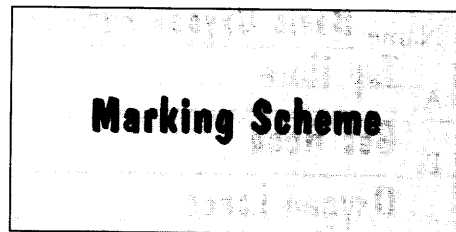


## AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

*Leaving Certificate Applied 2001***Vocational Specialism – Engineering**  
(240 marks)

Monday 11th June 2001

Morning 9.30 a.m. – 11.00 a.m.

*General Directions*

1. Write your examination number in this space.
2. Answer Question 1, Sections A and B, and any three other questions.
3. Write your answers in the spaces provided and include sketches as appropriate.
4. Hand up this Paper at the end of the examination.

*For the Examiner only*

1. Suim na n-iomlán deireadh leathanaigh Total of end of page totals	
2. Mór-iomlán na gceisteanna/ceiste nár ceadaíodh Aggregate total of all disallowed Question(s)	
3. An T-ollmharc cruinn a bronnadh (1 lúide 2) Total mark awarded (1 minus 2)	
4. Breismharc do fheaghairt trí mheán na Gaeilge (más i gceist) Bonus mark for answering through Irish (if applicable)	
5. Marc iomlán má bronnadh breismharc do fhreagairt trí Ghaeilge (3+4) Total mark awarded if Irish Bonus (3+4)	
<p>Nóta: Caithfidh an marc i líne 3 (nó líne 5 má bronnadh breismharc do fhreagairt trí mheán na Gaeilge) a bheith cothrom leis an marc sa bhosca <b>Mór Iomlán</b> ar an script.</p> <p>Note: The mark in row 3 (or row 5 if an Irish Bonus is awarded) must equal the mark in the <b>Mór-Iomlán</b> box on the script.</p>	

# Question 1.

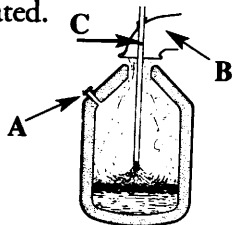
90 marks

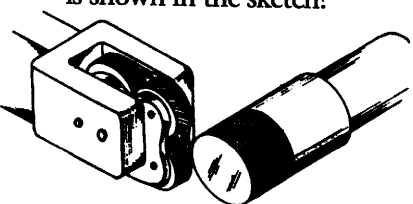
**SECTION A — 60 MARKS**  
 Give brief answers to any fifteen of the following.  
 (Sketches may be used to explain your answers).

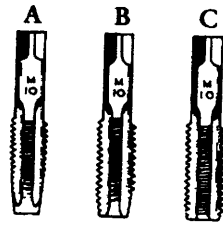
QUESTION	WRITTEN ANSWER	SKETCH
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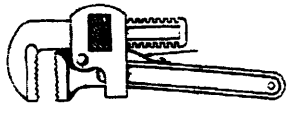

**USE A PENCIL ONLY**

<p>(a) Name <u>two</u> marking out tools used in Engineering.</p>	<p>1. <b>Scriber</b></p> <hr/> <p>2. <b>Spring Dividers</b></p> <hr/>	<p align="center"><b>(2 marks)</b></p> <hr/> <p align="center"><b>(2 marks)</b></p>
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<p>(b) Name the furnace shown and identify the <u>three</u> parts indicated.</p> 	<p>Name: <b>Basic Oxygen Furnace</b></p> <p>A. <b>Tap Hole</b></p> <p>B. <b>Gas Hood</b></p> <p>C. <b>Oxygen Lance</b></p>	<p align="center"><b>(4 x 1 mark)</b></p>
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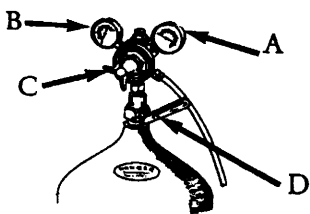
<p>(c) Which lathe turning process is shown in the sketch?</p> 	<p align="center"><b>Knurling</b></p> <hr/> <hr/> <hr/>	<p align="center"><b>(4 marks)</b></p>
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<p>(d) Name the <u>three</u> types of taps shown.</p> 	<p>A: <b>Taper tap</b></p> <hr/> <p>B: <b>Second tap</b></p> <hr/> <p>C: <b>Plug tap</b></p> <hr/>	<p align="center"><b>(Any 1 x 2 marks)</b></p> <hr/> <p align="center"><b>(+1 mark)</b></p> <hr/> <p align="center"><b>(+1 mark)</b></p>
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<p>(e) Name the tool shown and state <u>one</u> of its uses.</p> 	<p>Name: <b>Stillson Wrench</b></p> <hr/> <p>Use: <b>Tightening large nuts</b></p> <hr/> <p align="center"><b>in plumbing joints.</b></p> <hr/>	<p align="center"><b>(2 marks)</b></p> <hr/> <p align="center"><b>(2 marks)</b></p>
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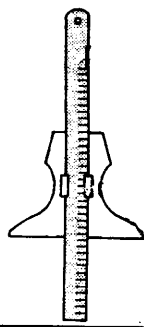
QUESTION	WRITTEN ANSWER	SKETCH
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(f) Identify any **two** of the items shown.



	<p>A. <u>Cylinder Contents Gauge</u></p> <p>B. <u>Working Pressure Gauge</u></p> <p>C. <u>Pressure Regulator</u></p> <p>D. <u>On/Off valve</u></p>	<p>(Any 2 x 2 marks)</p>
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(g) In engineering, what is the function of a: *Depth Gauge?*

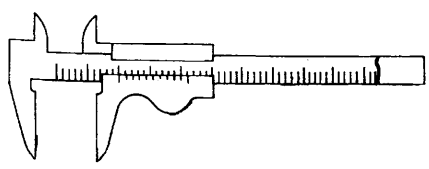


	<p>To measure the depth of</p> <hr/> <p>a blind hole.</p> <hr/>	<p>(4 marks)</p>
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(h) List **three** uses of computers in engineering.

