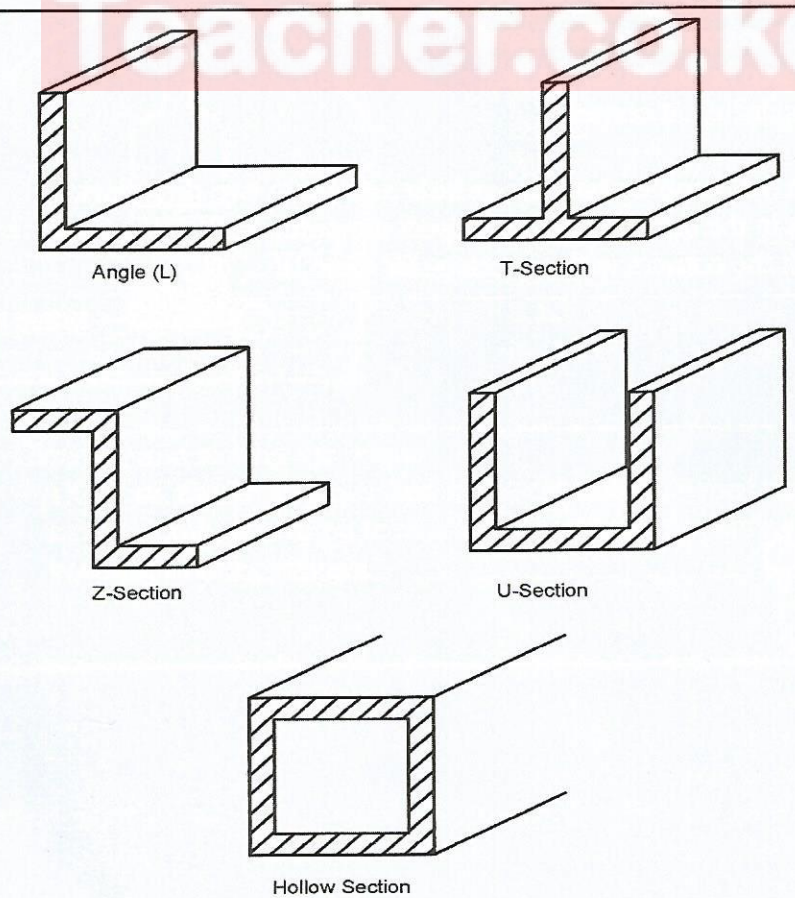
5.3 METAL WORK (445)

5.3.1 Metalwork Paper 1 (445/1)

1. (a)	**Sectors in metalwork industry** Manufacturing industry. Service industry. 2 x ½ = 1 marks	
(b)	(i) **Levels of training technical personnel:** Artisan Craft/ certificat Technician/ diploma Degree 4 x ½ = 2 marks	**5 marks**
	(ii) The industries in private sector are the companies owned by individuals while the public ones either partially or wholly owned by government or shareholders 2 x 1 = 2 marks	
2. (a)	**Safety precautions when using:** (i) Hammer - Do not use a hammer with a loose head or a chipped one. (ii) Cold chisel - Do not use a chisel which is not sharp at the tip or with a mushroomed head 2 x 1 = 2 marks	
(b)	 4 x ½ = 2 marks	**4 marks**

