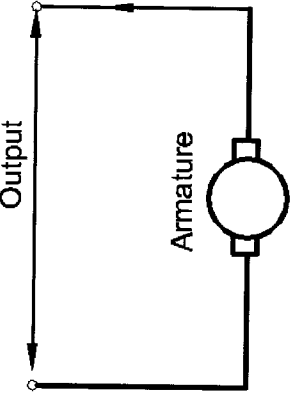
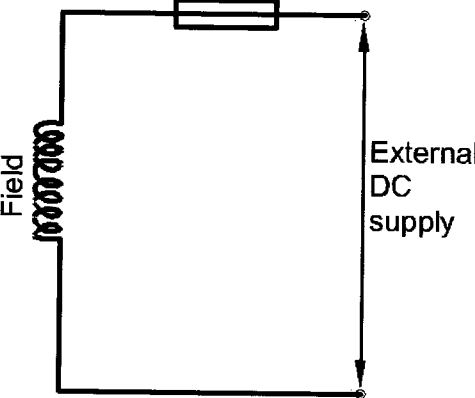
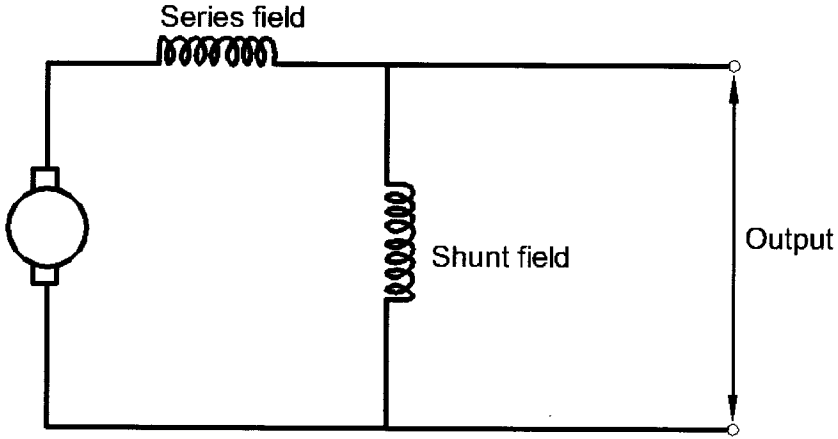
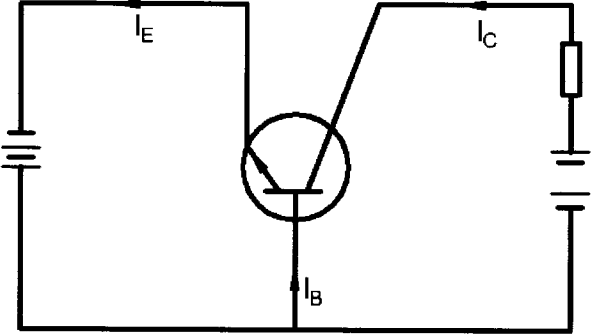

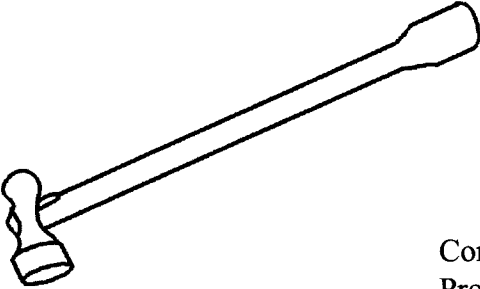
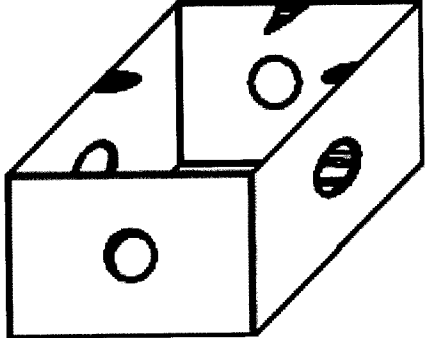