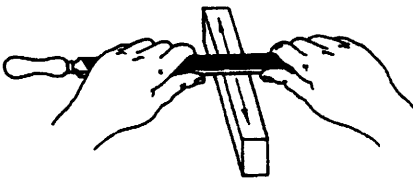
	<p>1. <u>CNC Lathe</u></p> <p>2. <u>Production of drawings</u></p> <p>3. <u>Research using internet</u></p>	<p>(Any 1 x 2 marks)</p> <p>(+1 mark)</p> <p>(+1 mark)</p>
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(i) Name the tool shown and state its use.

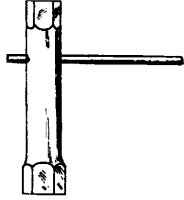
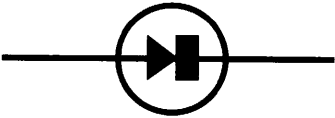




	<p>Name: <u>Vernier Calipers</u></p> <p>Use: <u>The accurate</u></p> <hr/> <p><u>measurment of</u></p> <hr/> <p><u>engineering materials.</u></p>	<p>(2 marks)</p> <p>(2 marks)</p>
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(j) Name the type of filing shown and explain its purpose.

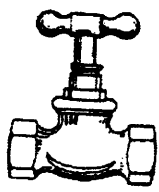


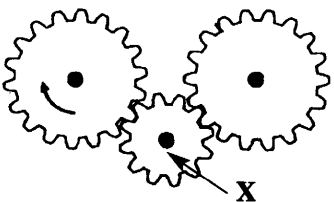
	<p>Name: <u>Draw Filing</u></p> <p>Purpose: <u>To produce a</u></p> <hr/> <p><u>smooth finish.</u></p> <hr/>	<p>(2 marks)</p> <p>(2 marks)</p>
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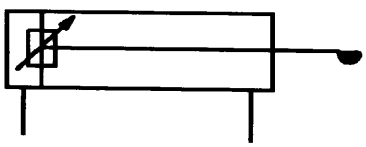
QUESTION	WRITTEN ANSWER	SKETCH
<p>(k) What is a plug spanner used for?</p> 	<p>To tighten or loosen plugs in an engine.</p>	<p>(4 marks)</p>
<p>(l) In electricity, what is meant by the terms <i>conductor and resistor</i>?</p>	<p>Conductor: <u>Material that allows electrical current to flow through it.</u></p> <p>Resistor: <u>Material that resists the flow of electrical current.</u></p>	<p>(2 marks)</p> <p>(2 marks)</p>
<p>(m) What is the function of a diode in an electronic circuit?</p> 	<p>Allows current to flow in one direction only.</p>	<p>(4 marks)</p>
<p>(n) Name the tool shown and state its use.</p> 	<p>Name: <u>Ring Spanner</u></p> <p>Use: <u>To loosen and tighten nuts</u></p>	<p>(2 marks)</p> <p>(2 marks)</p>
<p>(o) Why are spring washers used in the assembly of components?</p> 	<p>To prevent nuts and bolts from loosening due to vibration.</p>	<p>(4 marks)</p>

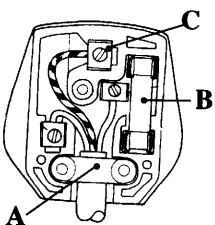
QUESTION	WRITTEN ANSWER	SKETCH
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<p>(p) What is the function of a spark plug in the ignition system of an engine?</p> 	<p>To produce a spark that ignites the fuel mixture in the combustion chamber.</p>	<p>(4 marks)</p>
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<p>(q) Why are valves used in domestic water systems?</p> 	<p>To turn on/off the water supply.</p>	<p>(4 marks)</p>
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<p>(r) Name the gear wheel 'X', and state its function.</p> 	<p>Name: <u>Idler</u></p> <p>Function: <u>To enable the driver and driven gear to turn in the same direction.</u></p>	<p>(2 marks)</p> <p>(2 marks)</p>
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<p>(s) List <u>three</u> uses of pneumatic cylinders in industry.</p> 	<ol style="list-style-type: none"> <li><u>Printing Heads</u></li> <li><u>Sliding Doors</u></li> <li><u>Entrance Barriers</u></li> </ol>	<p>(Any 1 x 2 marks)</p> <p>(+1 mark)</p> <p>(+1 mark)</p>
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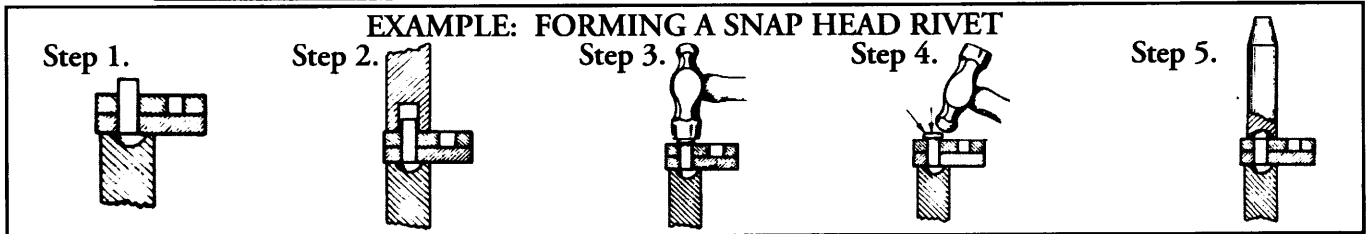
<p>(t) Name the <u>three</u> parts of the electric plug indicated.</p> 	<p>A. <u>Cable Strap</u></p> <p>B. <u>Fuse</u></p> <p>C. <u>Earth connection</u></p>	<p>(Any 1 x 2 marks)</p> <p>(+1 mark)</p> <p>(+1 mark)</p>
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**SECTION B — 30 MARKS**

Answer all questions from this section.  
(Sketches may be used to explain your answers).

(u) Choose any one of the processes listed below or name another process, (not the example given), from your experience of practical work and list five steps you used in carrying out the process.

Processes: Lathework, Drilling, Soldering, Brazing, Thread Cutting,  
Disconnecting a Car Battery, Replacing a Fuse in a Plug.



