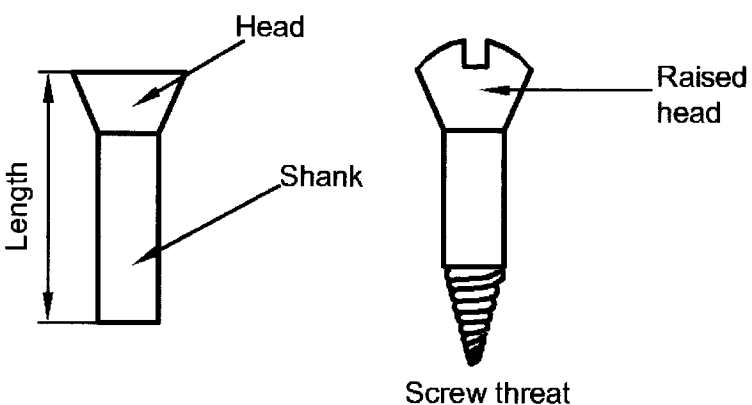


**5.8 AVIATION TECHNOLOGY (450)**

**5.8.1 Aviation Technology Paper 1 (450/1)**

**SECTION A**

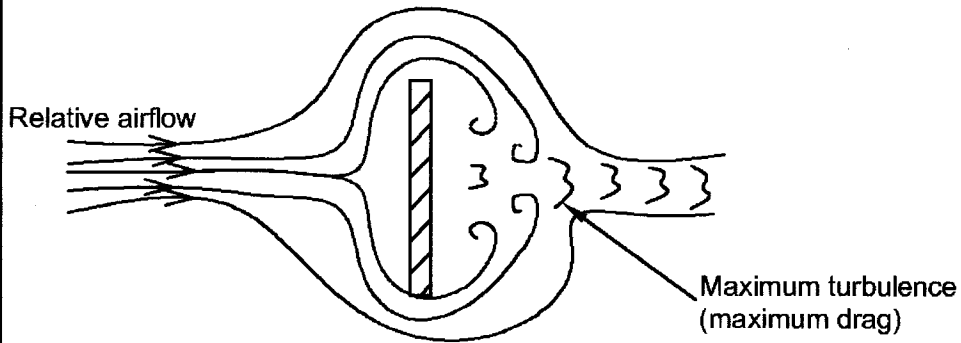
1. (a)	<ul style="list-style-type: none"> <li>- Do not wear loose clothing.</li> <li>- Always use safety goggles.</li> <li>- Wear safety boots.</li> </ul>	<b>(Any 2 x ½) = (1 mark)</b>
(b)	<ul style="list-style-type: none"> <li>(i) Aircraft technical records office               <ul style="list-style-type: none"> <li>- Class A fire</li> </ul> </li> <li>(ii) Paint store               <ul style="list-style-type: none"> <li>- Class B fire</li> </ul> </li> </ul>	<b>(Any 2 x ½) = (1 mark)</b>
(c)	<ul style="list-style-type: none"> <li>Mandatory safety equipment               <ul style="list-style-type: none"> <li>- Life jackets</li> <li>- Life rafts</li> <li>- Distress signals</li> </ul> </li> </ul>	<b>(Any 2 x ½) = (1 mark)</b>
2. (a)	<ul style="list-style-type: none"> <li>- Seek assistance if not sure</li> <li>- Avoid hasty movements</li> <li>- Apply safety regulations</li> <li>- Re-training on equipment</li> <li>- Do not take wrong orders to operate equipment</li> <li>- Exercise caution</li> <li>- Love your job</li> </ul>	<b>(Any 4 x ½) = (2 marks)</b>
(b)	<ul style="list-style-type: none"> <li>- Flight planning</li> <li>- Release of aircraft</li> </ul>	<b>(Any 2 x ½) = (1 mark)</b>
3. (a)	<ul style="list-style-type: none"> <li>- Fatigue</li> <li>- Drug abuse</li> <li>- Stress</li> </ul>	<b>(Any 3 x 1) = (3 marks)</b>
(b)	<ul style="list-style-type: none"> <li>- Poor communication due to lightning and thunder.</li> <li>- Poor visibility due to heavy rain or clouds.</li> <li>- Change of direction or instability due to turbulence.</li> </ul>	<b>(Any 3 x 1) = (3 marks)</b>

