

30.16 METALWORK (445)

30.16.1 Metalwork Paper 1 (445/1)

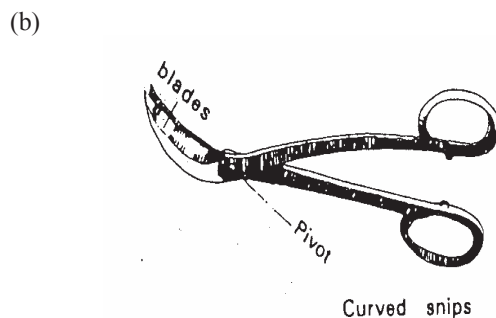
1. (a)
- To protect eyes.
 - To protect feet.
 - To protect hands.
 - To protect clothes .
- (4 × ½ marks)**

- (b) **Public:** are manufacturing industries which are either partially or wholly owned by the government.
Private: are industries owned by individuals (sole proprietor) or a group of individuals.
(2 marks)

2. (a)
- Length.
 - Cut.
 - Shape. (cross section)
 - Grade.
- (3 × ½ marks)**

- (b) (i) **Cross cut**
- Cutting square holes.
 - Making slots.
 - Making key ways.
 - Making channels.
- (ii) **Half round**
- Filing flat surfaces.
 - Filing concave surfaces.
- (Any 4 × ½ marks)**

3. (a)
- Drawing circles and radii where ordinary compasses are too small.
 - Bisecting long lines.
 - Transfer of measurements.
 - Marking parallel lines to an edge.
 - Stepping equal distances.
- (Any 4 × ½ marks)**



marks)

4. **Physical** :- Characteristics of metal which do not influence the strength of metal for example:- Colour, density, conductivity. **Mechanical**:- Characteristic of metal which influence its strength for example:- Hardness, toughness, brittleness, malleability, elasticity etc. **(4 marks)**

5. (a)
(i)

(1 ½

- **Backfire**:-a condition whereby the flame momentarily recedes back into the tip before being expelled with a loud sound.

- **Causes:-**

- Weak acetylene flame.
- Leaks.
- Overheated torch.
- Dirty tip.
- Tip coming into contact with molten pool.

(Any 2× ½=1 marks)

(ii)

- **Flashback**:- the torch stays lit instead of expelling the flame. It tends to travel in the torch body.

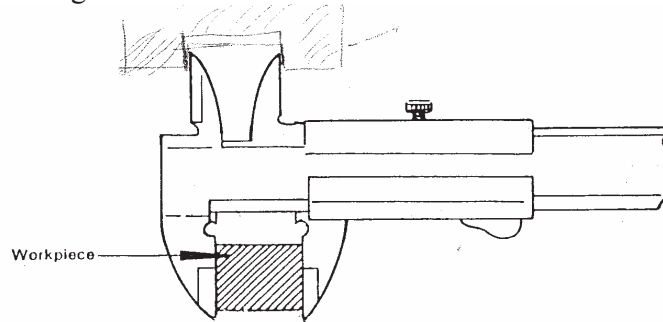
- **Causes:-**

- Improper pressures.
- Faulty mixing chamber.
- Overheating of torch.
- Faulty tip.
- Kinked hoses.

(Any 2× ½=1 marks)

6.

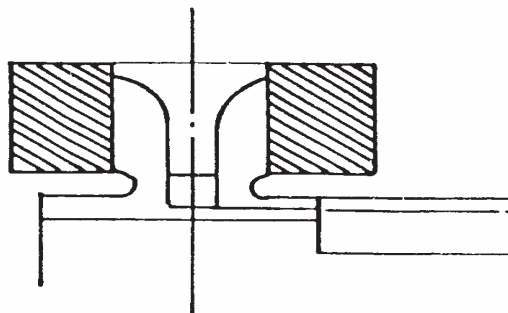
(i) Taking external measurements



(1 ½

marks)

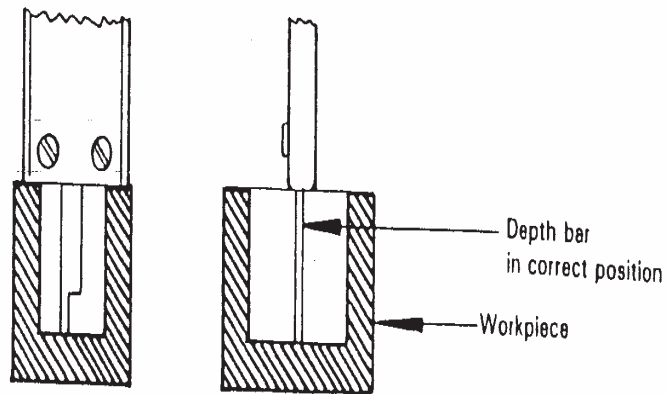
(ii) Taking internal measurements



(1 ½

marks)