Name of process chosen: Brazing (1 mark)

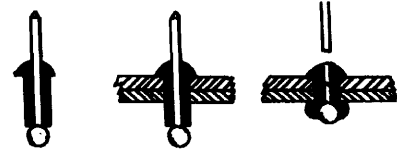


<p align="center">STEP 1</p> <hr/> <p><b>Prepare materials for brazing i.e. emery paper, matches, flux and brazing rod.</b></p> <hr/>	<p align="center">(2 marks)</p>
<p align="center">STEP 2</p> <hr/> <p><b>Clean all surfaces using emery cloth.</b></p> <hr/>	<p align="center">(2 marks)</p>
<p align="center">STEP 3</p> <hr/> <p><b>Place parts being brazed in a secure position on brazing hearth</b></p> <hr/>	<p align="center">(2 marks)</p>
<p align="center">STEP 4</p> <hr/> <p><b>Apply flux to the area where the joint is to be made.</b></p> <hr/>	<p align="center">(2 marks)</p>
<p align="center">STEP 5</p> <hr/> <p><b>Heat to a cherry red and melt the brazing rod into the joint. Allow to cool.</b></p> <hr/>	<p align="center">(2 marks)</p>

(v) In Engineering, rivets are used to join materials together.



Briefly describe three other methods of joining materials.



<p style="text-align: center;">Method 1</p> <p><b>Nuts and bolts - a hole is drilled through both pieces and a nut and bolt is then tightened.</b></p>	<p style="text-align: center;">(4 marks)</p>
<p style="text-align: center;">Method 2</p> <p><b>Soft soldering - Solder begins to melt at 183°C. Surface is cleaned and a flux is applied. Solder is applied after heating.</b></p>	<p style="text-align: center;">(4 marks)</p>
<p style="text-align: center;">Method 3</p> <p><b>Brazing-Brass is the joining metal used. It requires a high temperature. The parts are heated to above 850°C.</b></p>	<p style="text-align: center;">(4 marks)</p>

(w) From your experience of practical work, give two reasons why a particular *finishing process* was chosen for a project you completed. Don't forget to name the project.

Name of project: Candle Stick Holder (1 mark)

Name of finishing process: Painting (2 marks)

It was chosen because ...

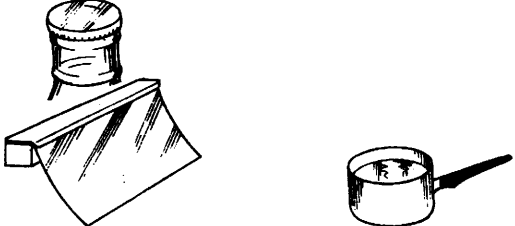
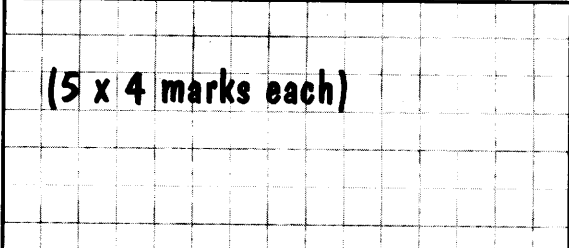
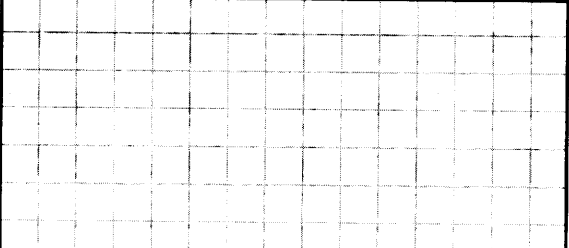
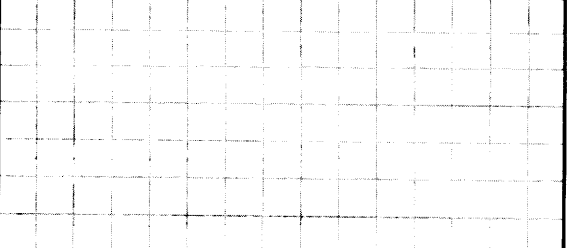
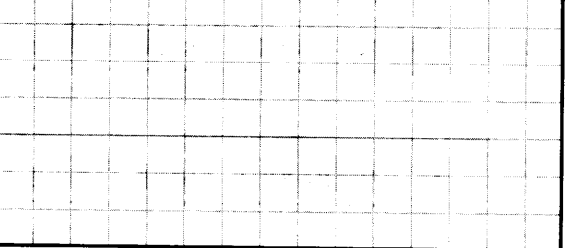
1. It prevented the steel from rusting. (2 marks)

2. It produced a clean finish that looked good. (2 marks)

# Question 2.

50 marks

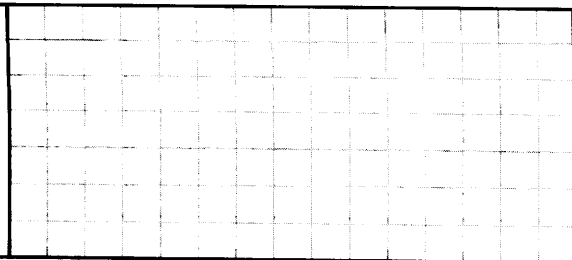
(a) Using the following table choose **any five** of the nine materials listed and give **one** example of their use. (Sketches may be used to explain your answer.)

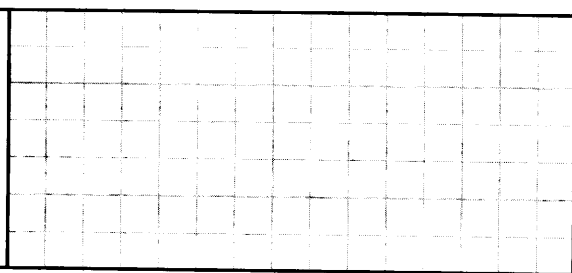
MATERIAL	USE	SKETCH
Example: Aluminium	Bottle Tops, Cooking Foil <hr/> Cooking Utensils	
Brass	<b>Door Handles</b> <hr/>	(5 x 4 marks each) 
Copper	<b>Water Cylinders</b> <hr/>	
Mild Steel	<b>Metalwork Projects</b> <hr/>	
Cast Iron	<b>Engineering Vices</b> <hr/>	

