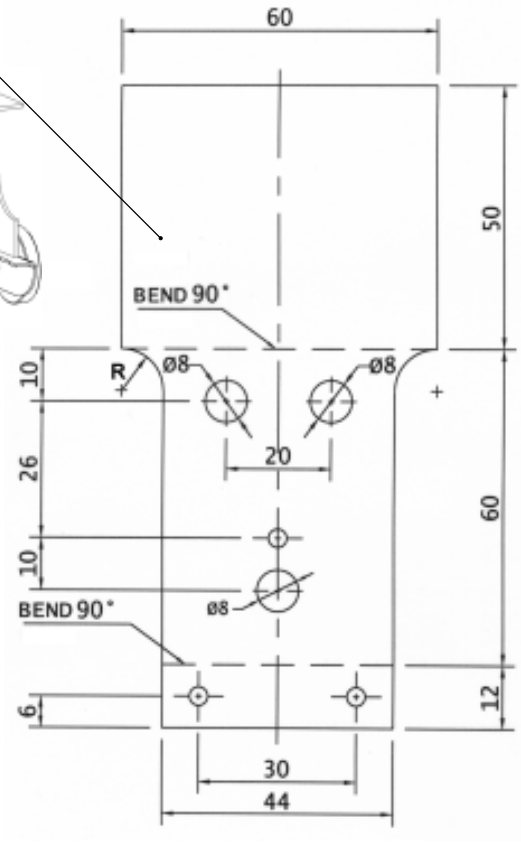
(c) **Complete the chart by listing devices that use the following mechanisms.**

Mechanism	Device	
~~Ratchet~~	~~*Fishing reel.*~~	
Lever	*Door handle.*	1
Pulley	*Car engine.*	1
Gear Train	*Lathe.*	1
Bevel Gears	*Hand drill.*	1
Rack & Pinion	*Pillar drill.*	1
Square Thread	*Vice.*	1

4. **20 Marks**

Details of a model locomotive are shown.





(i) **What is the overall width and height of the Cab?**

60 x 122 (2)

(ii) **What is the size of radius 'R'?**

8 mm (2)

(iii) **Describe how you would form this curve?**

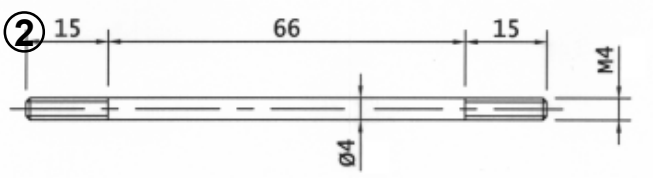
Mark out accurately.
Cut close to line with a Junior Hacksaw.
File high points with a round file.
Draw file the curve. (2)

(iv) **Describe how you would bend the Cab.**

Mark out accurately.
Line up workpiece accurately.
Use folding bars or folding press to create bend. (2)

(v) **List the tools used to make the axle.**

Hacksaw
Ruler
Stocks and die
File or lathe (2)

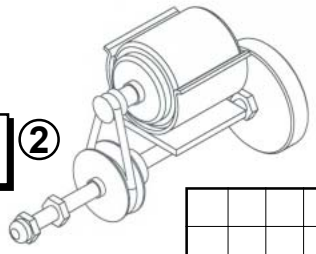


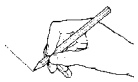
(vi) **What does 'M4' refer to on the axle drawing?**

4mm metric thread (2)

(vii) **Name the mechanism used to turn the axle.**

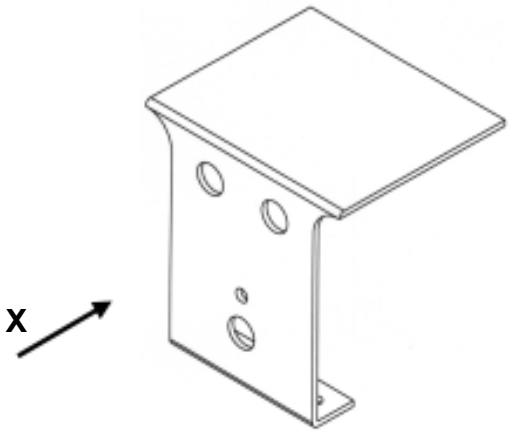
Pulley (2)