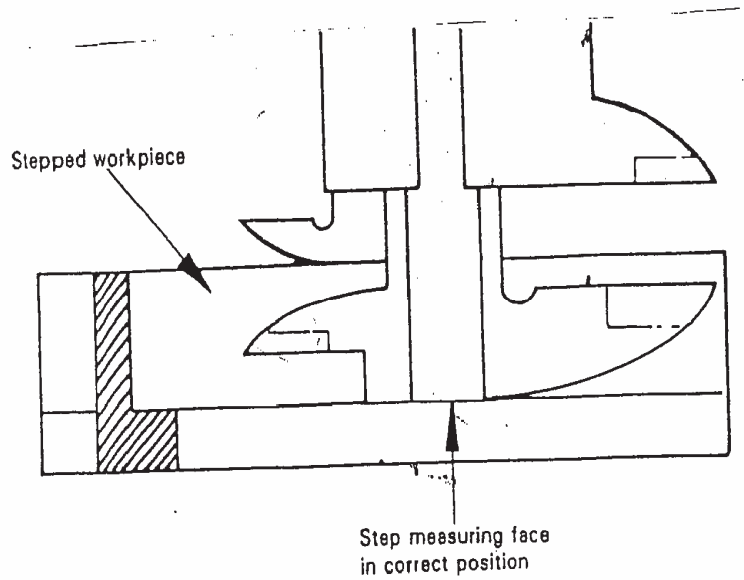
(iii) Taking depth measurements



(1 ½

marks)

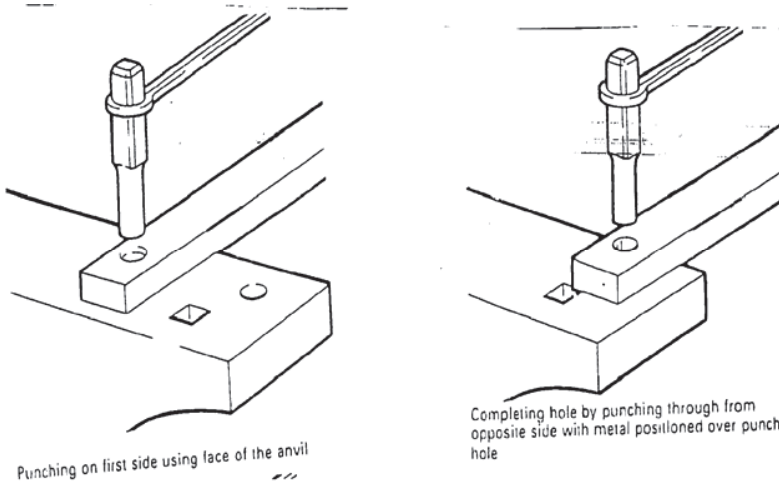
(iv) Taking stepped measurements



(1 ½

marks)

7.



(3 marks)

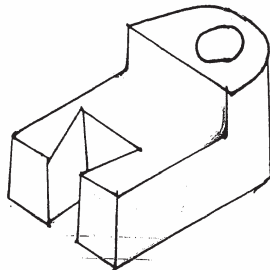
8. (a)
- Both use - different working temperature.
 - Soldering - different filler rod.
 - Soldering - different flux.
 - Brazed joint is stronger than soldered.
- (2 marks)**

- (b)
- By bending and flattening.
 - By wire edging (bend over a wire and retain it).
 - By heading (bend over wire and remove it).
- (3 marks)**

9. (a)
- Pop rivet faster to install than snap rivet.
 - Pop rivet is done from only one side.
- (2 marks)**

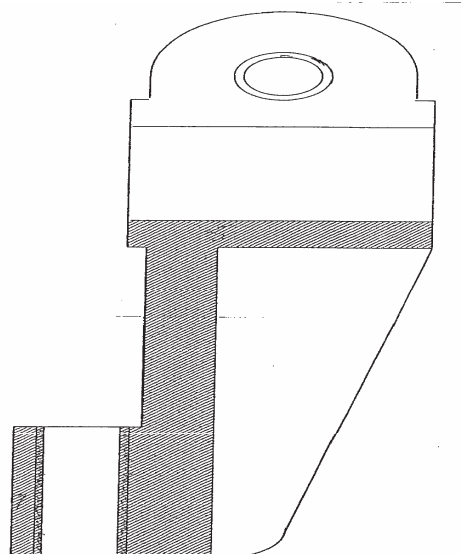
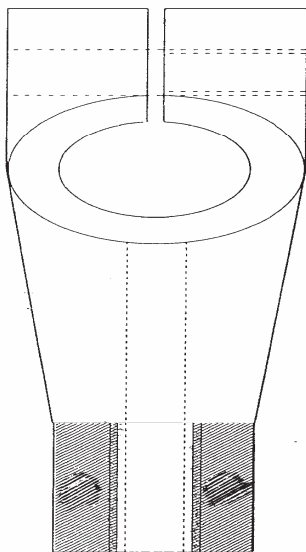
- (b)
- Protects surfaces from damages.
 - Provides additional beauty.
 - Protection from corrosion/rusting.
- (1 ½ marks)**

10.