5.6 ELECTRICITY (448)

5.6.1 Electricity Paper 1 (448/1)

1. (a)	<p>Equipment belonging to supply authority.</p> <ul style="list-style-type: none"> <li>- Energy meter</li> <li>- Cut out</li> <li>- Supply cable</li> <li>- Sealing chamber</li> </ul>	<p style="color: red; font-size: 2em; transform: rotate(-90deg); opacity: 0.3;">Downloaded From: <a href="https://aikaschool.org">https://aikaschool.org</a></p>
<p>4 x ½ = (2 marks)</p>		
(b)	<p><b>Conducting materials</b></p> <ul style="list-style-type: none"> <li>- Paper capacitors</li> <li>- Electrolytic capacitors</li> <li>- Mica</li> <li>- Tantalum</li> <li>- Air capacitor</li> <li>- Ceramic capacitors</li> </ul>	<p style="color: red; font-size: 2em; transform: rotate(-90deg); opacity: 0.3;">Downloaded From: <a href="https://aikaschool.org">https://aikaschool.org</a></p>
<p>Any 4 x ½ = (2 marks)</p>		
2. (a)	<p>(i) <b>Separately excited</b> Separately excited</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p style="text-align: center;">                 Correct circuit = 2 marks                  Labelling 2 x ½ = 1 mark                  3 marks             </p>	<p style="color: red; font-size: 2em; transform: rotate(-90deg); opacity: 0.3;">Downloaded From: <a href="https://aikaschool.org">https://aikaschool.org</a></p> <p>(1½ marks)</p>

	<p>(ii) <b>Compound wound generator</b></p> <p>Compound</p>  <p style="text-align: right;"><b>(1½ marks)</b></p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Downloaded From: <a href="http://atikaschool.org">http://atikaschool.org</a></p>
<p>3. (a)</p>	<p><b>Types of diodes</b></p> <p>(i) LED (1) – used in displays (1)</p> <p>(ii) Zener diode (1) – used as voltage regulator (1)</p> <p>(iii) PN junction diode – used in rectification.</p> <p style="text-align: right;"><b>Any 2 x 1 = (2 marks)</b></p>	
<p>(b)</p>	<p><b>Common base amplifier for n-pn transistor</b></p>  <p style="text-align: right;">Circuit – 3 x ½ = 1½ Labelling – 3 x ½ = 1½ <b>3 marks</b></p> <p style="text-align: right;"><b>(3 marks)</b></p>	
<p>4. (a)</p>	<p><b>Measuring instruments</b></p> <ul style="list-style-type: none"> <li>- Voltmeter (½); measuring voltage (½).</li> <li>- Ammeter (½); measuring current (½)</li> <li>- Ohmmeter (½); measuring resistance (½)</li> <li>- Wattmeter (½); measures power (½)</li> </ul> <p style="text-align: right;"><b>Any 6 x ½ = (3 marks)</b></p>	

(b)	<p>(i)</p> <p>SCREW DRIVER</p>  <p>(ii)</p> <p>BALL PEIN HAMMER</p>  <p>Correct sketching 2 x 1 = 2 marks  Proportionality 2 x 1 = 2 marks  4 marks</p>	(2 marks)
5. (a)	 <p>Correct sketch - 1  Oblique - 1  Proportionality - <math>\frac{1}{3}</math></p>	(3 marks)
6. (a)	<p><b>Institutions that offer artisan course.</b></p> <ul style="list-style-type: none"> <li>- Youth polytechnics</li> <li>- National youth service</li> <li>- Technical institutions</li> <li>- Institutions of technology</li> <li>- Technical training institutes</li> </ul>	4 x 1/2 = (2 marks)
(b)	<p><b>Procedure for using a fire extinguisher.</b></p> <ul style="list-style-type: none"> <li>- Hold the extinguisher upright then remove safety pin or cap.</li> <li>- Direct the nozzle to base of flame.</li> <li>- Press the level or strike the knob.</li> <li>- Spray the base of the fire.</li> </ul>	4 x 1/2 = 2 (2 marks)
7. (a)	<p><b>Precautions to prevent accidents from overhead powerlines.</b></p> <ul style="list-style-type: none"> <li>- Never attempt to climb electric power posts.</li> <li>- Do not touch broken overhead cables.</li> <li>- Avoid climbing trees near power lines.</li> <li>- Avoid falling trees near powerline.</li> <li>- Accept other suitable responses.</li> </ul>	3 x 1 = (3 marks)

(b)	<b>Identifying faults</b>	
	- Physical inspection by looking at the circuit components to determine shape and colour changes.	(1 mark)
	- Circuit analysis – by taking measurements comparing what is in the service manual.	(1 mark)
	- History of the problem.	