<p>4. (a)</p>	 <p style="text-align: center;">Screw thread</p> <p style="text-align: center;">2 sketches @1(2x1) = 2 marks 4 labels @½ (4x½) = 2 marks 4 marks</p>	<p style="text-align: right;"><b>(4 marks)</b></p>
<p>(b)</p>	<p>Procedure of annealing steel</p> <ul style="list-style-type: none"> <li>- Heat the metal to just above the upper critical point.</li> <li>- Cool it very slowly in ash, sand or furnace, i.e. quench slowly.</li> </ul> <p style="text-align: right;">(Any 2 x 1) =</p>	<p style="text-align: right;"><b>(2 marks)</b></p>
<p>5. (a)</p>	<p>Uses of odd leg calipers</p> <ul style="list-style-type: none"> <li>- To find the center of a circular rod.</li> <li>- For transferring measurements.</li> <li>- For drawing parallel lines.</li> </ul> <p style="text-align: right;">(Any 1 x ½) =</p>	<p style="text-align: right;"><b>(½ mark)</b></p>
<p>(b)</p>	<p>Uses of flat screw driver</p> <ul style="list-style-type: none"> <li>- Tightening or making loose flat head screws with straight slots.</li> </ul> <p style="text-align: right;">(Any 1 x ½) =</p>	<p style="text-align: right;"><b>(½ mark)</b></p>
<p>6. (a)</p>	<p>(i) Pure jet engines give a big acceleration to a small mass of air. (ii) Propeller driven engines give a small acceleration to a big mass. (iii) Fire wall (fire bulkhead) separate heat areas.</p> <p style="text-align: right;">(Any 2 x 1 = 2 marks)</p>	<p style="text-align: right;"><b>(2 marks)</b></p>
<p>(b)</p>	<p>Propeller blades are twisted to ensure equal work is done along the whole blade length.</p>	<p style="text-align: right;"><b>(1 mark)</b></p>
<p>7. (a)</p>	<p>Functions of the structural members of the semi-monologue.</p> <ul style="list-style-type: none"> <li>- Longerons take up bending loads.</li> <li>- Frames give the aircraft its circular shape and provide attachment for longerons and stringers.</li> <li>- They give the aircraft its rigidity.</li> <li>- Stringers give support, strength and provide attachment to the aircraft skin.</li> <li>- Bulkheads provide rigidity and partitioning.</li> <li>- The skin provides the aircraft structural cover and takes up aerodynamic loads.</li> </ul> <p style="text-align: right;">(Any 5 x 1 =</p>	<p style="text-align: right;"><b>(5 marks)</b></p>

(b)	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Ultra sonic</li> <li>• Radiographic (x-ray)</li> <li>• Magnetic particle</li> <li>• Dye penetrant</li> <li>• Eddy current</li> </ul>																			
<b>(Any 4 x ½)= (2 marks)</b>																				
8. (a)	<p>Methods of aircraft navigation:</p> <p>(i) Dead reckoning</p> <p>(ii) Astral</p> <p>(iii) Visual</p> <p>(iv) Radio</p> <p>(v) Global position GPS</p>																			
<b>(Any 4 x ½)= (2 marks)</b>																				
(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Part</th> <th style="width: 30%;">System</th> <th style="width: 50%;">Function</th> </tr> </thead> <tbody> <tr> <td>Pump</td> <td>Fluid system lubrication pneumatic hydraulic</td> <td>To create motive force in the fluid system, or lubrication system, etc.</td> </tr> <tr> <td>Transformer</td> <td>Electrical</td> <td>Steps up or down the voltage</td> </tr> <tr> <td>Thermo-couple</td> <td>Instrument Fire detection</td> <td>Measures temperature Detects increase in temperature</td> </tr> <tr> <td>Actuator</td> <td>Pneumatic or hydraulic</td> <td>Converts fluid pressure into mechanical movement (work)</td> </tr> <tr> <td></td> <td style="text-align: center;"><b>4 x ½= 2 marks</b></td> <td style="text-align: center;"><b>4 x ½= 2 marks</b></td> </tr> </tbody> </table> <p style="text-align: right;"><b>Total 2 x 2=</b></p>	Part	System	Function	Pump	Fluid system lubrication pneumatic hydraulic	To create motive force in the fluid system, or lubrication system, etc.	Transformer	Electrical	Steps up or down the voltage	Thermo-couple	Instrument Fire detection	Measures temperature Detects increase in temperature	Actuator	Pneumatic or hydraulic	Converts fluid pressure into mechanical movement (work)		<b>4 x ½= 2 marks</b>	<b>4 x ½= 2 marks</b>	<b>(4 marks)</b>
Part	System	Function																		
Pump	Fluid system lubrication pneumatic hydraulic	To create motive force in the fluid system, or lubrication system, etc.																		
Transformer	Electrical	Steps up or down the voltage																		
Thermo-couple	Instrument Fire detection	Measures temperature Detects increase in temperature																		
Actuator	Pneumatic or hydraulic	Converts fluid pressure into mechanical movement (work)																		
	<b>4 x ½= 2 marks</b>	<b>4 x ½= 2 marks</b>																		