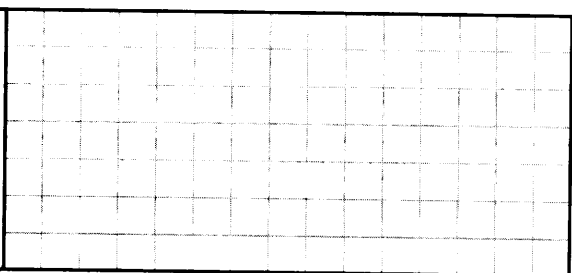


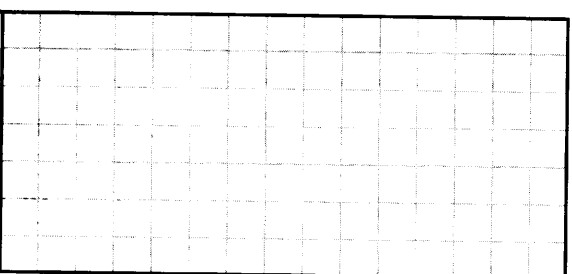
MATERIAL	USE	SKETCH
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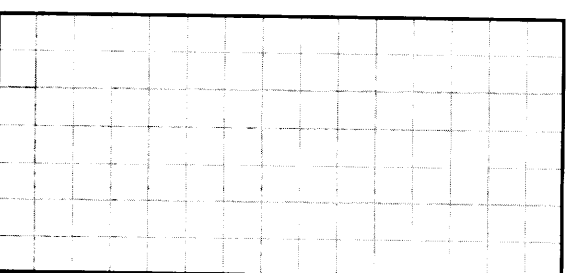
	<b>USE A PENCIL ONLY</b>
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Nylon	<b>Bearings</b> <hr/> <hr/>	
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Acrylic	<b>Toys</b> <hr/> <hr/>	
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Fibre Glass	<b>Canoes</b> <hr/> <hr/>	
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Plywood	<b>Shelving</b> <hr/> <hr/>	
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Resin	<b>Moulds</b> <hr/> <hr/>	
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(b) Based on your experience of Engineering, use the table below to describe these three types of material that may be used in project work.

(9 x 2 marks)

	Aluminium	Acrylic	Mild Steel
Purpose for which Material was used.	<b>Cover of Toy Project</b>	<b>Picture Frame</b>	<b>Base of Candle Holder</b>
Advantages of using this Material.	<b>Light and easy to bend</b>	<b>Easy to cut and bend</b>	<b>Strength and adds weight to base</b>
Description of its physical appearance.	<b>Greyish white appearance</b>	<b>May be coloured or translucent</b>	<b>Dark blue or greyish surface</b>

(c) Describe the following properties of materials under the headings shown.

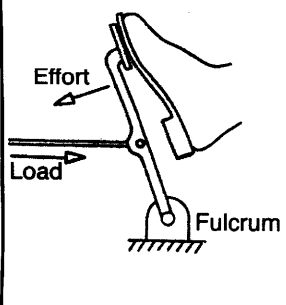
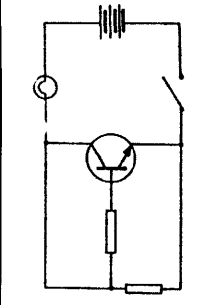
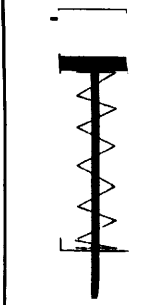
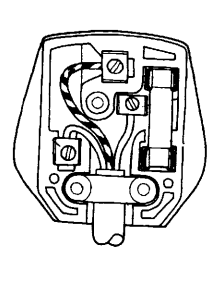
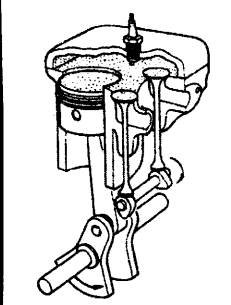
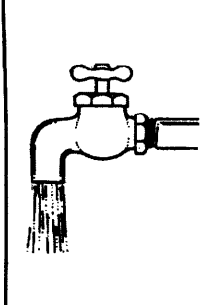
(6 x 2 marks)

PROPERTY	DEFINITION	AREA OF USE
Example: Conductivity	The ability of a material to allow heat or electricity to pass through it.	Electrical cables and heating elements.
Toughness	<b>The ability of a material to withstand sudden blows.</b>	<b>Tools or machine parts</b>
Ductility	<b>The ability of a material to be stretched without fracture by a tensile force.</b>	<b>Electrical wire</b>
Hardness	<b>The ability of a material to resist scratching.</b>	<b>Hammer heads or cutting tools</b>

# Question 3.

50 marks

(a) A table of “systems and services” modules is shown. Choose any one of these modules and answer the following questions:

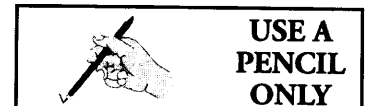
Mechanisms 	Electronics 	Pneumatics 	Electricity 	Motor Engineering 	Plumbing 
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Name of “systems and services” module: Motor Engineering 1 mark

(i) Describe three practical operations you carried out during this module: (Any 3 x 4 marks)

1. Installing Spark Plugs: Label and remove cable from plugs. Remove old spark plugs and install new spark plugs. Replace cables.
2. Changing the oil of an engine: Place container under sump. Undo sump plug nut. Allow oil to empty. Clean and replace plug nut. Pour in new oil.
3. Replacing a punctured tyre. Apply handbrake. Loosen wheel nuts. Lift up car on jack. Remove punctured wheel and put on new one. Tighten nuts. Lower car slowly with jack.

(ii) Name and sketch three items of equipment used for your work during this module.



Name	Sketch
1. <u>Plug spanner</u>	<p><b>Appropriate Sketches</b></p> <p><b>(3 sketches x 2 marks each)</b></p>
2. <u>Feeler Gauge</u>	
3. <u>Torque Wrench</u>	
<b>(Any 3 items x 2 marks each)</b>	

(b) Based on a “systems and services” module you have studied, give **one** example of where it could be used in **any three** of the areas of everyday life outlined in the table below. (Sketches may be used to explain your answer).



Name of “systems and services” module Motor Engineering (1 mark)

Areas of Use (Any Three)	Practical Application	Sketch
Home	Motor Car	(Any 3 x 3 marks each)
Industry	Lorries	
School	School Buses	
Sport	Racing Cars	
Transport	Motor bikes	
Entertainment	Go-karts	

(c) Name a **Principle** or **Regulation** you have learned, (other than the example given), and explain its application to your practical work.