(b)	<b>In parallel</b>	
	(1)            (1)	
	$C = C_1 + C_2 = 6\mu F + 4\mu F = 10\mu F$	(2 marks)
	<b>In series</b>	
(1)            (1)		
$C = \frac{C_1 C_2}{C_1 + C_2} = \frac{6 \times 4}{6 + 4} = \frac{24}{10} = 2.4\mu F$	(2 marks)	

9. (a)	<ul style="list-style-type: none"> <li>- Number of turns in the coil.</li> <li>- Amount of current that flow through coil.</li> <li>- The type of core material.</li> <li>- The length of coil.</li> </ul>	
		Any 2 x 1 = (3 marks)

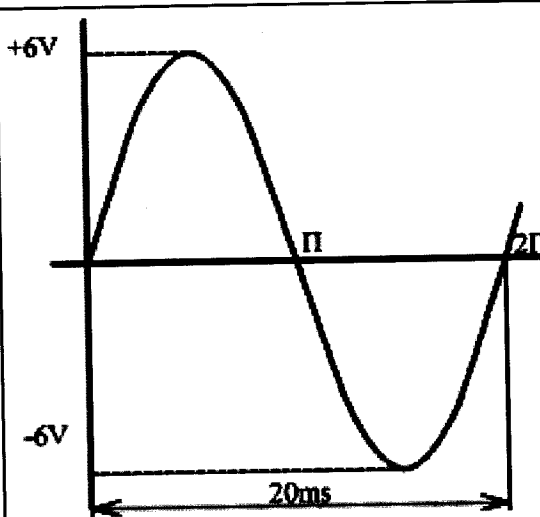
(b)	(i) Field produced by two parallel conductors	
		(2 marks)
	<p>Flux lines around the two conductors carrying current in the opposite direction <i>repel each other</i>.</p> <p>Explanation - 1 mark</p>	(1 mark)

10. (a)	Types of tariffs	
	- Two part tariff	
	- Plot rate tariff	
	- Accept any other tariff	
		Any 2 x 1/2 = (1 mark)

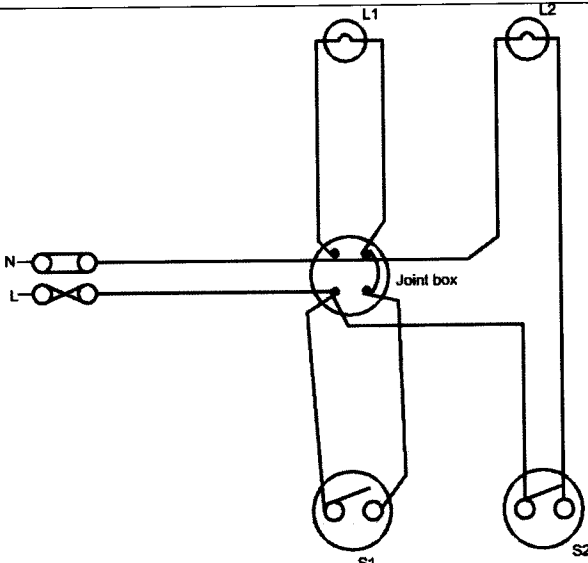
(b)	(i) $W = Pt$	(1 mark)
	$= (1.0 \times 5) + (3 \times 2) + (6 \times 3) + (4 \times 2)$ $= 5 + 6 + 18 + 8$ $= 37 \text{ kwh}$	(1 mark)
	(ii) Cost of energy in ksh	(1 mark)
	$= 37 \times 70 = 25.9 \text{ ksh}$	

**SECTION B**

**SECTION B**

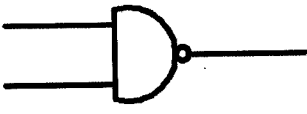


11. (a)	(i) Cycle – one complete series of variations in a waveform.	(1 mark)
	(ii) Frequency – the number of cycles completed in one second.	(1 mark)
(b)		(3 marks)
	<p>Axes - <math>2 \times \frac{1}{2} = 1</math></p> <p>Peak value - <math>\frac{1}{2}</math></p> <p>Wave form - 1</p> <p>Period - <math>\frac{1}{2}</math></p> <p style="text-align: right;">3</p>	