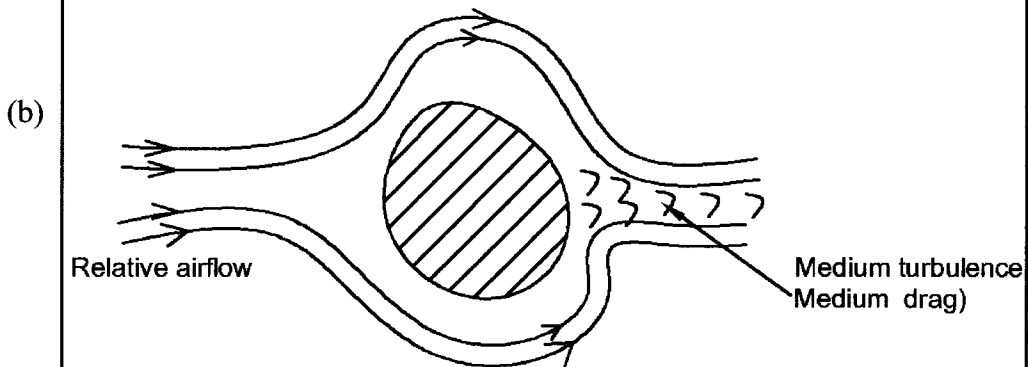
 Downloaded from: <https://atikaschool.org>

9. (a) Flat plate at 90° to the relative airflow.



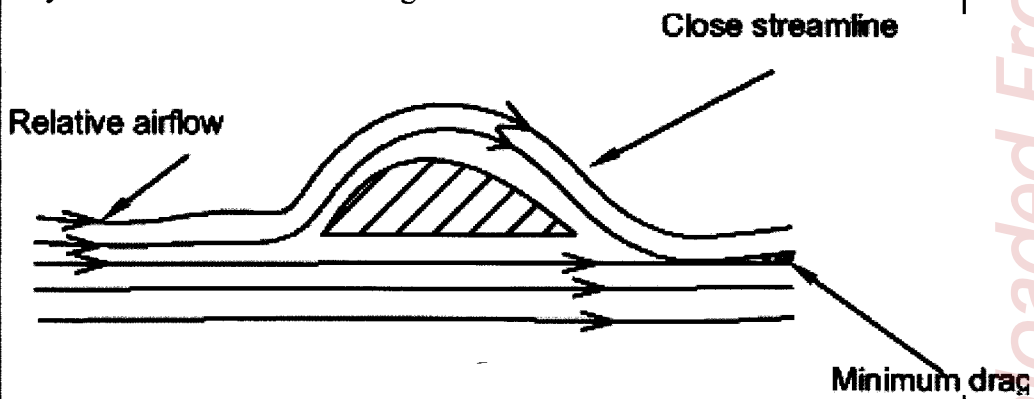
Sketching (1 mark)  
Labelling ( $2 \times \frac{1}{2} = 1$  mark)

Stationary sphere



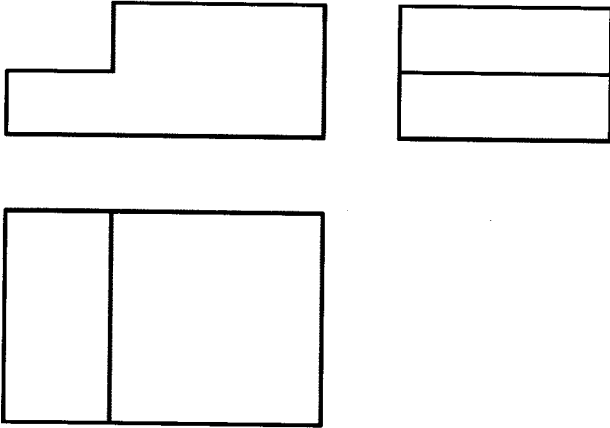
(b)  
Sketch (1 mark)  
Labelling ( $2 \times \frac{1}{2} = 1$  mark)

(c) Asymmetrical airflow at 0° angle of attack.