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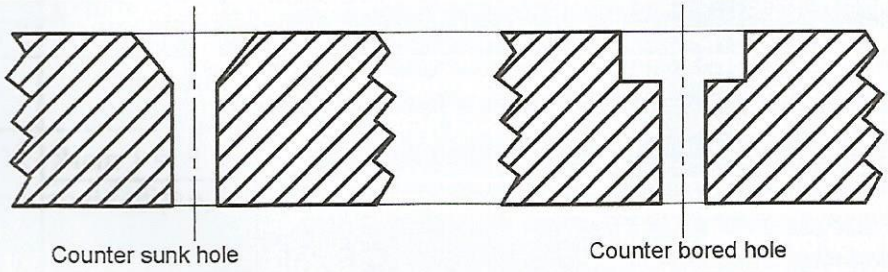
3. (a)	**Tools used for both measuring and checking** Steel rule. Engineer's square. Vernier caliper Protractor Vernier height gauge 4 x ½ = 2 marks	
(b)	**Care and maintenance practices related to the surface plate:** Handle with care Always keep it clean and oiled Storage should be in a safe place 2 x ½ = 1 mark	**3 marks**
4. (a)	(i) Marking out is the process of outlining the profile of n item to be fabricated on the material to be used (mostly in the workshop). 1 x 1 = 1 mark (ii) **Marking out agents are:** Copper sulphate solution Blue solution Chalk Any 2 x ½ = 1 mark	
(b)	**Uses of trammel are:** Drawing arcs and grids of large radii Bisecting long arcs Transferring large measurements Any 2 x ½ = 1 mark	**3 marks**
5.	 2 x 1 = 2 marks	**2 marks**
6. (a)	**Use of:** (i) Hatchet stake - Used for turning edges beyond . (ii) Creasing iron - Used for making angular bends, wiring, grooving. Any 2 x 1 (2 marks)	
(b)	Methods of coating sheet metal - Electroplating - Galvanizing - Hot dipping - Metal spraying - Lacquering Any 4 x ½ = 2 marks	**4marks**

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7. (a)	**Specifications fo rivets** - Shape of head - Diameter of shank - Length of shank - Material used Any 4 x ½ = 2 marks	
	(ii) Type of rivet recommended for use in sheet metal is the pop rivet. 1 x 1 = 1 mark	
(b)	(i) "Burnt iron" is the soldering bit that is overheated and has become heavily scaled and pitted. 1 mark	
	(ii) It can be corrected by cleaning with a file and tinning i . 2 x 1 = 2 marks	**6 marks**
8. (a)	**Safety precautions to be observed when arc welding** - Use protective clothing including overalls and hand gloves - Use a welding shield to protect the eyes - Use clear googles when removing the slag. - Make use of tongs and pliers for holding the metals. Any 2 x 1 = 2 marks	
(b)	(i) **Parallel turning** - is the lengthwise traverse of the tool, which produces a round face. (ii) **Facing** - is the cross-traverse of the tool, which produces a flat face. (iii) **Knurling** - forming patterns on surface of a workpiece 3 x 1 = 3 marks	**5 marks**
9. (a)	Point of decalescence is when the temperature of steel being heated starts to remain stationery in the process of heating. 1 x 1 = 1 mark	
(b)	**Factors to consider when tempering steel:** - Type of tool or article - Function of tool or article - Degree of hardness to be attained Any 2 x 1 = 2 marks	**3 marks**
10. (a)	Forging is the process of shaping and forming metals by hammering when red hot. 1 x 1 = 1 mark	**5 marks**
(b)	**Functions of parts of an anvil** (i) Hardie hole is the square hole which takes the shank of bottom tools e.g. fuller (ii) Punch hole is used as a clearance when punching holes in hot metal. 2 x 1 = 2 marks	**2 marks**