Example: (Electricity) OHMS LAW: RESISTANCE =  $\frac{\text{VOLTAGE}}{\text{CURRENT}}$   $\left[ R = \frac{V}{I} \right]$

Name of Principle or Regulation: Compression Ratio (5 marks)

Practical Application: The ratio of the total volume of a cylinder to the clearance volume. When the compression ratio is increased the power will be increased.

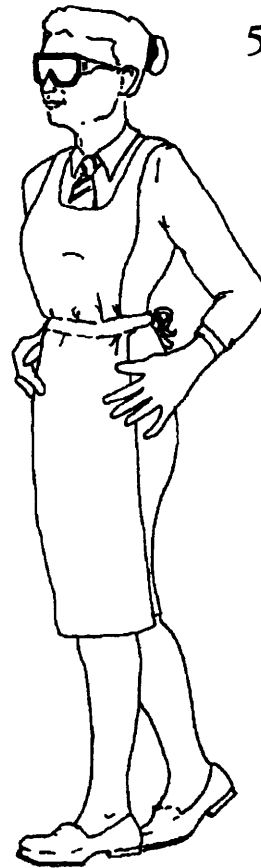
(10 marks)

## Question 4.

50 marks

(a) The girl in this sketch is suitably dressed for working in the engineering workshop.

- (i) List **four** safety features that the girl has observed and give a reason why each is important.



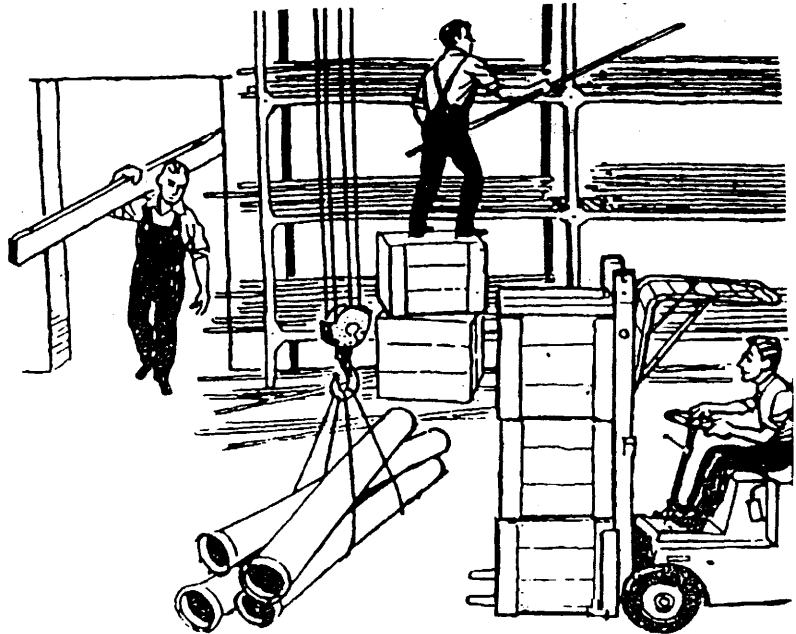
(Any 4 safety features x 1 mark each)

(4 reasons x 1 mark each)

Safety Feature	Reason
1. <b>Hair tied up.</b>	<b>To stop hair getting caught in machines.</b>
2. <b>Safety Glasses.</b>	<b>To prevent swarf from entering the eyes.</b>
3. <b>Safety Shoes.</b>	<b>To prevent a falling object from hurting the foot.</b>
4. <b>Apron tied behind.</b>	<b>To prevent the apron string from getting caught in a machine.</b>

(ii) The work practices in this sketch are unsafe. One example of an unsafe practice and the reason why it is unsafe is given below.

List **three** other unsafe practices in the sketch and give reasons why these practices are unsafe.



Unsafe Practices	Reason
Example: <b>Lifting Pipes.</b>	Pipes are not properly supported and are likely to fall when lifted.
1. <b>Too many boxes on forklift.</b>	<b>Driver unable to have a clear view.</b>
2. <b>Man standing on boxes.</b>	<b>He may lose balance and fall.</b>
3. <b>Material overhanging the door entrance.</b>	<b>People are likely to walk into the material.</b>

**(Any 3 dangers x 1 mark each)**

**(Any 3 reasons x 1 mark each)**

(iii) During the course of your studies in Engineering, you designed and made a variety of practical projects using various hand and machine tools. Name one practical project you completed and list four safety precautions you had to take when making the project. Give a reason for each precaution taken.

Don't forget to name the project.

Practical Project: Making of model racing car (3 marks)

(Any 4 precautions x 1 mark each)

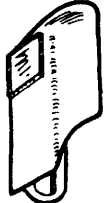

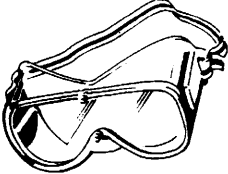
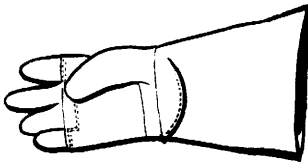


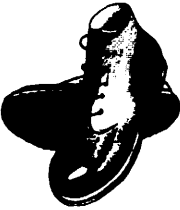

(4 reasons x 1 mark each)

Safety Precautions	Reason
1. <u>No sharp edges left on metal.</u>	<u>To prevent injury to hands from sharp edges.</u>
2. <u>Wear goggles when drilling.</u>	<u>To prevent swarf from entering the eyes.</u>
3. <u>When using files make sure file handles are tight.</u>	<u>To prevent damage to hands from sharp tang on file.</u>
4. <u>Wear face mask when spraying.</u>	<u>To prevent paint getting into lungs.</u>

(b) For any **five** of the items of safety equipment shown here, give a practical example of their use and a brief explanation of the protection provided.

**(Any 5 uses x 1 mark each)**  
**(Any 5 Reasons x 1 mark each)**

An example is given below.