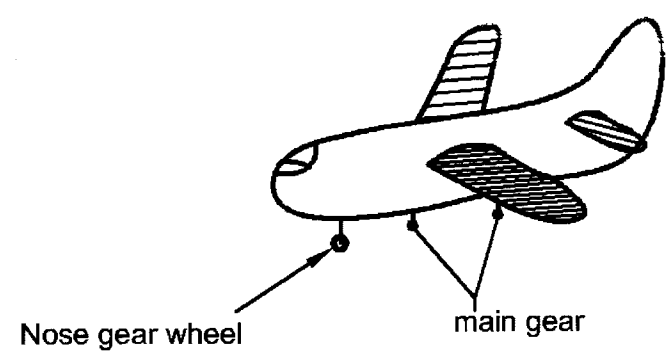
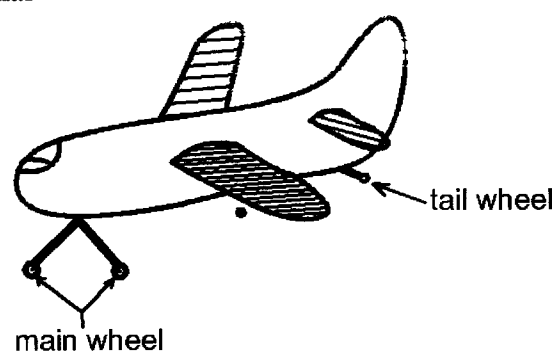
Sketch (1 mark)  
Labelling ( $2 \times \frac{1}{2} = 1$  mark)

Downloaded From: <https://atikaschool.org>

10. (a)	<p style="text-align: center;">LINES USED IN DRAWING</p> <p style="text-align: center;">----- Centre line</p> <p style="text-align: center;">----- Hidden details line</p> <p style="text-align: right;">(2 x ½ = 1 mark)</p>	
(b)	 <p style="text-align: right;">(2 marks)</p>	



















**SECTION B (56 MARKS)**

11. (a)	<p>Aircraft systems that use pneumatic power are:</p> <ul style="list-style-type: none"> <li>- Air conditioning system</li> <li>- Pressurization system</li> <li>- Aerofoil and engine anti-icing and de-icing system</li> <li>- Gas turbine engine starting system</li> <li>- Aircraft emergency systems</li> </ul> <p style="text-align: right;">(Any 4 x ½) = (2 marks)</p>	
---------	--	--



<p>(b)</p>	<p>(i) Tri-cycle</p>  <p>Nose gear wheel                      main gear</p> <ul style="list-style-type: none"> <li>This is an arrangement where a nose landing gear is fitted in front of two main landing gear.</li> </ul> <p>Correct sketch                      - 2 marks  Explanation                          - <u>1 mark</u>  <b>Total</b>                                      <b>3 marks</b></p>	<p>(3 marks)</p>
<p>(c)</p>	<p>(ii) Conventional</p>  <p>main wheel                                      tail wheel</p> <p>This is an arrangement where the main wheels are ahead of the tail wheels</p> <p>(i) - Steering to the right.</p> <ul style="list-style-type: none"> <li>- The pilot steps on the right hand brake pedal.</li> <li>- The right hand main wheel stops moving (stationary).</li> <li>- The nose wheel turns to the right, as the aircraft steers to the right and vice versa</li> </ul> <p>(3 x 1) = (3 marks)</p> <ul style="list-style-type: none"> <li>- Using a steering pad</li> <li>- The pilot steps on the right brake pedal</li> <li>- The right hand main wheels stop moving</li> <li>- The tail wheel turns to the right as the aircraft steers to the right and vice versa</li> </ul> <p>(3 x 1) = (3 marks)</p>	<p>(3 marks)</p> <p>(3 marks)</p>

