22.0 METAL WORK (445)

22.1 Metal Work Paper 1 (445/1)

1. (a) CAUSES OF ACCIDENTS
Failure to hold chisel firmly
Failure to use goggles
Using chisel with mushroomed head
Using blunt chisel
Failure to hold work piece firmly
Grieared chisel .

Any 4 x ½= 2 marks

(b) ENTRY REQUIREMENT

(i)	ARTISAN	KCPE
(ii)	DIPLOMA	KCSE (C Plain) or Craft certificate
(iii)	CRAFT	KCSE (D Plain) of Artisan

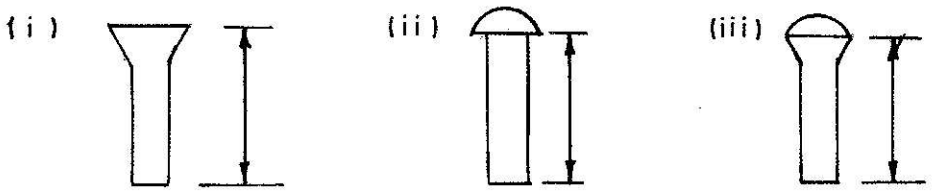
3 x ½ =1 ½ marks

2. (a) READING MICROMETER
Read the whole number on barrel/sleeve
Read complete subdivision on barrel
Read number on thimble before datum line
Read extra divisions coinciding with datum line
Finding the centre of the round bar.

4 x ½= 2 marks

(b) SCRIBING BLOCK
Marking out
Testing parallelism
Testing alignment
Testing roundness/concentricity 4x ½= 2 marks

3. (a)



3 × 1 = 3 marks

3 x 1= 3 marks

(b) Marking + appropriate sketch
Checking + sketch
Guiding + sketch

Any 3 x 1= 2 marks

4. (a) Twist drill HSS/HCS Hardness and wear resistance
(b) Rivet MS, Alminium, Brass, Copper Malleability/ductility

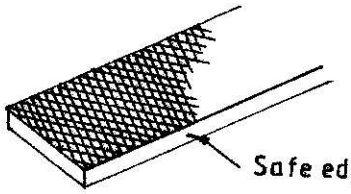
(c)	Hammer head	Medium Carbon Steel	Toughness/hardness
(d)	Knife blade	Stainless steel	Non-corrosive/hardness/easy to cold work

8 x ½= 4 marks

5. (a) (i) Clogging of a file by metal chips
(ii) Applying chalk on the surface
(iii) Cleaning using a file card or wire brush

3 x 1= 3 marks

(b)



1½ Marks

Allows filing one surface of a shoulder or inner corner ½ mark

1

Allows filing one surface of a shoulder or inner corner ½

2 marks

6. (a) LEG VICE
Enhanced rigidity hence withstands heavy blows
Capable of opening more hence holds wider work piece
Withstands very high temperatures Any 2 x 1= 2 marks

(b) Slide the rule through the slot in the centre head and lock. Hold the centre head against the end of the bar
Scribe a line across the end of the bar
Rotate the bar and scribe another line to obtain a centre of intersection/bar

4 x ½= 2 marks

7. (a) Forms:
Rod, wire, strip, powder Any 2 x ½= 1 mark

(b) REASON:
To cater for
- thickness of material being brazed
- the design of the joint
- method of heating the metal

Any 1 x 1= 1 mark

8. (a) WELDING
The process of joining metals by heating them to melt and fusing together.

(b) RIGHTWARD WELDING
Deeper penetration and faster
Rate of cooling is reduced hence better results
Less gas is used
No berel is required for steels up to 8.0 mm thus less filler metal required/used..

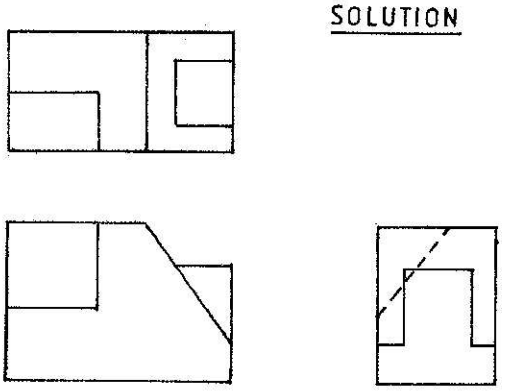
Any 2 x 1= 2 marks

9. OIL BLACKING
Clean the surface
Heat to red hot
Dip in clean thick oil
Heat again to burn excess oil
Allow to cool
Clean the surface

6 x ½= 3 marks

10.

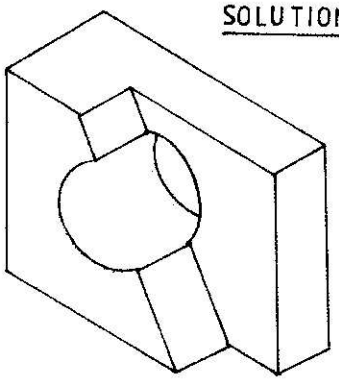
SOLUTION



9 faces × ½ = 4½
Hidden details = ½
3rd Angle projection = ½
TOTAL = 5½ marks

11.