Safety Equipment	Practical use	Protection provided
<p>Example</p> 	<p>Used when welding.</p>	<p>To protect eyes from the ultra-violet light.</p>
	<p>Used when working on centre lathe.</p>	<p>To protect face from flying swarf.</p>
	<p>Used when Drilling.</p>	<p>To prevent swarf from entering eyes.</p>
	<p>Used when forging.</p>	<p>To prevent burns to hands.</p>
	<p>Used when grinding.</p>	<p>To prevent ear damage.</p>
	<p>Used when spray-painting.</p>	<p>To stop paint getting into lungs.</p>
	<p>Used when lifting-materials</p>	<p>To prevent damage to feet.</p>
	<p>Used when on construction site.</p>	<p>To protect the head from falling materials.</p>



(c) When working with the tools shown below certain dangers exist. In each case state one safety precaution that should be taken and give a reason.

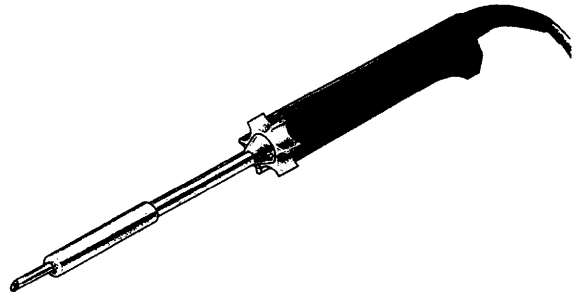
(Any 5 precautions x 1 mark each)

(Any 5 reasons x 2 marks each)

1. Working with an electric soldering iron.

Precaution Hold properly

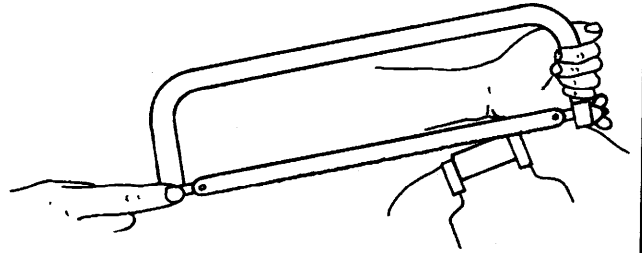
Reason To prevent burns to hands.



2. Working with a hack saw.

Precaution Hold properly.

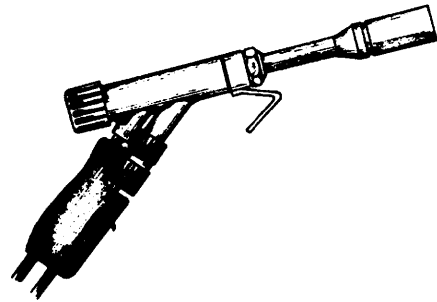
Reason To prevent slipping and cut hands.



3. Working with a gas torch.

Precaution Wear gloves and goggles.

Reason To prevent burns to eyes and hands.



4. Working with a sharp knife.

Precaution Cut away from you.

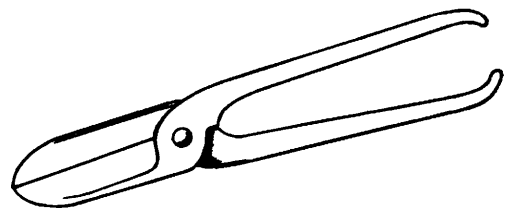
Reason To prevent cuts to hands.



5. Working with a tinsnips.

Precaution Hold properly.

Reason To prevent cuts to fingers.



# Question 5.

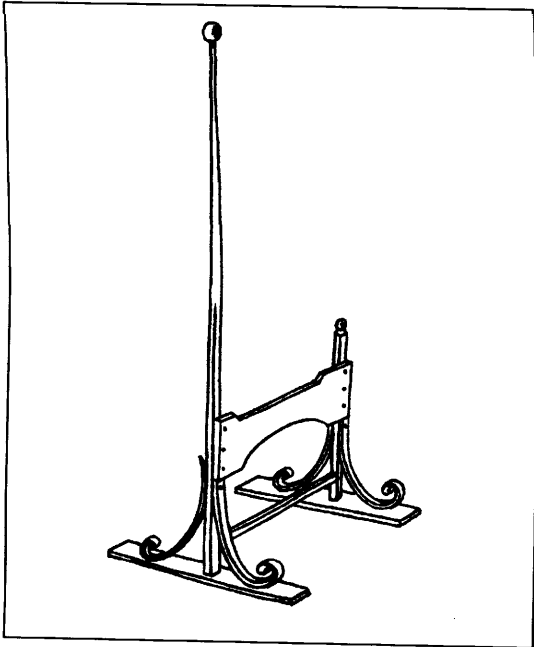
50 marks

(a) Various stages in a typical design process are listed below.

For any **four** stages, briefly describe what each involves.

**(Any 4 explanations x 3 marks each)**

Stages	This stage involves:
1. Design Brief	<b>Short statement of problem to be solved.</b> _____
2. Investigation	<b>Work carried out to help find solution to problem.</b> _____
3. Ideas and Possible Solutions	<b>Various initial ideas which may solve problems.</b> _____
4. Final Solution	<b>Final solution to problem which may incorporate some parts of initial ideas.</b> _____
5. Working Drawing	<b>Plan, elevation and end-view of what is being made.</b> _____
6. Testing	<b>Work carried out to establish if solution works.</b> _____
7. Evaluation	<b>A report on idea indicating strengths and weaknesses.</b> _____



(b) The diagram shows a boot-scraper used to remove mud from boots.

Sketch a different design for a boot-scraper in the grid box below.

Produce a working drawing of your design including plan, elevation and end view, on the grid box on the next page.