USE A PENCIL ONLY

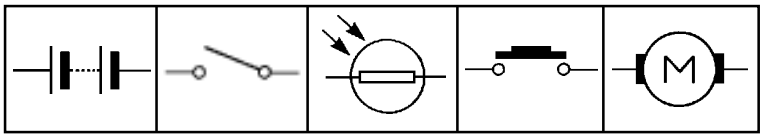
(viii) **Draw an elevation of the cab looking in the direction of arrow 'X'.**



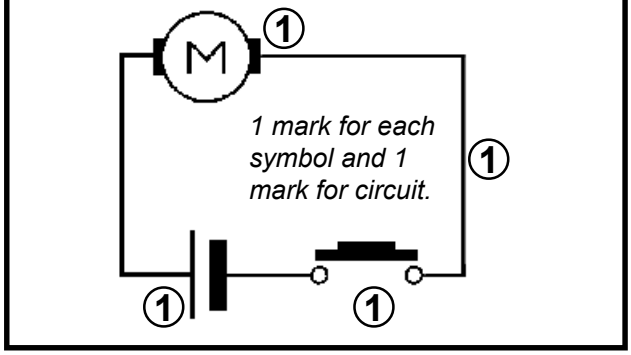
All orthographic edges shown = 2 marks
All holes shown in location = 2 marks
Standard of sketch = 2 mark

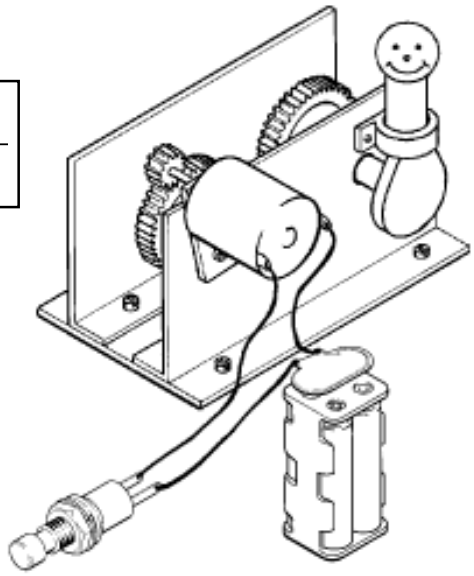
5. **20 Marks**

(a) (i) **Select the correct symbols from the chart and complete the electrical circuit diagram for this project.**

