

**NATIONAL BUSINESS AND TECHNICAL EXAMINATIONS BOARD  
(GENERAL EDUCATION EXAMINATION)**

**FABRICATION AND WELDING  
051-1 (ESSAY)  
QUESTION AND MARKING SCHEME**

**QUESTION**

1(a) State THREE functions of flux in hard soldering?

**ANSWER**

- (i) To dissolve any oxide that is present on metal surface.
- (ii) To prevent corrosion or oxidation by excluding air.
- (iii) It enables spelter to flow easily along the joint.
- (iv) It enables solder to adhere to metal surface.

**QUESTION**

1(b) Explain the flame used when brazing

**ANSWER**

Neutral flame is generally used for brazing. Oxidizing flame may be used when present metal or filler rod contains about 50% zinc to prevent zinc loss during soldering.

**QUESTION**

2. Explain the following terms
- (i) Ductility
  - (ii) Malleability
  - (iii) Hardness
  - (iv) Tenacity

**ANSWER**

- (i) **Ductility:** This is the ability of material to be drawn into thin wire without fracture e.g. copper, aluminum, e.t.c. it is the opposite of brittleness.
- (ii) **Malleability:** This is the ability to be hammered, rolled or bent without fracture or ability of metal to stretch in all directions by hammering without breaking e.g. copper, aluminum, gold etc.
- (iii) **Hardness:** This is the property a metal posses that enables it to resist indentation, wear, cut or scratch e.g. high carbon, steel, cast iron e.t.c. a harder metal will always cut a softer one.
- (iv) **Tenacity:** This is the ability of a material to resist its particles being torn apart by a pulling or stretching force. It resists distortion e.g. bronze high carbon steel.

**QUESTION**

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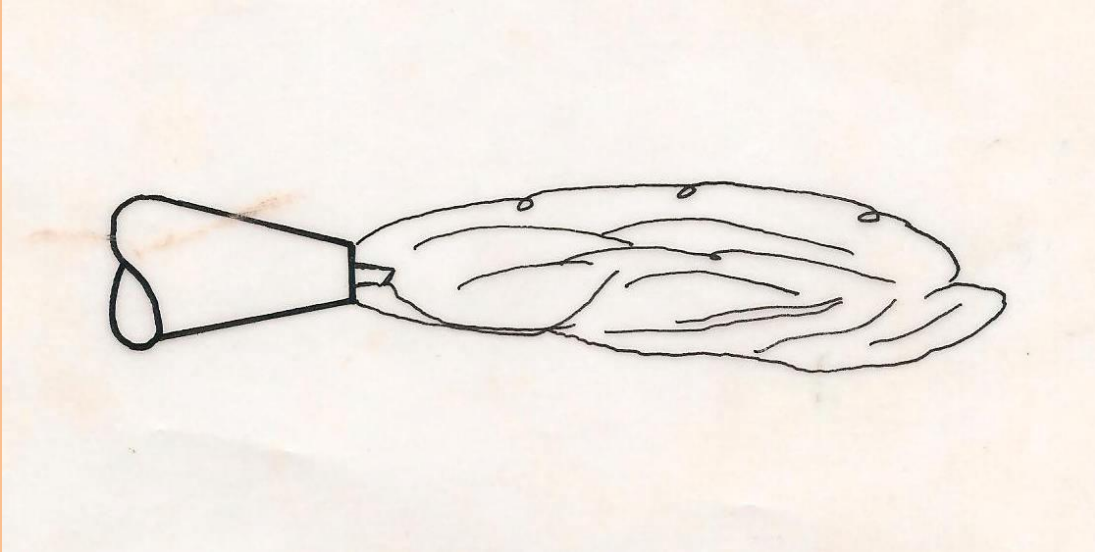
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3. With neat sketches name THREE types of oxy-acetylene flames and their application.

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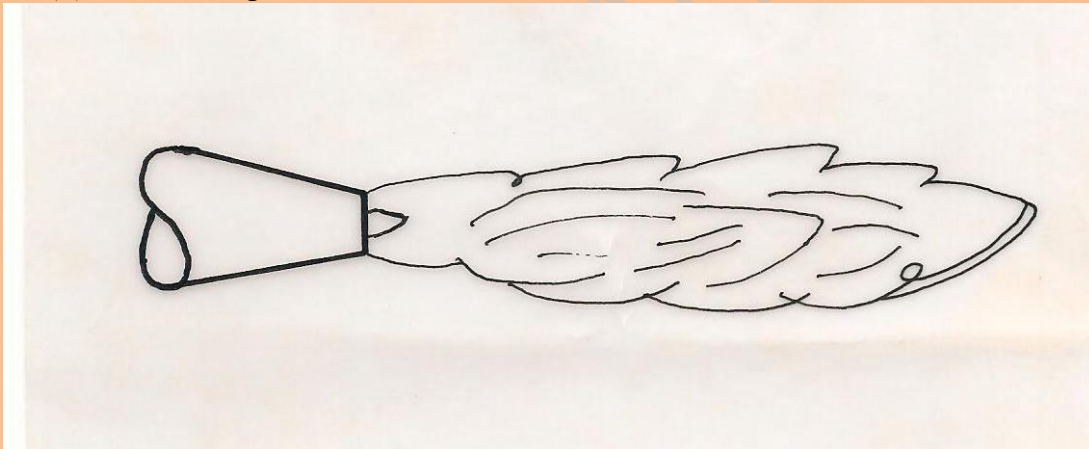
**ANSWER**