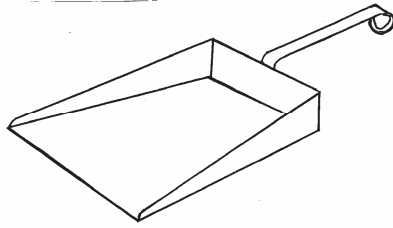
(5 marks)

11.



(15 marks)

12. (a)



(5 marks)

(b) (i)

- Mark out the development as shown in the diagram.
- Cut and file to shape and size.
- Using a mallet and folding bars, bend the two sides.
- Bend the back over the sides
- Bend the flaps.
- Deburr the work piece.

(ii)

- Cut the required length of the flat bar.
- Form a loop (eye) on one end of the handle.
- Bend the second end to correct shape and angle.
- Deburr the handle.

(iii)

- Clean the surfaces to be braced.
- Align the body and handle and lamp together.
- Open the cylinders and set the gas to correct pressure.
- Light and set the torch to correct flame.
- Heat the brazing rod and dip it into flux.
- Heat the joint to melting point of the rod.
- Braze the joint.
- Put off the flame.
- Clean the joint to remove excess flux.
- Shut off the cylinders and release the system pressure.

(10

marks)

13. (a) (i) Alloy of tin and lead: Should have:

- Low melting temperature.
- Low surface tension.
- High capillarity resistance to corrosion.

(ii) Cast iron: Should be:

- Self lubricating.
- Hard surface.
- Easy to make.




(iii) High speed steel: Should be:

- Resistance to rust and wear.
- Retain hardness even at high temperature.

- Hard.
marks)

(4½

(b)

- (i)  For roofwork and window frames
- (ii)  Steel structures and frames
- (iii)  Furniture, fences, gates

(3×1½ marks)

(c)

- **Bluing:-** A method of finishing metal articles using heat to achieve a corrosion resistant surface. Done by heating until colour changes to blue then dip the work into light oil and allow to cool. (2 marks)
- **Lacquering:-** A process of metal finishing using lacquer for preservation and beauty. The types of lacquer used include hot, gum cellulose and synthetic and is applied using a brush, dipping or spraying. (2 marks)
- **Planishing:-** Is a process of finishing by making even decorative dents on sheets metal using a planishing hammer and stake. The process includes annealing, picking buffing and cleaning. (2 marks)

14.

- (a) (i) Shank diameter
 $\text{Ø} = 1\frac{1}{2} \text{ thickness} = \frac{3}{2} \times 4 = 6 \text{ mm}$
- (ii) Shank length = $2 \times \text{thickness} + 1\frac{1}{2}\text{Ø} = (2 \times 4) + (\frac{3}{2} \times 6) = 8 + 9 = 17$
- (iii) Edge distance A = $1\frac{1}{2}\text{D} = \frac{3}{2} \times 6 = 9$
- (iv) pitch distance = $3\text{D} = 3 \times 6 = 18$

(6½ marks)

(b)

- Strength of the joint.
 - Thickness of the joint.
 - Appearance.
 - Where used.
- marks)*

(1½

(c)

- Mark the holes and drill one hole on cover plate.
- Drill a hole on one of the plates to be joined.
- Debur the plates.
- Cut the rivet to correct size.
- Align the pieces and insert rivet.
- Close the plates using rivet set.
- Spread the tail of the rivet shank.
- Form the head with ball pen.

- Finish with rivet snap.
- Drill the second hole and rivet.
- Align the second plate.
- Drill the holes for second plate.
- Rivet the second plate.
- Finish.

(14×½ marks)

15. (a)

- Cold forging procedures better finish than hot forging.
- Cold forging work hardens and leaves the work stressed.
- Cold forging requires ductile material and of small cross-section unlike hot forging.

(3 marks)

(b)

(i)

Eye: πD where $D=20+3+3=35$

$$\pi 35 = \frac{22}{7} \times 35 = 110$$

$$\text{Straight part: } 120 - \left(\frac{22}{7} + 6 \right) = 102 - 20.5 = 99.5$$

$$\text{Total length} = 110 + 99.5 = 209.5 \text{ mm}$$

(3 marks)

(ii)

- Mark the required for the eye.
- Bend the rod to 90°.
- Form the eye on anvil by start, further and closing.
- Hammer the eye on the anvil flatten.

(3 marks)

(iii)

- Hold the work piece in the vice.
- Chamfer the end to be threaded.
- Select the correct die M6.
- Fix the die in the die stock.
- Adjust the die to maximum opening.
- Fit the die square at the end of the bar.
- Apply cutting the thread.
- Continue cutting and reversing to break the chips.
- Remove the die.
- Adjust the depth of the cut.
- Repeat thread cutting until the right depth is achieved.

(6 marks)