



**Section I : Attempt all the Twelve (12) questions**

**(60 marks)**

- 01.** List ten (10) consumable materials used in gas welding production. **(5 marks)**
- 02.** State five (5) elements used in making a filler rod production. **(5 marks)**
- 03.** State five (5) applications of ferrous metals and nonferrous metals. **(5 marks)**
- 04.** Give five (5) examples of accessories used in oxyacetylene gas welding. **(5 marks)**
- 05.** Mention at least five (5) functions of flux. **(5 marks)**
- 06.** Choose the correct answer: **(5 marks)**

**1.** The quality expected from flux used in silver soldering is that it should be able to:

- A. Dissolve oxides formed on the work
- B. Fill up any gap in the joint
- C. Vitrify after the solder has become molten
- D. Form an oxide during the soldering operation

**2.** The melting temperature range for soldering process is:

- A. 40°C to 100°C
- B. 180°C to 450°C
- C. 300°C to 500°C
- D. 600°C to 900°C
- E. 1000°C to 2000°C

**3.** Brazing is the process of:

- A. Joining plastic sheets
- B. Hard soldering using brass spelter
- C. Casing in brass
- D. Making steel look like brass

4. The melting temperature range of brazing process is:

- A. Equal 450<sup>0</sup>c
- B. Above 450<sup>0</sup>c
- C. Less than 450 <sup>0</sup>c
- D. Any of the above

5. A solder is made of:

- A. Brass
- B. Tin and lead
- C. Steel
- D. Copper and zinc

07. a) Identify four (4) typical major components of organic fluxes.

**(2 marks)**

b) What is the form of flux?

**(3 marks)**

08. With neat sketch state all types of flames and their applications.

**(5 marks)**

09. With neat sketch draw oxy acetylene gas welding equipment. **(5 marks)**

10. Give five (5) examples of measuring tools used in gas welding production.

**(5 marks)**

11. What is the purpose of using a pressure regulator in gas welding?

**(5marks)**

12. Step by step what are the procedures of adjusting welding flame?

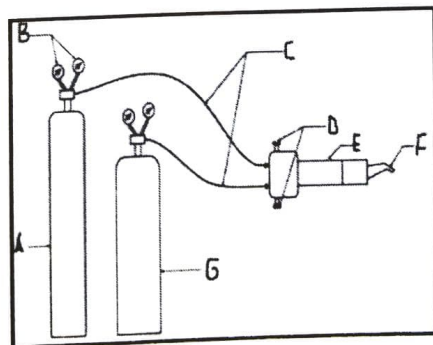
**(5marks)**

**Section II: Attempt any Four (4) questions out of Six (6) (40 marks)**

13. Make a comparison between oxygen cylinders and acetylene cylinder. **(10 marks)**
14. Discuss about three (3) types of oxy acetylene gas welding flames and their applications. **(10 marks)**
15. Identify five (5) limitations and advantages of brazing process. **(10 marks)**
16. BRARIRWA enterprise wishes you to fabricate tanks which are used to store water with the following characteristics:
- Resist for corrosion and rust
  - Have the attractive color
  - Have thermal conductivity
  - Must be installed in 200cm height above the ground surface

Questions:

- a) Give four (4) examples of metals you have to request in order to perform this work. **(4 marks)**
- b) Identify three (3) tools and three (3) equipment needed to perform this work. **(6 marks)**
17. a) Provide the names of the following points on oxy-acetylene gas welding process. (Long cylinder is Acetylene and shorter is oxygen). **(7 marks)**



- b) Differentiate back fire from flash back. **(3 marks)**
18. Describe the procedures for lighting the flame. **(10 marks)**

# Section I

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- ① - Sheet metal 0.5 mark  
- tubes 0.5 mark  
- profiles 0.5 mark  
- Round bar 0.5 mark  
- iron tee 0.5 mark  
- Angle iron 0.5 mark  
- flat bar 0.5 mark  
- Square bar 0.5 mark  
- pipe 0.5 mark  
- U-beam 0.5 mark

2) Elements used in making a Miller rod production

- of base metal to be welded 1 mark/each
- of welding position
- of regulatory specifications and codes
- of design requirements
- of shielding gas
- of welding equipments

3) 5 application of ferrous metal. 0.5/each

- of Structural (building structure, concrete reinforcements)
- of Automotive (chassis, engine parts, drive train, body parts)
- of Marine (Ship hulls, structure, engines)
- of Defense (Tanks, weapons)
- of consumer products (appliances, recreational vehicle toys, utensils and tools)

Application of non ferrous metals 0.5/each.