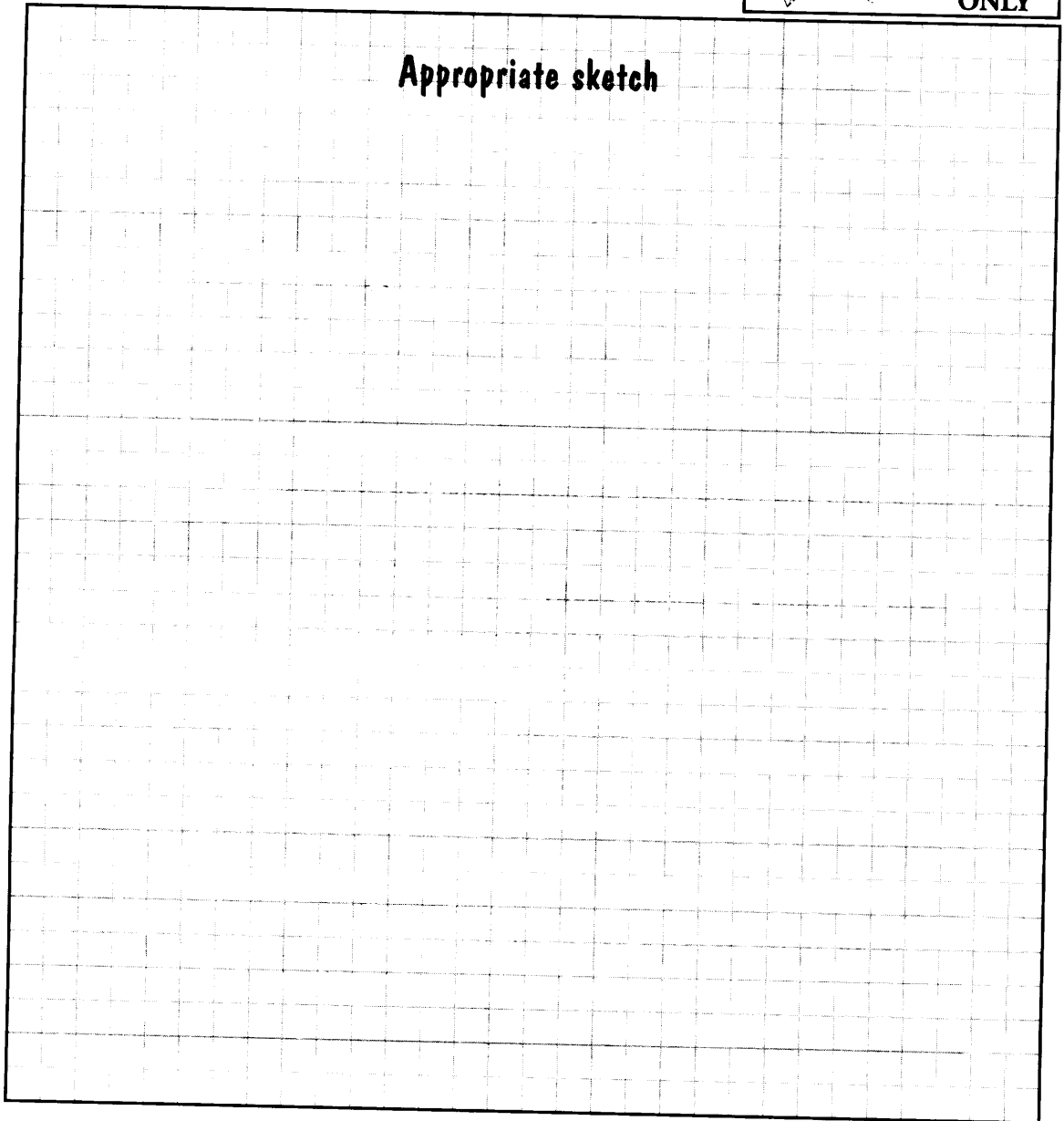


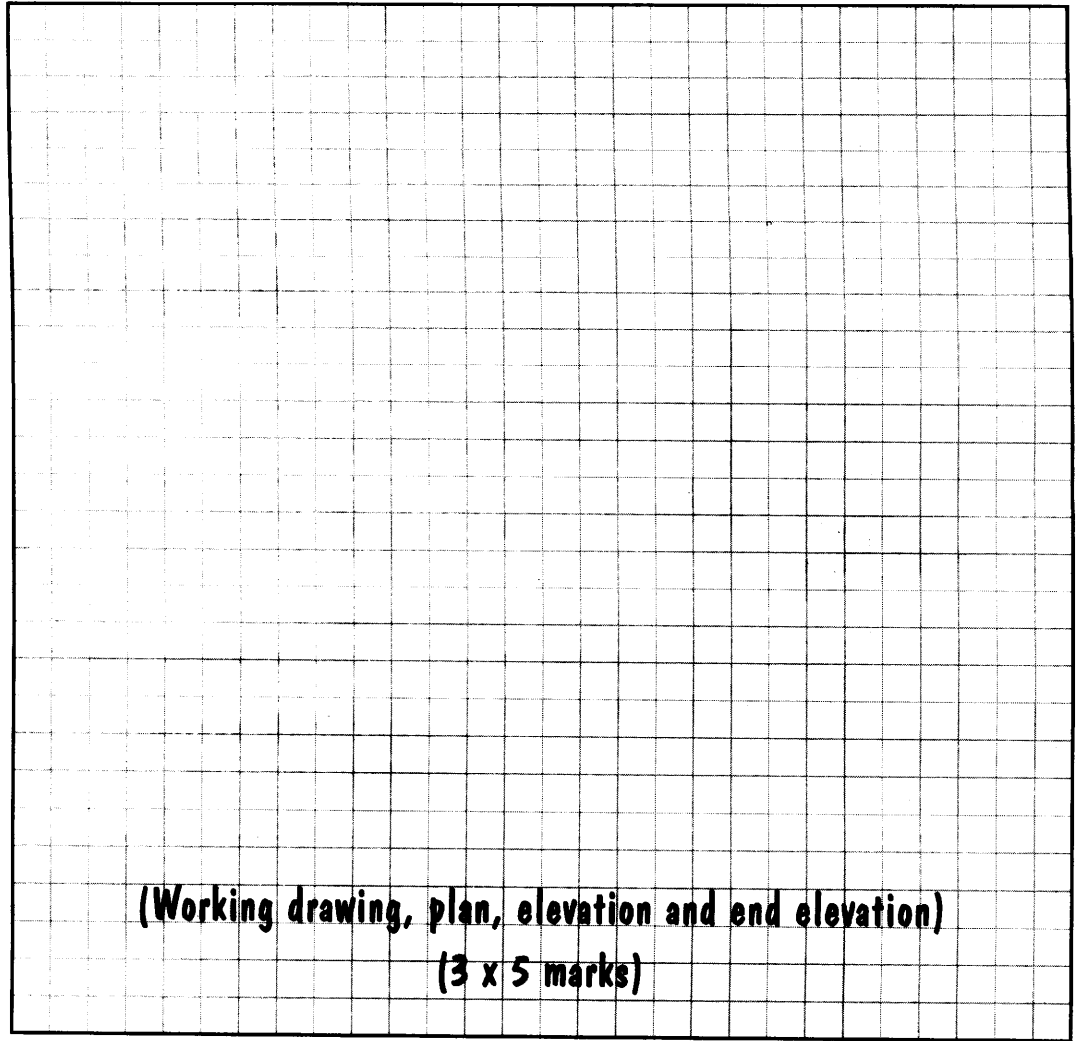
**USE A  
PENCIL  
ONLY**

Sketch your  
Design

**Appropriate sketch**

**(13 marks)**





**(Working drawing, plan, elevation and end elevation)**  
**(3 x 5 marks)**

(c) Describe how you would make the boot-scraper you designed.