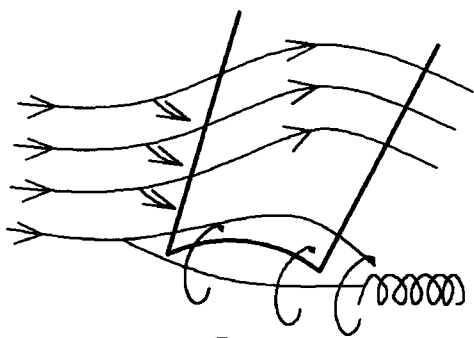
12. (a)	<p>(i) <b>Cargo And Courier Services</b> This is the business of transporting cargo, letters and money. <b>(1 mark)</b></p> <p><b>Advantages</b> 1) Aircraft are a fast means of transport. 2) Aircraft transport is reliable.</p> <p><b>Disadvantages</b> 1) Some cargo can be hazardous or poisonous which may not be carried on aircraft. This needs a lot of care and safety in handling. 2) Some cargo can be considered a security threat for example explosives. <b>(4 x 1/2) =</b></p> <p>(ii) <b>Aircraft maintenance shops</b> For the repairs, servicing and painting of aircraft (ground handling) <b>(1 mark)</b></p> <p><b>Advantages</b> 1) Easy availability of clients 2) Closeness to the market because of many small aircraft operators 3) Provides direct employment to qualified personnel (availability of skilled labour).</p> <p><b>Disadvantages</b> 1) Expensive to set up 2) Stiff competition from established operators 3) Expensive spare parts 4) Legislative (licensing) challenges <b>(4 x 1/2) =</b></p>	<p><b>(1 mark)</b></p> <p><b>(2 marks)</b></p> <p><b>(1 mark)</b></p> <p><b>(2 mark)</b></p>
(b)	<p>Effects on human body</p> <p>(i) Low temperature which may lead to freezing.</p> <p>(ii) Low pressure which leads to decrease in oxygen, may cause hypoxia and anoxia.</p> <p>(iii) Low humidity at high altitudes causes itching, sore throat and dry skin.</p> <p><b>(Any 3 x 1) =</b></p>	<p><b>(3 marks)</b></p>
(c) (i)	<p>Functions of KCAA</p> <ol style="list-style-type: none"> <li>1) Licensing of air services.</li> <li>2) Provision of air navigation services.</li> <li>3) Ensuring safety and efficiency in Kenyan airspace (air traffic control services)</li> <li>4) Accident investigation</li> <li>5) Aircraft registration</li> <li>6) Enforcing technical standards</li> <li>7) Examination of technical personnel</li> <li>8) Advising the government of matters concerning civil aviation</li> </ol> <p><b>(Any 6 x 1/2) =</b></p>	<p><b>(3 marks)</b></p>

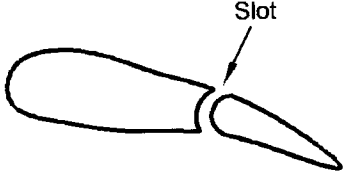

(c) (ii)	Categories of airports in Kenya. Category A - inspected daily Category B - inspected weekly Category C - no inspection Category D - private	(Any 2 x ½) = (2 marks)
----------	---	-------------------------

13. a)	<div style="border: 1px solid black; padding: 10px; margin-bottom: 20px;"> <table style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">1  Air speed</td> <td style="width: 33%;">2  Artificial Horizon</td> <td style="width: 33%;">3  Altimeter</td> </tr> <tr> <td>4  Turn co-ordinator</td> <td>5  Heading Indicator</td> <td>6  Vertical speed indicator</td> </tr> </table> </div> <p style="text-align: center;">       Correct six = 6 x ½ = 3 marks        Arrangement = 6 x ½ = 3 marks  <b>Total 6 marks</b> </p> <p><b>Functions</b></p> <ol style="list-style-type: none"> <li>1) Altimeter       <ul style="list-style-type: none"> <li>- Shows aircraft height above a particular point (datum)</li> </ul> </li> <li>2) Airspeed indicator (ASI)       <ul style="list-style-type: none"> <li>- Indicates the aircraft speed relative to surrounding air.</li> </ul> </li> <li>3) Heading indicator (directional grid)       <ul style="list-style-type: none"> <li>- Displays the aircraft heading with respect to geographical North.</li> </ul> </li> <li>4) Turn indicator       <ul style="list-style-type: none"> <li>- Displays direction of turn and rate of turn.</li> </ul> </li> <li>5) Vertical speed       <ul style="list-style-type: none"> <li>- Senses changes of air pressure and displays the rate of aircraft climb or descent.</li> </ul> </li> <li>6) Attitude indicator (artificial horizon)       <ul style="list-style-type: none"> <li>- Shows aircraft attitude relative to the horizon (nose up or nose down)</li> </ul> </li> </ol> <p style="text-align: right;">6 x 1 = (6 marks)</p>	1  Air speed	2  Artificial Horizon	3  Altimeter	4  Turn co-ordinator	5  Heading Indicator	6  Vertical speed indicator	<p>(6 marks)</p> <p>(6 marks)</p>
1  Air speed	2  Artificial Horizon	3  Altimeter						
4  Turn co-ordinator	5  Heading Indicator	6  Vertical speed indicator						
(b)	(i) VFR <ul style="list-style-type: none"> <li>- Visual flight rules. Flying. Without the aid of instruments, using land marks.</li> </ul>							