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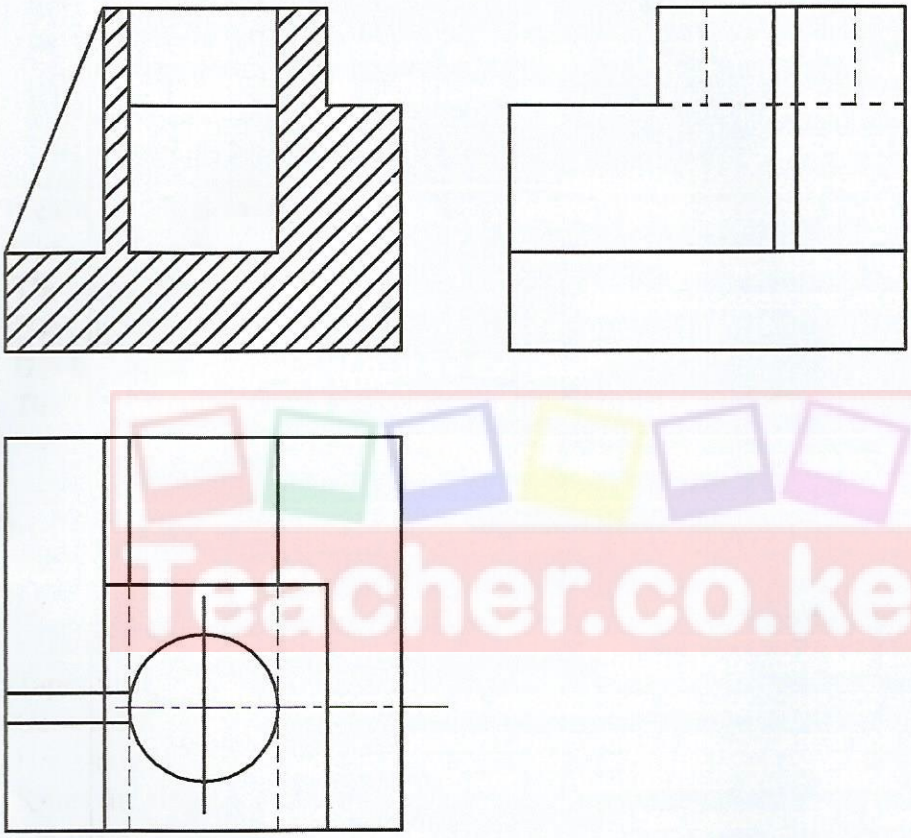
(c)	Methods of finishing metal article - Use of shellac - Enameling - Coating with zinc powder - Bronzing - Painting Any 4 x ½ = 2 marks	**2 marks**
11.	 Correct angle of projection= 2 marks **F.E** 4 faces- 4 × ½ = 2 marks Correct hatching = 1 mark **E.E** 4 faces- 4 × ½ = 2 marks 2 features of hidden details- 2×1 = 2 marks **Plan** 8 faces- 8 × ½ = 4 marks 1 feature of hidden details 1 × 1 = 1 mark Neatness - 1 mark **15 marks**	**15 marks**

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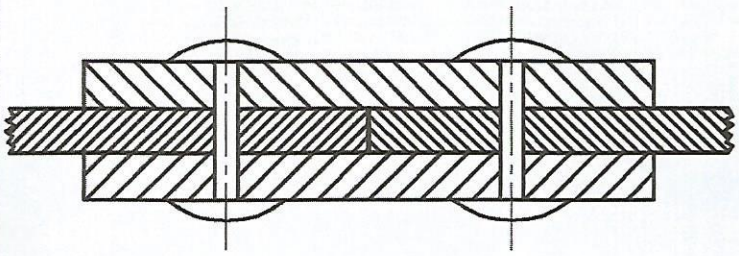
12. (a)	**Reasons for applying finish on metal articles** - To improve the physical appearance of the product (aesthetics) - To prevent them from rusting - To improve the surface of an article - To increase the lifespan of the product - To prevent tarnishing. Any 4 x 1 = 4 marks	
(b)	(i) **Properties of cast iron:** Cast iron : - is brittle - is grey in colour - is self lubricating - can be cast into intricate shapes - is heavy - has high machineability - has high compression strength Any 4 x ½ = 2 marks	
	(ii) Electric furnace can produce high quality steel because: - Heat can be controlled - Regulation of oxygen in the system can be done finel . 2 x 1 = 2 marks	
(c)	Thread forms and their application: (i) Buttress - for quick release mechanisms as in carpenter's vices. (ii) Acme - for transmission of power and motion (iii) Square thread - for transmission of power (iv) Vee thread - for general use. Any 4 x 1 = 4 marks	
(d)	A riveted double cover plate butt joint  6 parts correctly shown × ½ = 3 marks	**15 marks**