**(Any 5 steps x 2 marks each)**

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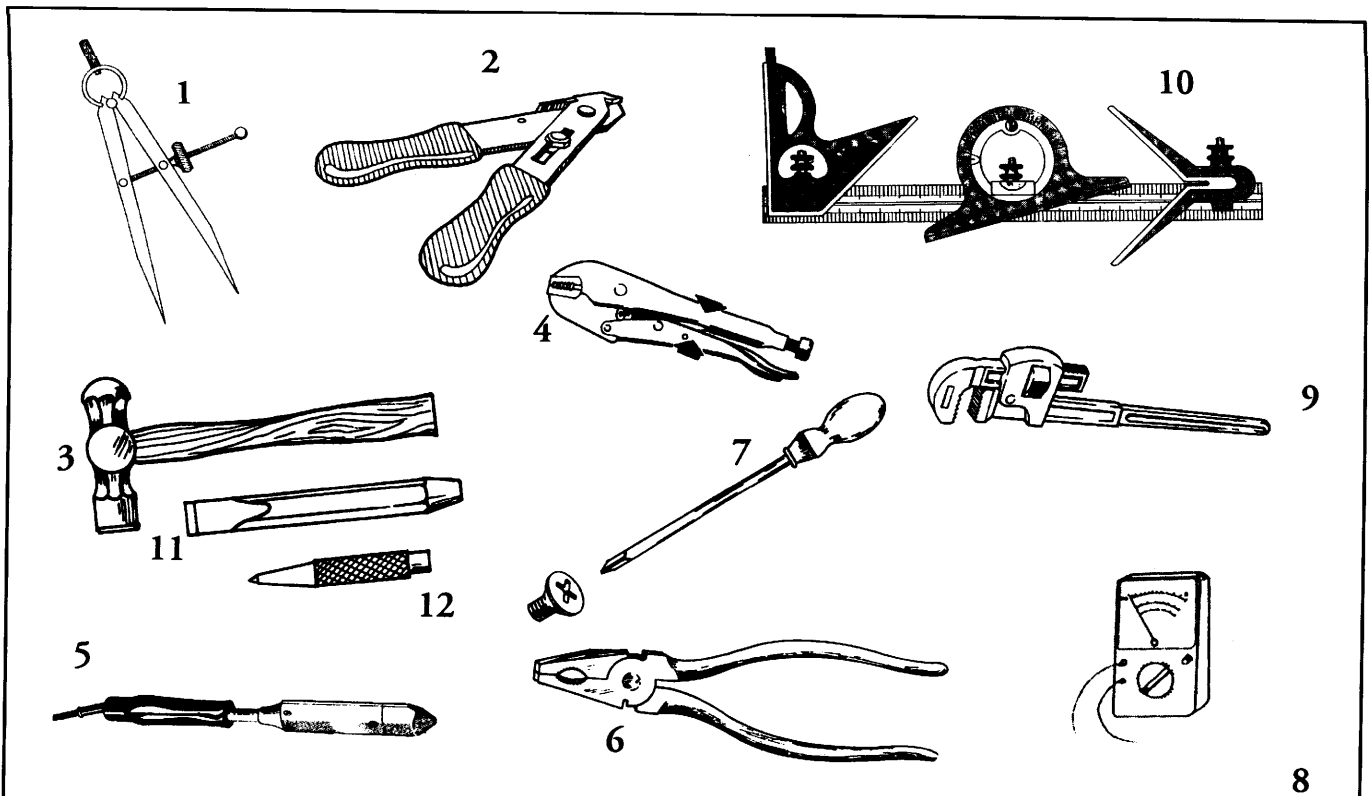
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# Question 6.

50 marks

(a) A variety of workshop tools are shown. Complete the table naming any eight tools and give a use for each one named.



Tool Number	Name (Any 8 tools x 1/2 marks each)	Description of use (Any 8 uses x 1/2 marks each)
1	Spring Dividers	Used for marking out circles or arcs.
2	Wire Strippers	Used to cut or strip electrical wire.
3	Ball Pein Hammer	Used in the formation of a rivet head.
4	Vice grips	Used for clamping materials together.
5	Electrical soldering Iron	Used for soldering electrical circuits.
6	Combination Pliers	Used for holding small parts.
7	Philips Screwdriver	Used to tighten or loosen philips head screws.
8	Multimeter	Used for measuring volts, amps and ohms.

- (b) (i) Make a freehand sketch of a cutting tool used in Engineering. Label the **two** most important parts. Don't forget to name the tool.

Name of Tool: \_\_\_\_\_ **(2 marks)**

**Appropriate sketch (7 marks)**  
**(Labelling of two main parts 2 x 1 mark)**

- (ii) State **two** advantages of power tools over handtools. **(Any 2 x 4 marks each)**

Advantage 1 **Power tools are usually faster and can save time.**

Advantage 2 **Power tools can also produce a neater finish.**

(iii) Explain why some electrical power tools are not earthed.

6 marks

**Some electrical power tools may be enclosed in a plastic casing and are therefore not earthed.**

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(c) (i) State **three** reasons why it is important to store tools correctly.

(Any 3 x 3 marks each)

Reason 1: **They will last longer.**

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Reason 2: **They will be less likely to be damaged therefore are safer for use.**

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Reason 3: **Reduces the maintenance on them which in the long term saves money.**

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(ii) State **two** things you should consider when hiring tools or machinery.

(Any 2 x 4 marks each)

Consideration 1: **Ensure that you are familiar with how to operate the tool or machinery properly.**

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Consideration 2: **Ensure that appropriate safety precautions are observed during operation.**

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