<p>(c)</p>	<p>(i) <math>R = 4\pi</math>    <math>L = \text{mH} = 9.55 \times 10^{-3} \text{H}</math>    <math>f = 50 \text{Hz}</math>  <math>V = 200 \text{ V}</math></p> <p>(i) Inductive reactance  <math>X_L = 2\pi fL</math>  <math>= 2\pi(50)(9.55 \times 10^{-3})</math>  <math>= 3 \text{ H}</math></p> <p>(ii) Impedance  <math>Z = \sqrt{R^2 + XL^2}</math>  <math>= \sqrt{4^2 + 3^2} = 5 \text{ H}</math></p> <p>(iii) Supply current  <math>I = \frac{V}{Z} = \frac{200}{5} = 40 \text{ A}</math></p>	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p>
	<p>(iv) Phase angle between</p> $\tan\theta = \frac{XL}{R}$ $\theta = \tan^{-1} \frac{XL}{R} \quad \tan^{-1} \frac{3}{4}$ <p><math>= 36.87^\circ</math> <b>Lagging</b></p>	<p>(1 mark)</p> <p>(1 mark)</p>
<p>12 (a)</p>	<p>Coupler - Used to connect two conduits together. (½)</p> <p>Circular boxes – enable many outlet way connections to be made. (½)</p> <p>Saddles – securing the conduit to surface during installation. (½)</p> <p>Elbow joint bend – to enable 90° bend to be made. (½)</p> <p>Accept any other accessory</p>	<p>(½ mark)</p> <p>(½ mark)</p> <p>(½ mark)</p> <p>(½ mark)</p>

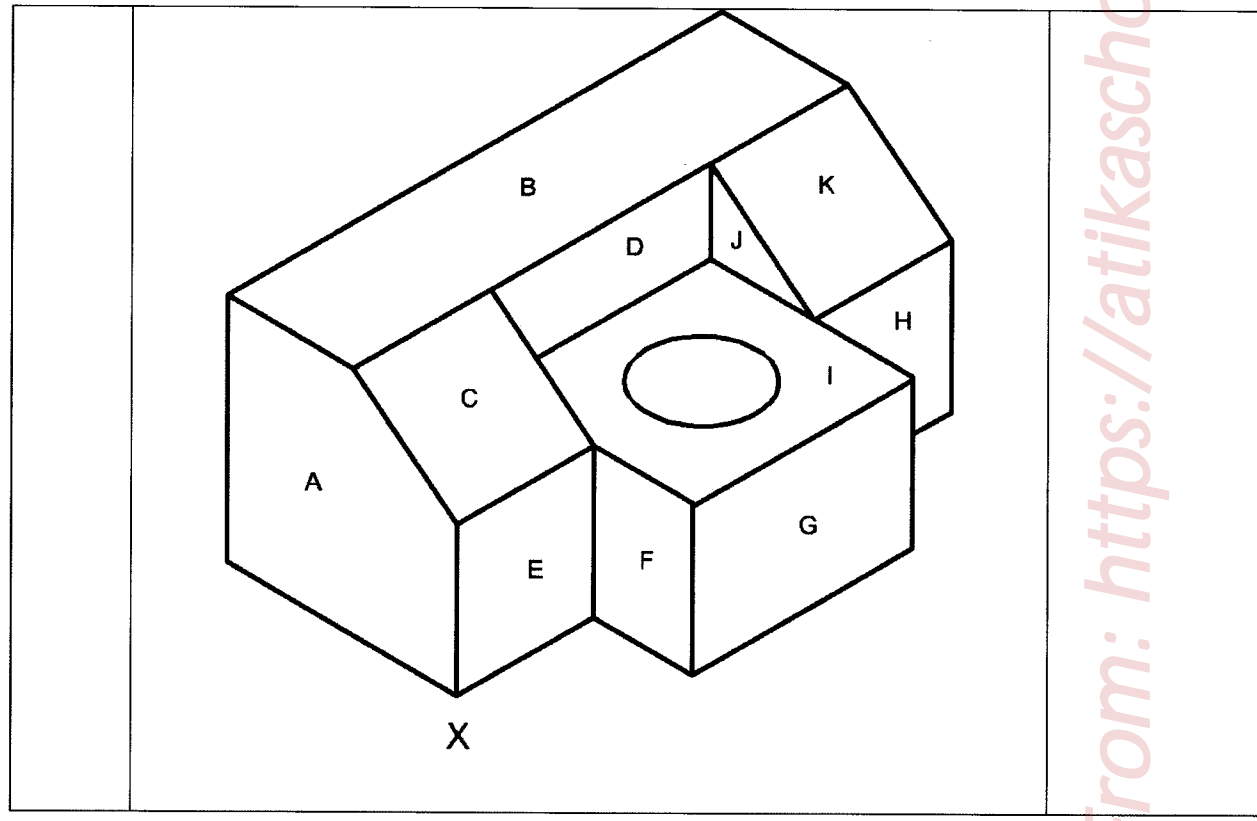
<p>(b)</p>	<p><b>Faulty fluorescent fitting</b>  <b>Lamp does not light at all</b></p> <ul style="list-style-type: none"> <li>- Faulty starter switch.</li> <li>- No power supply.</li> <li>- Broken tube electrodes.</li> <li>- Broken wires in the circuit.</li> <li>- Burn out tube.</li> </ul> <p style="text-align: right;"><b>Any 2 x 1 = (3 marks)</b></p>	
<p>(c)</p>	<p>(i) IEE Regulation</p> <ul style="list-style-type: none"> <li>-The rating of fuse or circuit breaker should be 30 A.</li> <li>-Maximum floor area should be 100 m<sup>2</sup>.</li> <li>-Standard 13 A socket outlets should not be installed inside a bathroom.</li> <li>- The total number of spurs on stationary appliances shall not exceed the total number of socket outlets.</li> </ul> <p style="text-align: right;"><b>Any 4 x 1 = (4 marks)</b></p>	
	<p>(ii)</p>  <p style="text-align: right;">       Correct circuit – 2        Components – 6 x ½ = 3  <b>5 marks</b> </p>	
<p>13 (a)</p>	<p>Parts of a DC machine.</p> <p>(i) Yoke</p> <ul style="list-style-type: none"> <li>- Consists of the external frame (1) it forms part of the field magnetic circuit.</li> <li>- It is made of mild steel casing (1) or cast steel construction. <b>2 marks</b></li> </ul>	