- of Residential
- of Commercial
- of Aluminium for aircraft frames
- of Magnesium transmissions
- of titanium for golf clubs
- of zinc in electrical hardware
- of Marine (brass/bronze fittings)

#### 4) Gas welding accessories

1 mark / each

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- \* Spark lighter
- \* Nozzle cleaner
- \* Trolley
- \* Cylinder key
- \* Wire brush
- \* Hammer
- \* Tongs
- \* Anvil

#### 5) Five functions of flux

1 mark / each

- \* Flux helps form strong joint by bringing the filler metal into immediate contact with adjoining base metals and permitting the filler to penetrate the pores of the metal.
- \* Flux prevent oxidation of the base and filler materials
- \* To provide shielding gas, ~~or gas shielded by~~ for protecting against atmospheric reaction
- \* To add alloying elements to the weld metal which will increase the strength and improve other properties in the weld metal.
- \* To provide arc stabilizers which produce a smooth welding arc.

- 1) B
  - 2) B
  - 3) A
  - 4) B
  - 5) B
- 1 mark/each

### 7) Major components of organic fluxes

- of Activators 0.5 mark
- of vehicle, 0.5 mark
- of Solvent 0.5 mark
- of additives 0.5 mark

6) The form of flux are liquid, powder and paste.

### 8) Types of flames and their applications

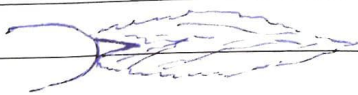
#### (\*) Neutral flame



generally application for welding of mild steel, copper and stainless steel.

#### (\*) Oxidizing flame:

5 marks.

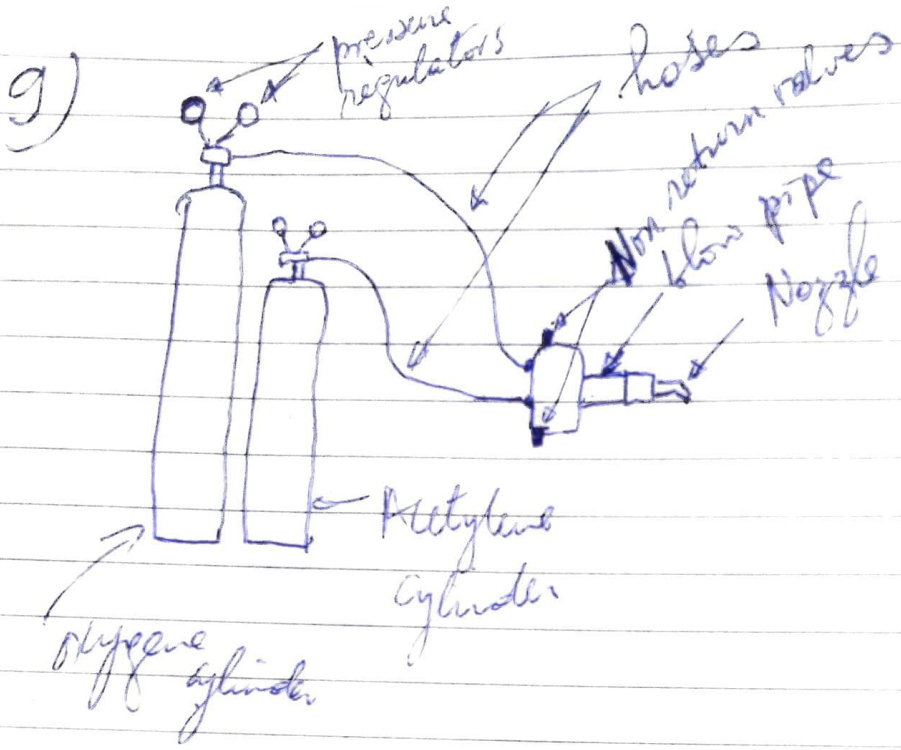


generally application for welding of brass, bronze, brazing and braze welding

#### (\*) Carburizing flame



generally application for welding aluminium and hard facing.



7 marks.

### 10) Measuring tools

- \* Tape measure
- \* Vernier caliper
- \* Steel ruler
- \* square
- \* protractor

1 mark/each

### 11) Purpose of using pressure regulator

- 1) To know the quantity of gas inside the cylinder
- 2) To set the quantity of gas coming out the cylinder
- 3) To reduce the cylinder gas pressure to the working pressure
- 4) To control the flow of gas at a constant rate to the blow pipe.

1 mark.



## 12) Procedures for adjusting flame.

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- ) Open the acetylene valve further and watch the flame near the nozzle tip. add more acetylene until the flame is just about to separate from the tip. 2 marks
- ) Slightly open the oxygen pin valve. if the flame goes out turn off the gases and try again. 5 marks

if the flame will be divided into 3 different color regions.