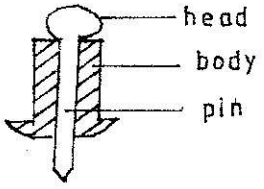
SOLUTION



12. (a)
(i) Scribe the centre line using a scriber
(ii) Step off the 75mm hole centres using dividers
(iii) Dot punch hole centres using hammer and punch
(iv) Scribe 18mm radius using dividers and rule
(v) Scribe 25mm radius using rule and dividers
(vi) Join 18mm and 25mm radii tangentially using rule and scriber
(vii) Drills holes Ø 18 and Ø 25 using a drill bit.
(viii) Cut along the outline using a hacksaw
(ix) File the outline smooth using a file.

6 x 1= 6 marks

(b) (i) POP-RIVET



Sketch and labelling = 2½ marks

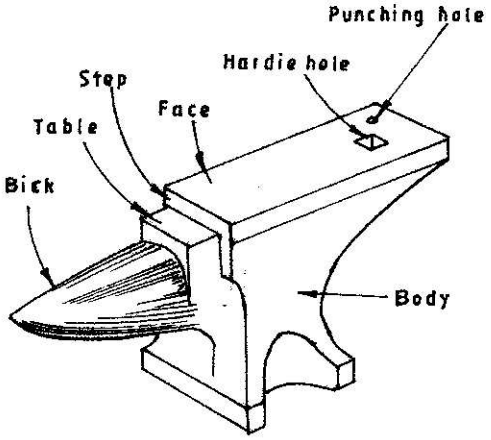
(ii) STEPS
Mark and drill the plates
Debur the plates
Align the holes 3x ½= 1 ½ marks

(iii)I nsert the rivets into the work piece and grip the pin with the rivet gun.
Press the gun to pull the pin causing the head to expand the body.
Continue pressing the gun until the pin breaks off.

3 x 1= 3 marks
Any 2 sketches x 1= 2 marks

13. (a) ANVIL

ANVIL



Sketch = 2
Labelling (3x) = 1½
TOTAL = 3½ marks

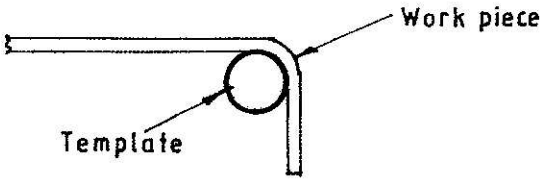
(b) (i) LENGTH OF MATERIAL

Inner radius 18
Outer radius 18 + 918 + 3) ½
Mean radius $\frac{42}{2}$ = 21
Length of curvature = $\frac{2\Pi r}{4}$
= $(2 \times \frac{22}{7} \times 21) \times \frac{1}{4}$
= 33mm

4 x ½ = 2 marks

(ii) RADIUSED BEND
Obtain a suitable template/jig for Ø 36 or R18
Mark the area to be bent
Heat the area to be bent
Clamp work piece against the jig
Bend to shape.

5 x ½ = 2 ½ marks



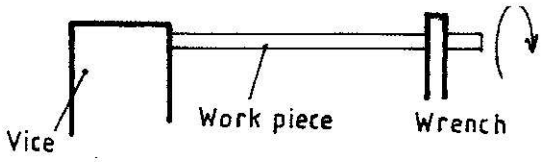
Sketch = 1

Total = 3 ½marks

TWISTING

Heat the area to be twisted
Grip firmly in the vice one end of area to be twisted
Hold the other end with tongs or wrench
Twist the bar 90° or 180°

4 x ½= 2 marks

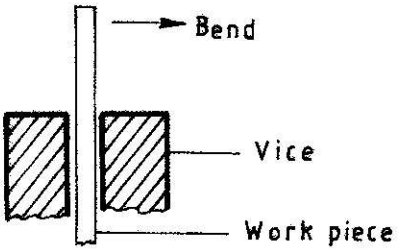


Sketch = 1

Total = 3

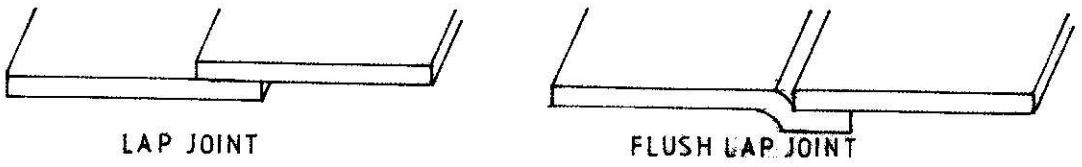
BENDING

Mark section to be bent
Heat the section to be bent
Hold in the vice
Bend at 90°



4 x	=	2
Sketch	=	1
Total	=	3

14. (a)



Sketch 2 x 1 = 2

(b) PROCEDURE:

- Clean the surface to be soldered, with abrasive cloth
- Clean the soldering bit with a file
- Tin the soldering bit
  - heat the soldering bit until it is brown
  - apply flux to the point
  - add solder to the point
- Tin the surfaces separately i.e. apply flux
  - heat
  - apply solder
- Put the surfaces to be joined together and press firmly.
- Heat the joint using any suitable heat source e.g. soldering iron, Gas torch or blow lamp etc; until the solder melts.
- Let the joint cool while still applying pressure.
- Clean the joint to remove any excess flux.

