## Contents

<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Properties</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Location</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Structure</td>
<td>23</td>
</tr>
<tr>
<td>A</td>
<td>Revision</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>Measurement 1</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>Process 1 Function and Ability</td>
<td>39</td>
</tr>
<tr>
<td>6</td>
<td>Process 2 Actions in Sequence</td>
<td>45</td>
</tr>
<tr>
<td>B</td>
<td>Revision</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Measurement 2 Quantity</td>
<td>57</td>
</tr>
<tr>
<td>8</td>
<td>Process 3 Cause and Effect</td>
<td>65</td>
</tr>
<tr>
<td>9</td>
<td>Measurement 3 Ratio and Proportion</td>
<td>74</td>
</tr>
<tr>
<td>C</td>
<td>Revision</td>
<td>82</td>
</tr>
<tr>
<td>10</td>
<td>Measurement 4 Frequency, Tendency, Probability</td>
<td>86</td>
</tr>
<tr>
<td>11</td>
<td>Process 4 Method</td>
<td>93</td>
</tr>
<tr>
<td>12</td>
<td>Consolidation</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Glossary</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>Bibliography</td>
<td>117</td>
</tr>
</tbody>
</table>
Unit 5  Process 1 Function and Ability

Section 1  Presentation

1. Look at this table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Properties</th>
<th>Some uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tin</td>
<td>Corrosion resistant.</td>
<td>Coating sheet mild steel to give tin plate.</td>
</tr>
</tbody>
</table>

Ask and answer questions like the following:

Why is aluminium used for lightweight electrical conductors? Because it has high electrical conductivity and low density.

2. Look at this sentence:

Aluminium has high electrical conductivity and low density and is, therefore, used for lightweight electrical conductors.

Now write six similar sentences.
3. Look at these sentences:

A hard material \( \{ \text{has the ability to withstand} \) scratching or indentation \( \text{is able to withstand} \) by another hard body.

Now say whether these statements are true or false. Correct the false statements.

a) Aluminium is capable of conducting electricity.
b) Lead is unable to resist attack by corrosive substances.
c) Wrought iron is not capable of withstanding a tensile force without breaking.
d) Copper is able to withstand hammering.
e) Tin does not have the ability to withstand corrosion.
f) Medium carbon steel is capable of withstandin scratching or indentation.
g) Aluminium does not have the ability to conduct heat.
h) Copper is capable of being drawn into wire.
i) Lead is unable to withstand scratching from another body.

Section 2 Development

4. Look and read:

![Diagram of milling machine]

Movements on a milling machine

The spindle nose acts as a location for the arbor (the shaft which carries the cutters). The function of the table is to support the workpiece. It also enables the workpiece to move against the cutter.

The cross-slide provides the operator with a means of centring the workpiece under the cutter. The knee enables the workpiece to be fed into the cutter, thus controlling the depth of metal that is removed.

Answer these questions:

a) Which part acts as a support for the workpiece?
b) What does the cross slide enable the operator to do?
c) Which part locates the arbor?
d) Which part provides a means of controlling the amount of metal that is removed?
e) What is the function of the knee?
f) What is the function of the spindle nose?

5. Look at this diagram:

![Diagram of drilling machine]

Column-type drilling machine

Now make true sentences from this table:

<table>
<thead>
<tr>
<th>Function of</th>
<th>Base</th>
<th>Spindle Nose</th>
<th>Sliding Head</th>
<th>Gearbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>The function of the</td>
<td>is to</td>
<td>house the gears, transmit the drive to the drill bit, hold the machine rigid, hold the drill bit in place, control the vertical movement of the drill bit.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Look at this diagram:

Oxy-acetylene welding equipment

Complete the following using these words:
act(s) as, function, provides, enables, connected

In the electric arc welding equipment the workpiece and the electrode ______ terminals in the electric circuit, and are ______ by cables to a welding set. This welding set ______ the electricity. The main ______ of the electrode is to carry the current which melts the surface of the workpiece, but it also ______ a filler metal. One ______ of the coating on the electrode is to protect the weld against impurities, another is to ______ an insulator for the wire. In addition, it ______ a gas shield around the molten metal to keep oxygen and nitrogen in the air away from the metal, and ______ alternating current to be used.

Section 3  Reading

8. Read this:

A relay is a switching device for opening and closing one or more electrical circuits on receipt of an electrical signal.

A simple kind of relay consists of two parts, a switch in a high voltage circuit which is operated by a spring loaded armature and a low voltage electro-magnetic circuit.

The electro-magnet comprises a soft iron core shaped like a horseshoe. Each arm of the core has a coil wound around it. The coils are connected to each other and to a battery through an on/off switch.

When the switch is closed, the electro-magnet is energised, and the armature is attracted towards it. This closes the contacts and enables the current to flow through the high voltage circuit. When the switch is opened, a spring pulls the armature away from the magnet, and the contacts open again.

Now match the letters with the parts of a relay:

Electric arc welding equipment

Relay

cables (carry the welding current)

isolating switch-fuse

welding set (reduces supply voltage to a safe level and increases and controls the current)

high voltage circuit

a)  
b)  
c)  
d)  
e)  
f)  
g)  
h)  
i)  
j)  
k)  
l)  
m)  

coated electrode (filler metal)

gas shield
fused filler and parent metal

melted weld pool
parent metal

supply mains

current regulator
9. Say whether the following statements are true or false. Correct the false statements.

a) When the switch in the low voltage circuit is closed, the high voltage circuit is broken.
b) When the contacts in the high voltage circuit are closed, current flows from the low voltage circuit to the high voltage circuit.
c) When the switch in the low voltage circuit is open, the armature moves towards the magnet.
d) The contacts in the high voltage circuit are controlled by the electro-magnet.
e) The function of the soft iron core is to open and close the contacts in the high voltage circuit.
f) The armature is restrained.
g) The electro-magnet is attached to the battery.
h) The coils of wire are mounted on the soft iron core.
i) The battery and switch are connected in parallel.
j) When the contacts are closed, they act as conductors.

Section 4 Listening

10. Listen to the passage and make notes under these headings:

a) The function of a centrifugal governor.
b) The construction of a centrifugal governor.
c) What happens to the spherical masses when the shaft rotates.
d) The function of the throttle valve.
e) What happens when the engine speed decreases.

11. Now answer these questions:

a) What is the function of a centrifugal governor?
b) What does a centrifugal governor consist of?
c) What happens when the shaft rotates?
d) What is the function of the throttle valve?
e) What happens when the speed decreases?
f) What is the purpose of adjusting the spring?