	<p>(ii) Poles</p> <ul style="list-style-type: none"> <li>- They designed to produce the maximum flux in cores slots, each pole assembly is made up of a pole core circular or (1) rectangular threaded to a field coil.</li> </ul> <p>The core is bolted to the yoke and has an extension consisting of pole shoe. (1).</p>	(2 marks)
(b)	<p>(i) <math>kVA = I_1 V_1 = I_2 V_2</math></p> <p>(1) (1)</p> $\frac{100,000}{11000} = I_1 = 9.09A$	(1 mark) (2 marks)
	<p>(1)</p> <p>(ii) <math>\frac{V_1}{V_2} = \frac{N_1}{N_2}</math></p> $N_2 = \frac{N_1 \times V_2}{V_1} = \frac{800 \times 240}{11000} = 17.45 \text{ turns}$	(3 marks)
(c)	<p>IEE Regulations</p> <ul style="list-style-type: none"> <li>- Transformer must be double wound.</li> <li>- The core of transformer (metal case at one point of the secondary must be earthed.</li> <li>- The transformer must be connected to a separate sub-circuit.</li> <li>- Cables used to supply the transformer must be of suitable grade.</li> </ul> <p style="text-align: right;">Any 3 x 1 =</p>	(3 marks)



14 (a)	<p>(i) NAND gate</p>  <p>(ii) NOR gate</p>  <p>(iii) OR gate</p> 	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p>
(b)	$R_B = 100\Omega \quad R_L = 1\Omega \quad V_{CC} = 10V$	
	<p>(1) (1)</p> $I_B = \frac{V_{CC}}{R_B} = \frac{10}{100} = 0.1A$ <p>(1) (1)</p> $\frac{I_C}{I_B} = \beta \Rightarrow I_C = 100 \times 0.1 = 10A$ <p>(1) (1)</p> $V_{CE} = V_{CC} - I_C R_L = 10 - 10 \times 1 = 0$	<p>(2 marks)</p> <p>(2 marks)</p> <p>(2 marks)</p>
(c)	<p>(i) <math>I_B = \frac{V_{CC}}{R_B} = \frac{20}{100} = 0.2A</math></p> <p>(ii) <math>I_C = \beta I_B = 100 \times 0.2 = 20A</math></p> <p>(iii) <math>V_{CE} = V_{CC} - I_C R_L</math>  <math>= 20 - \{(20)(2)\} = -20V</math></p>	<p>(1 mark)</p> <p>(1½ marks)</p> <p>(1½ marks)</p>

13.	<p>Faces A B C D E = 5          Faces F G H I J K = 5½          Isometric = ½          Placement of X = ½          Correct measurements = 1          Neatness = ½          Line work = ½</p> <p style="text-align: right;"><b>13 marks</b></p>	
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