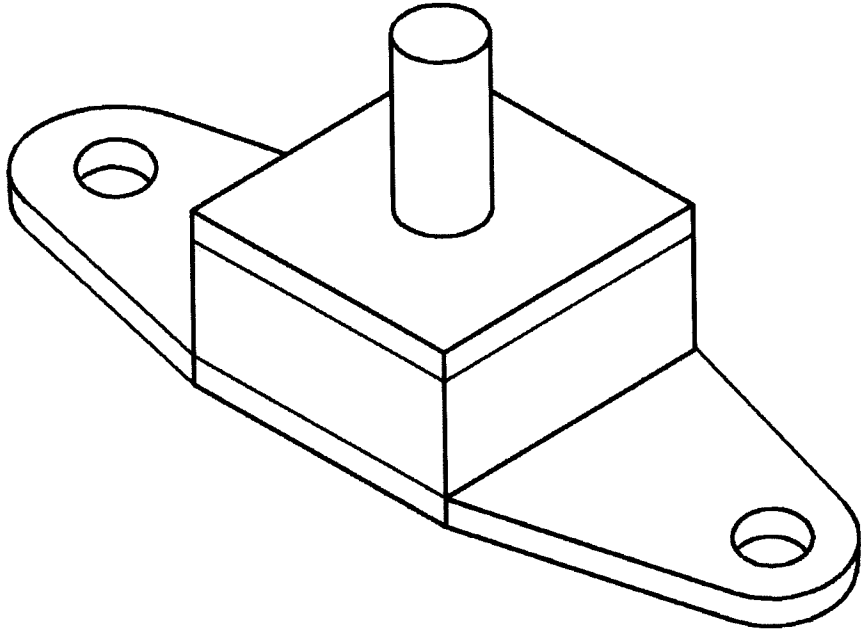


	<p>(ii) IFR</p> <ul style="list-style-type: none"> <li>- Use of navigational instruments (instrument flight rules)</li> <li>- Use of flares or lights</li> <li>- Use of painted signs</li> </ul> <p style="text-align: right;"><b>2 x 1= (2 marks)</b></p>	
14. (a)	<p>(i) anhedral</p> 	
	<p>(ii)</p> <p>(iii) Gull wing</p>  <p style="text-align: right;"><b>2 x 1= (2 marks)</b></p>	

(b)	<p>(i) - Induced drag is formed as a result of lift productions and high angles of attack.</p> <ul style="list-style-type: none"> <li>- This is the formation of 3 dimensional airflow over the wing, that is: <ul style="list-style-type: none"> <li>(i) Flow above the wing having low pressure.</li> <li>(ii) Flow under the wing having high pressure.</li> <li>(iii) High pressure flow upwards at the wing tip.</li> </ul> </li> </ul>  <p>The flow at the wing tip forms a vortex (induced drag)</p> <p style="text-align: right;"><b>(9 marks)</b></p> <p style="text-align: center;">Explanation (description) (5x 1= 5 marks)</p> <p style="text-align: center;">Sketch as detailed areas (4 x 1 = 4 marks)</p>	
-----	---	--

(c)	(i) Single slotted flap		(1½ mark)	(3 marks)
	(ii) Split flap		(1½ mark)	

15.



1. Correct faces (14 x ½) = 7 marks
2. Correct projections (1 x 1) = 1 mark
3. Correct measurements = 2 marks
4. Circular features drawn correctly 5 x ½ = 2½ marks
5. Current position of 'X' (1 x ½) = 1 mark
6. Line work and neatness = ½ mark

**Total 14 marks**

**(14 marks)**

Downloaded From: <https://atikaschool.org>