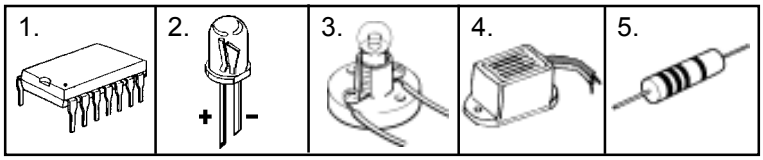


Draw the circuit in this box



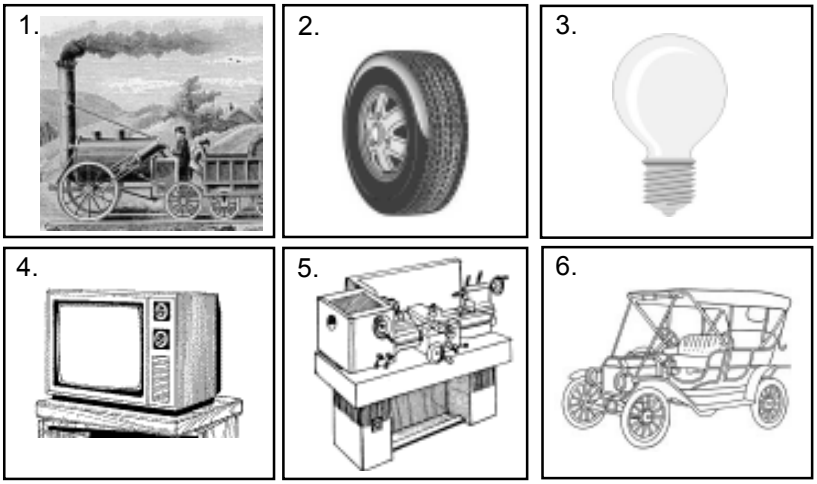


(ii) **Match the number to the component.**



Component	No.	
Bulb	3	1
Buzzer	4	1
Integrated Circuit	1	1
LED	2	1
Resistor	5	1

(b) **Match the achievement to the inventor.**



Inventor	No.	
John Logie Baird	4	1
Henry Maudslay	5	1
Thomas Edison	3	1
Henry Ford	6	1
John Dunlop	2	1
George Stephenson	1	1

(c) (i) **Which of these devices can store more data?**

CD - ROM	✓	1
Floppy Disk		

(ii) **Name two computer input devices.**

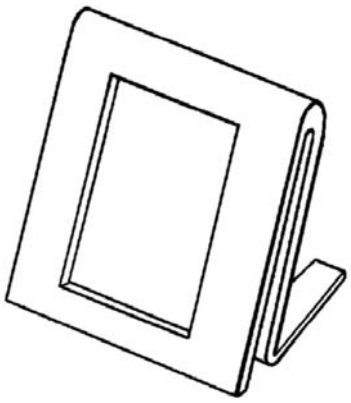
1.	*Keyboard*	1
2.	*Mouse*	1

(iii) **List two uses for a computer in the engineering industry.**

1.	*CAD*	1
2.	*CNC*	1

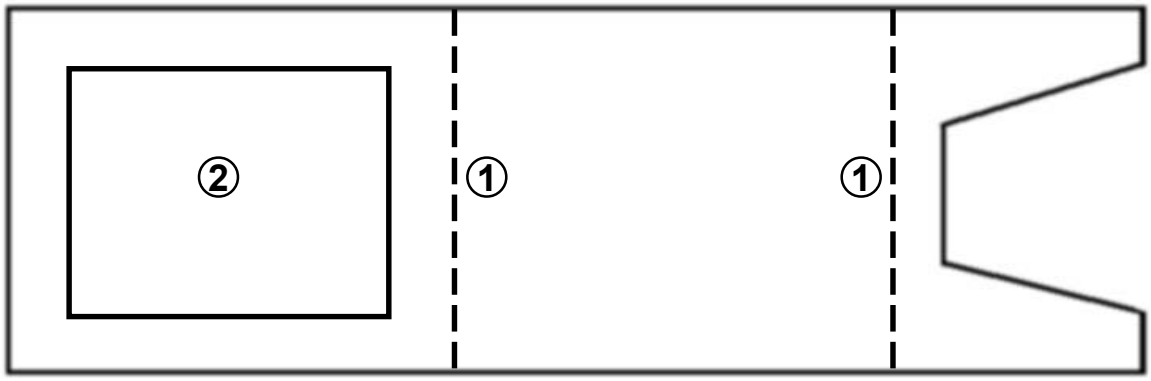
6. **20 Marks**

(i) The design shows a photograph frame. Name one plastic material and one sheet metal material suitable for making this project. Give reasons for your choice.



Plastic:	*Acrylic*	(1)
Reason:	*Easy to bend, good appearance.*	(1)
Metal:	*Brass*	(1)
Reason:	*Can be polished to give a good finish.*	(1)

(ii) The rectangle below shows the blank piece of material to be used to make the project. Complete the marking out and show where the bend lines should be located.



(iii) Using the chart below describe the cutting and shaping processes to be used to make the photograph frame. Also list the tools used at each stage.

Cutting:		**Tools used:**	
Description of cutting acrylic or sheet metal to include cutting out rectangle and legs.	(2)	*Pillar Drill* *Hacksaw*	(1) (1)
Shaping:		**Tools used:**	
Description of shaping acrylic or sheet metal to include forming of shape.	(2)	*Try Square* *Strip Heater*	(1) (1)

(iv) How would you finish the edge of the photograph frame?

File and polish edges to a high finish.	(2)

(v) Before designing a photograph frame what information would you need to know?

The size of the photograph.	(2)