## Section II

### 13) Comparison between oxygen cylinders and acetylene cylinder

#### Oxygen cylinder

- ) is a seamless steel container used to store oxygen gas. 2 marks
  - ) the cylinder valve has right hand thread. 2 marks
  - ) cylinder body is painted black or blue. 2 marks
- two comparisons for each are enough.

#### Acetylene cylinder

- ) acetylene cylinder is made with pores. 2 marks
- ) cylinder body is painted red, ~~black~~ or maroon. 2 marks
- ) cylinder valve has left hand thread. 2 marks
- ) it is not seamless steel container (sometimes it can be seamless)
- ) box of acetylene cylinder (curved inside) is fitted with fuse which allow the gases to escape at high temperature.

14) 3 types of gas welding flames and their applications

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<sup>1 mark</sup>  
•) Neutral flame: it is obtained when the mixed torch gas consists of approximately one volume of acetylene and one volume of oxygen.  
it has temperature <sup>1 mark</sup>  $3200^{\circ}\text{C}$  at its inner cone tip.

application: used to weld: <sup>1 mark</sup> mild steel, copper, stainless steel

<sup>1 mark</sup>  
•) Oxidizing flame: is produced when slightly more than one volume of oxygen is mixed with one volume of acetylene.

<sup>1 mark</sup>  
it has temperature  $3300^{\circ}\text{C}$  at the inner cone tip.

<sup>1 mark</sup>  
application used to weld brass, bronze, brazing and bronze welding.

<sup>1 mark</sup>  
•) Carburizing flame: is obtained when there is an excess amount of acetylene over oxygen gas.

<sup>1 mark</sup>  
It has temperature  $2900^{\circ}\text{C}$ .

<sup>1 mark</sup>  
application: used to weld aluminium and hard facing.

15)

## advantages of brazing.

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- 3 advantages are enough
1. Brazing does not melt the base metal of the joint. (2 marks/each)
  2. non-similar metal and non metal can be brazed together
  3. Brazing produce less thermal distortion than welding due to the uniform heating of a brazed piece
  4. Complex and small part assemblies can be brazed cost-effectively
  5. Brazing can be coated or plated for protective purpose

## Limitation of brazing

- 2 disadvantages are enough
1. Lack of joint strength as compared to welding joint. (2 marks/each)
  2. Brazed joint can be damaged under high service temperature
  3. The joint color is often different from that of the base metal.

- 16) a) - Stainless steel sheet metal (1 mark/each)
- Aluminium painted Angle iron
  - (or mild steel angle iron painted with Aluminium)
  - Mild steel tube (painted with Aluminium)
  - ~~mild~~ stainless steel tube.

b) Tools: Scriber (1 mark), steel ruler (1 mark), tape measure (1 mark), shipping hammer

equipment: DC welding machine (1 mark), angle grinder (1 mark), gas welding equipment (1 mark), regulators (1 mark).

- 17) a) A - Oxygen cylinder  
B - pressure regulators  
C - hoses  
D - Non return valve  
E - blow pipe  
F - nozzle  
G - Acetylene cylinder

1 mark / each

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b) Back fire: At a certain times during flames ignition in gas welding a small explosion of the flame occurs at the torch tip. Also, by improper operation of the torch may cause the flame to go out with a loud snap.

1 mark

Flash back: Sometime when during backfire, the flame goes off and the burning acetylene gas travels backward in the blow pipe towards the regulator or cylinder, this is known as flash back.

1 mark

18) procedures for lighting the torch (flame)

- 1) Open the cylinder valve on the acetylene tank - 1/4 turn 1 mark
- 2) open the pressure regulator valve on the acetylene tank (clockwise) and adjust the pressure in the acetylene line to 5 psi. 1 mark
- 3) open the acetylene control valve on the handle of the welding torch letting the acetylene escape. 1 mark
- 4) open the cylinder valve on the oxygen tank until it is full open 1 mark
- 5) open valve on the oxygen (pressure regulator) tank (clockwise) and adjust the pressure to 10 psi 1 mark

Open the oxygen pin valve on the handle of the welding tool, letting the oxygen escape until pressure regulator is constant at 20 psi and close the oxygen pin valve. **1 mark**

1) Slightly open the acetylene valve ( $\sim 1/8$ ) until you can just barely hear acetylene escaping. **1 mark**

2) Ignite the acetylene. **1 mark**

3) Continue open the acetylene valve slowly until the flame burns clean. **1 mark**

4) Slowly open the oxygen valve and adjust the required flame. **1 mark**