(i) Neutral flame



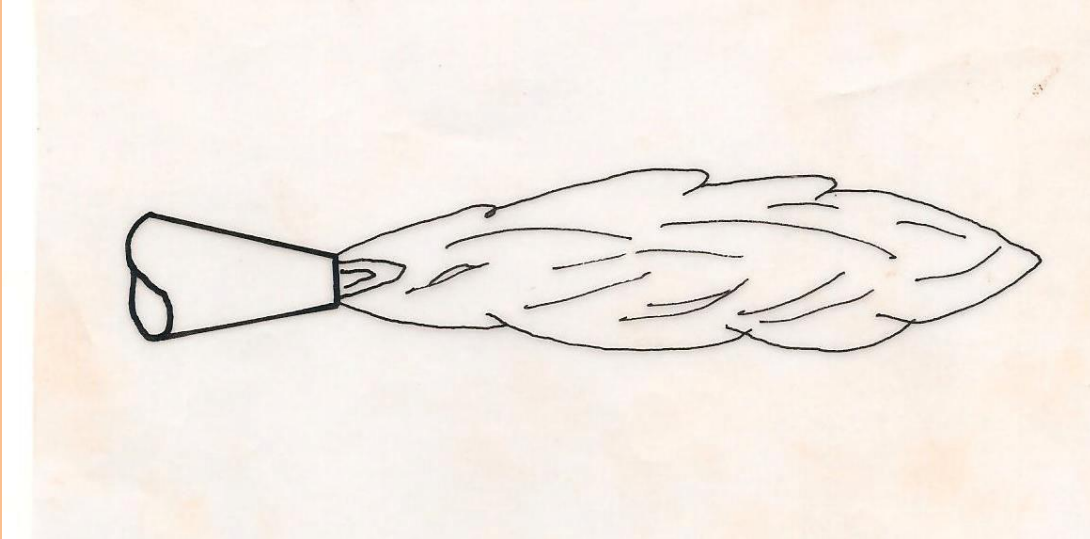
Application: It has equal volumes of oxygen and acetylene (50-50) with the inner cone well defined. It is used for welding steel, copper, aluminum, cast iron.

(ii) Oxidizing flame



Application: It contains excess oxygen which results in oxygen rich zone beyond the cone and inner cone is sharply defined. It is used for welding brass and brass alloys.

(iii) Carburizing flame



Application: It contains excess acetylene which results in carbon rich zone extending around and beyond the inner cone. It is used mainly for hard surfacing.

#### QUESTION

4. Explain the reason for heat treating cast iron before welding.

#### ANSWER

Cast iron is very brittle and this makes it difficult to weld unlike steel. Heat treatment is therefore required.

- (i) Heat treatment of cast iron before welding prevents cracking due to expansion and contraction.
- (ii) Heat treatment enables a sound weld to be made as the welded cast iron cools down slowly.
- (iii) It enables a weld that can be good surface finish to be produced.
- (iv) It causes grey cast iron to be formed instead of the hard white unmachinable weld that would occur if it cooled off rapidly.

#### QUESTION

5(a) Explain the term “weld defect”

#### ANSWER

A weld defect is an imperfection on the weld which may lead to failure of the joint under service e.g. undercut, porosity, and blow holes e.t.c.

#### QUESTION

5(b) What causes the following weld defects?

#### ANSWER

- (i) **Undercut**
  - A too rapid rate of travel of electrode or blow pipe.
  - Use of wrong electrode or blow pipe.

- It can be caused by excessive heat built up.
  
- (ii) **Slag inclusion**
  - Using too low current to weld.
  - Using too large electrode.
  - Fast metal surface can cause it.
  
- (iii) **Porosity**
  - Using damp or wet electrode
  - Welding on dirty surface of metal like rust, grease, water etc.
  
- (iv) **Excessive penetration**
  - Using too high welding current.
  - Slow rate of travel of electrode or blow pipe.
  - Bad edge preparation or wide root gap.
  - Too much concentration of heat.

#### QUESTION

6. Differentiate between AC and DC welding machines.

#### ANSWER

- (i) The supply voltage of DC machine remains steady while that of AC machine is alternating from positive to negative.
- (ii) DC welding machine has rotating parts inside while AC machine is static.
- (iii) The voltage in AC is from main supply while that of DC is from petrol driven engine.
- (iv) Troublesome magnetic field causing arc blow is eliminated in AC welding set during welding.
- (v) The efficiency of AC welding machine is slightly greater than welding set of the same capacity
- (vi) Slightly covered or base wire electrodes can be used in DC set while flux covered electrodes can only be used in AC machine.

**QUESTION**

7. Sketch the following welding symbols and their sectional conventions