8 x 1= 8 marks

(c) SAFETY RULES

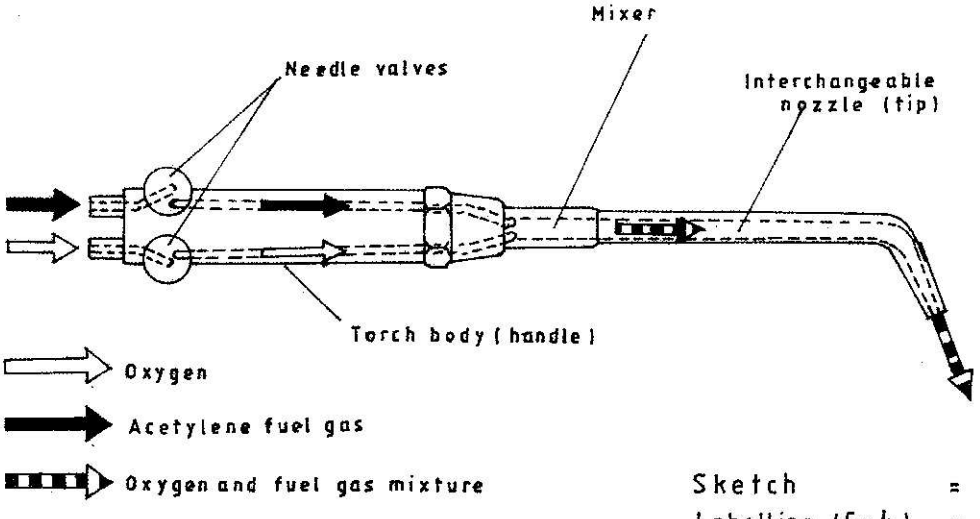
(i) Keep the hot iron away from the body.
(ii) Do not put the hot soldering iron on a wooden bench.
(iii) Liquid flux is corrosive and must be kept away from eyes.
(iv) Do not touch a newly soldered joint - The joint may still be hot.

4 x ½= 2 marks

(d) (i) Copper conducts heat very well.
(ii) Copper retains heat for a long time.
(iii) Copper picks up solder very easily.

3 x 1= 3 marks

15. (a) WELDING TORCH



Sketch = 2
Labelling (5×½) = 2½

SAFETY PRECAUTIONS

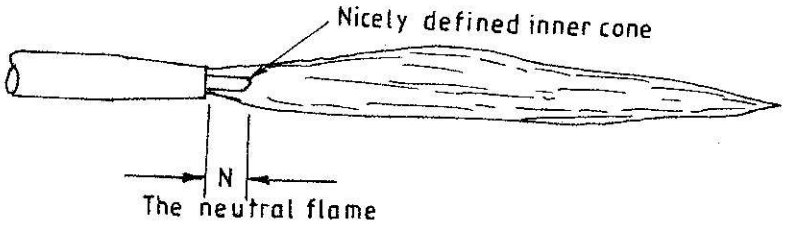
- Ensure that the nozzle seat and threads are free from any foreign materials.

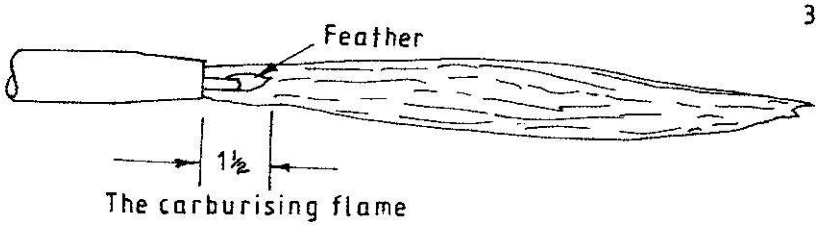
- Nozzle should only be cleaned with tip cleaner
- Never use nozzle to hold or push the work piece
- Avoid knocking nozzle against hard surfaces

Any 3 x 1= 3 marks

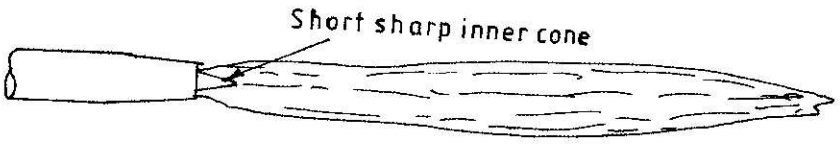
(b) GAS WELDING FLAMES

(i)





3 × 1½ = 4½ marks



(ii) 1. Neutral Flame has equal quantities of oxygen and acetylene
2. Carburising flame has more acetylene gas than oxygen
3. Oxiding flame has more oxygen than acetylene gas

3 x 1