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13. (a)	(i) Procedure for tinning a soldering bit: - Clean the soldering iron - file if necessar - Heat to the correct temperature - Clean with the flu - Rub the solder on the iron to tin it. 4 x 1 = 4 marks	
	(ii) Procedure of sweat soldering a joint: - Clean the faces to be joined. - Fit the parts together, such that the tinned faces lie on each other. - Apply heat so that the solder in-between the parts melts, and hold the parts together until they bond - Remove any excess solder 5 x 1 = 5 marks	
(b)	**Precautionary measures in order to achieve a good soldered joint** - Clean the joint area - The joint must be close fittin - Use correct flux - Use the correct amount of heat for the solder - The bit must be in good working condition and properly tinned - Ensure the joint is cleaned after soldering 6 x 1 = 6 marks	**15 marks**
14. (a)	**The procedure of making the bush:** - Face both sides A and B - Parallel turn the diameter of the portion to be knurled - Parallel turn the smaller diameter on both sides - Taper turn side A - Centre drill side A - Hold side B in the chuck and support side A with the dead centre - Knurl the ring - Fix the drill on the tail stock chuck and drill the hole - Cut the taper on side B with a drill or tool bit 9 x 1 = 9 marks	
(b)	**Case hardening the bush:** - Remove all burrs and polish the bush - Heat to a bright red colour - Dip in kasenit compound (carbon) - Allow it to cool slowly - Reheat to a bright red colour - Quench in oil/ brine/ water to harden the skin. 6 x 1 = 6 marks	**15 marks**

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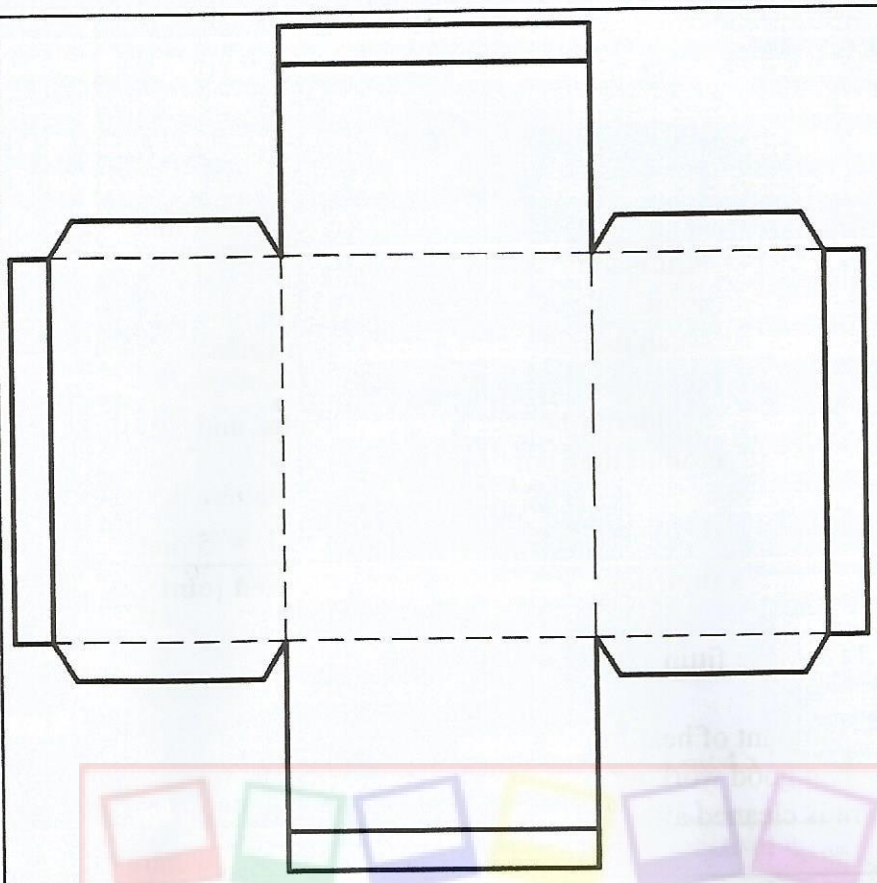
15. (a)	 5 faces correctly represented – 5 × 1 = 5 marks 4 hidden detail lines – 4 × ½ = 2 marks Flaps correctly represented = 1 mark Total = 8 marks	**15 marks**
(b)	**Reasons for making wired edges:** - For strength - For safety - For aesthetics Any 2 x 1 = 2 marks	
(c)	**Procedure for making a wired edge:** - Mark out the allowance for the edge - Bend along the folding line to a right angle using folding bars - Tap over the edge further down over a metal bar with a rounded edge - Place the wire in the grove and using a mallet, tap the edge further down - Close down the edge using a hand groove - Tuck in the end using a hatchet stake and tucking hammer. Any 5 x 1 = 5 marks	

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